Endocrine Dysregulation Adversely Effects Female Reproductive Health in South Punjab Pakistan

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Supervisor: Dr. Adeeb Shehzad

School of Mechanical and Manufacturing Engineering

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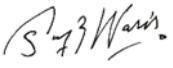
Name of HOD: **Dr. Muhammad Asim Waris** Signature: 

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To My Late Grand Parents. I dedicate this work to them. I am very grateful for their confidence in me and for their prayers which have been a great source of encouragement for me.

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Above all, I bow before Almighty Allah for providing me with the health, vigor, and numerous favors that helped me finish this research. However, for His Grace, none of this could have happened.

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AFP	Alpha-fetoprotein
ART	Assisted Reproductive Technologies
BMI	Body Mass Index
BVH	Bahawalpur Victoria Hospital
CA-125	Cancer Antigen 125
CVD	Cardiovascular Disease
DM	Diabetes Mellitus
ECLIA	Electrochemiluminescense Immuno Assay
ER	Estrogen Receptor
FSH	Follicle Stimulating Hormone
GnRh	Gonadotropin Releasing Hormone
HPG axis	Hypothalamic-Pituitary-Gonadal Axis
hCG	Human Chorionic Gonadotropin
HCG	Hepatacellular Carcinoma
IVF	In-Vitro Fertilization
LH	Lutenizing Hormone
MAPK	Mitogen-Activated Protein Kinase
MAR	Membrane Androgen Receptor
PCOS	Polycystiv Ovary Syndrome
PMS	Premenstral Syndrome

PMDD	Premenstral Dystropic Disorder
T3	Triiodothyronine
T4	Thyroxine
TSH	Thyroid Stimulating Hormone
UTI	Urinary Tract Infection
OC	Ovarian Carcinoma
SST	Serum Separator Tube
E2	Estradiol
PRL	Prolactin
PR	Progesterone
HbA1c	Hemaglobin A1C
SPSS	Stastical Pacakage For The Social Science

ABSTRACT

Endocrine disorders have severe consequences for reproductive health and, overall, the woman's condition. The role of this research is to establish the level of hormonal imbalance resulting in reproductive and other diseases among women in south Punjab, Pakistan. Thus, the present study has adopted a cross-sectional, observational research design in choosing 430 females from Bahawalpur Victoria hospital. Serum samples were also taken from females and hormonal assays performed on the collected samples in endocrine lab. The collected data were analyzed statistically to compare hormonal levels with health status of the women. The findings of the study were that the common symptoms were fatigue, cravings for food, and the high level of obesity among the participants. Hormonal level was correlated with amenorrhea, oligomenorrhea, type 2 diabetes, and insomnia at the considerable level. Serum levels of CA- 125 and AFP were also raised significantly with ovarian cancer. Some other common manifestations were psychological, such as depression, anxiety, increased, and insomnia. Also, the most frequent reproductive symptoms identified were pain and swelling of the breasts, benign breast diseases, and night sweating. The survey work showed high prevalence of hair loss and hirsutism to above the norms, therefore pointing at dermatological consequences of hormonal disturbances. Another group of marriage-related problems that were also identified were fertility problems which were also common affecting a large percentage of the population. No significant associations were found between hormonal levels and certain conditions such as cardiovascular disease and liver disease. The hormonal testing showed dysregulation in FSH and LH and estrogen and progesterone and thyroid hormones. Women of south Punjab are undergoing hormonal imbalance, which includes reproductive health problems and other health related concerns. Focused education on symptoms, early checkups, and encompassing medical approaches are useful in reducing effects of hormonal fluctuations in this group of ladies.

Keywords: Hormonal Dysregulation, Female Sexual Dysfunction, Thyroid Dysfunction, Amenorrhea, Oligomenorrhea, Endocrine Disorders

CHAPTER 1: INTRODUCTION

The coordination between the nervous system and peripheral organs is crucial for ensuring the timing and functionality of reproductive processes. This assists in creating the most suitable internal and external ecology for the propagation of the species. The hypothalamic-pituitary-gonadal axis makes this possible, acting in harmony and regulating ovulation with reproductive activity (Christensen et al., 2012) .Girls possess all the eggs that they will ever have at birth; they come out at time ovulation, and generally, this period is between the onset of menopause and periods. At approximately the age of 11, breast development should have started, while at approximately the age of 13, menstruation should have begun. It is also important to note that egg release may not happen during the first periods of a cycle, but at some other times in fertile years, one egg is usually launched (Bates & Bowling, 2013) . Gonadotropic hormones are secreted from the ovaries and brain, managing pregnancy, periods, and puberty (Kaiser, 2011) . The female reproductive system is a body system composed of glands and organs designed to produce, nourish, and transport eggs and prepare for the meeting of eggs and sperm. The female reproductive system is also influenced by hormones such as estrogen, progesterone, and gonadotropin, which are secreted by the pituitary gland and ovaries (Andina, 2023) .

1.1 Development

It provides for the development of female gametes, and it originates from germ cells. Spermatogonia undergoes early proliferation during fetal development, and during the seventh month of pregnancy, about 7 million germ cells are formed. The number of germ cells will then reduce the rate at which it is done in oogonia, many of which will die, while the few principal oocytes that will be left will enter the first meiotic division. These cells do not divide in prophase I and remain damaged and inactive till the onset of menarche. Here, the granulosa and theca cells form distinct layers surrounding each initial egg or oocyte within the primordial follicle(van Geelen & Sand, 2023) . These granulosa cells also proliferate and form one or more layers surrounding the growing oocyte and the maturing oocyte undergoes extreme increase in size as the primary or

primordial follicles grow (Vogazianou, 2019) . Loose associations of granulosa cells can restart meiosis and progress to the next stage after menarche occurs. Oocytes are arrested at metaphase II when fertilization occurs. The oocyte, which transforms itself into an ovum, extrudes its second polar body after the process of fertilization, and meiosis reinitiates back once more due to the action of a sperm cell, or male gamete (van Geelen & Sand, 2023) .

1.2 Female Reproductive System Organs

The female reproductive system consists of organs for ova production, transport, and storage of gametes and for the copulation of hem and sperm. It also includes external and internal genitalia (Hoare & Khan, 2020) .During pregnancy, the placenta, a kind of transitory body, plays an important role. Organ systems also undergo improvement throughout a woman’s lifetime. The fertility period is characterized by starting with menarche, which is the first menstruation, and ending with the final stage of the cycle known as menopause (Rehfeld et al., 2017) .

1.3 Female Reproductive Internal Part

The female reproductive system's internal part begins with the ovaries; the ovary is surrounded by some abdominal organs and situated within the ovarian fossa, which is on the side wall of the pelvis. In postpartum women, being in position or not depends on various factors, such as the period taken into the bilateral procedure. The two ligaments which connect the pipe to the uterus are the ovarian ligament and the mesovarium. In the case of blood supply, the ovarian arteries are more prominent than the ovarian veins, which serve as a drainage system (Pavlicev et al., 2022) . Its main function is in the ovulation and secretions of hormones, carrying eggs with the help of a ductal system, and helping in the process of inhalation of sperm and the birth of babies. It does so because of hormones (Ramírez-González et al., 2016) .The ovaries, found in the pelvis, have two sections: the outer part, known as the cortex, and the other part, known as the medulla. The cortex has follicles and corpora lutea, and there are corpus albicans and stromal cells in the ovary. (Bates & Bowling, 2013) .The female reproductive system's internal part begins with the ovaries; the ovary is surrounded by some abdominal organs and situated

within the ovarian fossa, which is on the side wall of the pelvis. The first essential activity relates to ovum production and secretion of hormones.

1.3.1 Fallopian Tube (Oviduct/Uterine Tube)

Fertilization can occur and is relatively frequent on the surface of the ovary, as well as a the end of the fimbria of the fallopian tube. Thus, The zygote glides to the uterine cavity through the fallopian tube through ciliary and muscular peristaltic movements. This one extends from the ovary to the uterine horn and reconnects in the uterine cavity. The fallopian tube consists of four parts: There are four parts of the uterus—the intrauterine part, the isthmus, the ampulla, and the infundibulum. And meat of this, according it's around 10 cm in size of fallopian Tube (Oviduct/Uterine Tube) (Ramírez-González et al., 2016) .

1.3.2 Oviduct Parts

The oviducts, where eggs meet sperm, have three sections: tubercle, assammena, and infundibulum, ampulla, isthmus (Rosner et al., 2019) .

1.3.3 Three primary sections to the uterine tube:

The isthmus is a thick-walled structure that connects the uterine tube to the horn of the uterus. Ampulla, the largest and the longest part, generally involves the process of fusing or the mating point, although science has not upheld this (Rosner et al., 2019) .

1.3.4 Cervix

The cervix is simply a narrow channel that opens during birth. The section of the uterus known as the cervix is named from the Latin word which means neck; its existence as a distinct structure was first recognized by Sopranos in the first century A. D. It is the expressed area of the uterus that protrudes into the upper part of the Vagina, the lowest part of the uterus. The cervix is located within the Vagina; the fold divides the female reproductive tract into the lower and upper segments-known as the Vagina and supramarginal portion, respectively. The anterior and posterior lips of the Vagina are a glossy and smooth surface known as the exocervix. This is because they make up the

Vagina Isthmus is the part or area that lies in between the uterus and the endocervix. Thus, the cervical region is less muscular than the rest of the uterus, with mounted specialization on the isthmus, which expands during labour. It originates from the uterine arteries supplying the cervical blood, including the cardinal and uterosacral ligaments. Some women may experience significant pain during menstruation, and if the nerves in these ligaments are taken, it would significantly reduce the pain (Maharajh et al., 2024) .

1.3.5 Cervical Structure

The inner lining of the Vagina involves the surface epithelium, whereas the outermost layer comprises the muscular layers and serosa. It is composed of an outer longitudinal coat and an inner circular coat, collectively termed a muscle coat. The latter is, however, less developed than the uterine exterior or the so-called Perimetrium (Almeida et al., 2016) .

1.3.6 Vaginal flora

The female genital tract, consisting of the vagina, uterus with its cervix and endometrium, uterine tubes, and ovaries, harbors its own typical microbiota, accounting for 9% of the total bacterial population in females (Liptáková et al., 2022) .

1.4 External Genitalia Anatomy

These preliminary details make it critical to explain the external structure of the female reproductive system to students and parents so that they realize the value of reproductive organs in sexual and reproductive health. This system comprises various parts that all have an important function in contributing to the general well-being of an individual.

The labia majora is likely to be fused when the vulva is being developed during the fetal period as well as after birth; hence, the need to neglect them in order to look at the vaginal opening. This brings the labia minora into contact with each other. The labia majora and minora would be shaded on the bottom if indicated in a specific representation of the vulva (Hunter, 2016) .A little below the umbilicus, there is pubic symphysis, which is concealed by the mons pubis that is made by the labia majora, which

are located lateral to the labia minora and meet at the middle of the vulva. The urethral and vaginal openings are found in the vulvar vestibule area, which is an area surrounded by the two minora labia. The vaginal opening is located close to the Bartholin's glands (Rosner et al., 2019) .Estrogens stimulate lipogenic activity and thereby lead to the deposition of fat just beneath the skin, forming a mound-like structure over the mons pubis. Lubrication also helps to protect the symphysis pubis with this fatty layer during intercourse (Andina, 2023) .

1.4.1 Labia Minora

Labia ma is a loose, pendulous skin primarily fatty, located between the permineum and the mons pubics. Their micous membranes lining the inside are oink and sofy, and they do not have body hair on them, while on the outside, they have curly and black body hair and dark skin. (Yavagal et al., 2011)

1.4.2 Labia Majora

The labia majora also have Aulin's fascia and Camper's fascia, which contain fat, and the Colles' fascia, which is deeper down than the anterior abdominal wall.It indicates that infections and hematoma cannot reach the thigh but can reach the anterior abdominal wall (Yavagal et al., 2011)

1.4.3 Clitoris

The Clitoris serves only one purpose in females: the sexual passions that encompass sexual delight. Leading to vulvar enlargement and the secretion of fluid in the Vagina plus clitoral blood flow resulting in clitoral erection. In its simplest form, when a person reaches a specific point, the muscles surrounding the pelvic region contract to an extent and provide sexual gratification (Pauls, 2015) .

1.4.4 Urethra

It is important to note that the whole urethra is the sphincter for urination in females. Hence, during the filling phase of the micturition cycle .The concentric layers of the urethral wall ensure that there is a high tone that maintains the luminal closure of the

urethra, adequate transmission of abdominal pressure to the bladder neck, and proximal urethra; and lastly, neural control of LUT are some of the constant sustaining urinary sphincter function (van Geelen & Sand, 2023) .

1.4.5 The Vestibule

External meatus and Skene's glands are situated in the vaginal vestibule, closely resembling the dorsum of the male urethra in their structure connected to the intraurethral gland, also called the female prostate gland. It forms the vaginal opening, mainly in the form of a median crack below the urethral opening. Also, a morphological sign found in the vestibule is the small vestibular glands (Puppo, 2011) .

1.4.6 Bartholin's Glands

Paramount among them are the minor vestibular glands, also referred to as Bartholin's glands which are larger than the minor glands but are situated near the vaginal orifice. It has been argued that they produce a slippery fluid that moistens the inner lips of the vulva as well as the Vagina interferes with friction during intercourse (Vogazianou, 2019) .

1.4.7 Skene's Glands

The minor vestibular glands, often termed Skene's glands, are located near the urethra. They can be antibacterial, useful for diminishing bacterial infections of UTI, and they produce a fluid that is used to lubricate the urinary passage. It is believed that they are involved in female ejaculation during sexual stimulation, although their specific function within the human body still lacks clear definition (Nguyen & Duong, 2019) .

1.5 Hypothalamic-Pituitary-Gonadal Axis

The HPG axis is the most crucial element in the human reproductive system and the formation of various sexual characteristics (Mungenast & Thalhammer, 2014). Reproductive function is precisely controlled by tight control systems in the hypothalamus, including diverse and specific neurons (McIlwraith & Belsham, 2020) GnRH is associated with the hypothalamus to regulate the production and secretion of pituitary gonadotropins. These gonadotrophins then act on the target gonads to trigger the

release of the sex hormones gonadotrophins-LH and FSH and also the gonads (Maggi et al., 2016) .

1.6 Gnrh Gene Structure

In mammals and other vertebrates, the neuronal hormone analogous to TRH, called gonadotropin-releasing hormone or GnRH, controls the reproductive system. The current research findings have identified GnRH-I and GnRH-II to exist in both non-human primates and humans. Several neuronal groups produce these forms, resulting in gonadotropin release to respond in various ways. Though GnRH-I neurons exhibit negative feedback towards estradiol to enable constant LH secretion, GnRH-II neurons have positive feedback that might lead to the LH surge before ovulation ***(Jiang et al., 2024)*** .

Cessation of GnRH analogues causes decreased gonadotropin levels, which makes them helpful in treating Endometriosis, early sexual development and the management of steroid-sensitive neoplasms (Limonta et al., 2018) .

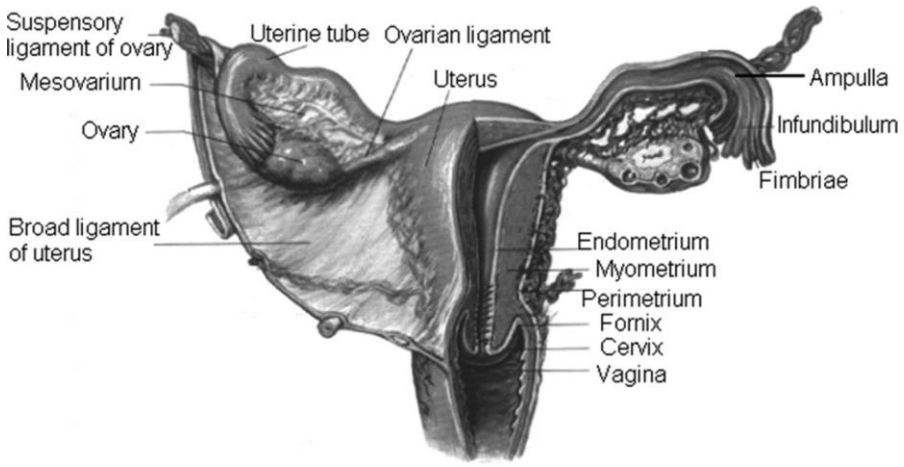

Figure 1 is a labeled diagram of the female reproductive system, highlighting structures such as the ovary, uterine tube, uterus, cervix, and vagina, along with their supporting ligaments and layers like the endometrium and myometrium. It also includes parts like the uterine tube's fimbriae, infundibulum, and ampulla. (Colvin & Abdullatif, 2013)

1.6.1 GnRH signal transduction pathway

The signal transduction intracellular signalling system of GnRH release is marked by the receptor binding of GnRH to GN RH receptor and activation of G proteins, particularly Gq/11α, in female reproductive tissues. The palmitoylation of Gq/11α's is regulated by GnRH receptor activation. The second negative bifaceted intracellular loop, which is involved in the signalling through the Gq/11 protein, is found in GnRH receptors. At the molecular level, the GnRH receptor impacts cellular processes by initiating MAPK signalling pathways and other proteins regulated by Ca2+ ions. The DSEO-reduced GnRH agonists inhibit the pathways triggered by EGF and modify the EGF receptor in cancer cells. GnRH agonists influence genes, particularly c-fos, which are regulated by external stimuli and responsive to Ras/MAPK signalling. GnRH analogues prevent the gene expression activity related to the growth or death of cells in other organs that E2 regulates, thus preventing cell proliferation induced by E2 (Wu et al., 2021) .

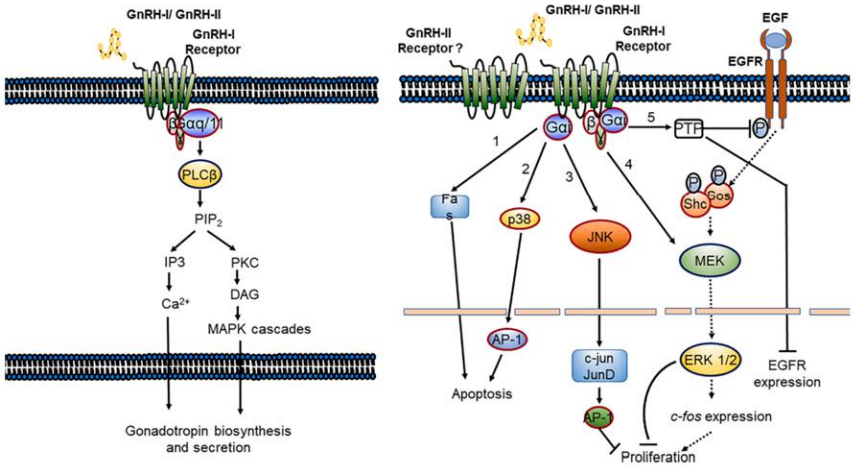

Figure 2 GnRH-1 and GnRH-2 Pathways(Wu et al., 2021)

1.7 Follicle Stimulating Hormone

Three of the essential processes in mammalian reproduction include folliculogenesis, selection of oocytes, and sex hormone biosynthesis, and all of these activities are mediated by FSH via FSHR. Its primary signalling pathway is cAMP/PKA, which is required for gametogenesis; it also nurtures the growth and the survival of the cell,

opposing the effects of steroids that induce cell death but, if overstimulated, induces cell death.Understanding the action of FSH signalling can help us explain reproductive physiological processes and have imperative applications in reproductive disorders and conception (Casarini & Crépieux, 2019) .

1.8 Luteinizing Hormone

The glycoprotein LH was identified as the ideal candidate to model and analyze as a control system for several reasons: due to its less variability with normal physiological changes, its ability to predict the physiological events reflected in renal function and its reports in the literature. Of these, LH induces oocyte maturation and ovulation and promotes progesterone and estradiol secretion. Hence, a model of LH is relevant to the context of translational medicine, with future work on the clinical usability of this model being highlighted in the discussion section (Christensen et al., 2012) .

1.9 Estrogen

The sharp rise in plasma estradiol concentration establishes a positive feedback loop, which leads to the surge release of GnRH. Luteinizing hormone is raised by both estradiol and progesterone. Kisspeptin neurons contain progesterone receptors because they express estrogen, which activates the GnRH neuron. In the same vein, metabotropic glutamate receptor type 1a (mGluR1a) is transactivated, and the fast synthesis of neuroprotection (NeuroP) is activated when estrogen at the brain membrane receptors interacts with astrocytes estradiol. NeuroP subsequently activates the discharge of GnRH while simultaneously surging kisspeptin into GnRH neurons (Christensen et al., 2012) .

1.10 Progesterone

The hormone that influences the growth and shedding of the uterine lining is known as progesterone, which is synthesized by adrenal glands, placenta, and ovaries. Thus, it prepares the uterus for planting and for receiving any fertilized egg while suppressing contractions that may eject the egg out. It happens in cases where fertilization does not occur. Thus, the progesterone level reduces, and the endometrial layer disintegrates,

causing menstruation. One example of progestogen is levonorgestrel, a synthetic agent with progestogenic (Cable & Grider, 2020) .

1.11 Prolactin

It is a polypeptide hormone related to growth hormone and placental lactogen, a type of protein produced by the body. These are needed for lactation and for the breast tissue to become engorged or to support a leaking breast. Conversely, plasma is produced in the uterus, mammary glands, immunological system, central nervous system and especially the anterior pituitary gland of the body. High renin levels are indicative of Males with elevated RPA values having pituitary adenoma or adverse drug reactions; RPA values in females who are not nursing or pregnant and no increases in serum RPA are modest (Al-Chalabi et al., 2018) .

1.12 Thyroid Hormone

The assessment also revealed that TH plays a central role in the development and growth of reproductive organs, including the ovaries, uterus and placenta. Hypo- or hyperthyroidism also demonstrates infertility, which affects the placenta, the menstrual cycle or pregnancy. The hypothalamus, pituitary gland and thyroid all work in a feedback mechanism with regard to TH secretion and synthesis. When iodide moves into the thyroid follicle, it is transformed into T3 and T4 hormones. This process involves pendrin and sodium-iodide symporter (NIS) proteins during their transport and these are regulated by transcription factors (Silva et al., 2018) .

1.13 Causes Of Hormonal Imbalance

Reproductive function is also in female sexual dysfunction is sexual dysfunction which is a common medical issue that occurs due to various factors that interfere with physical intimacy and sexual satisfaction as well as impact mood, quality of life, and feeling of self-worth. Most especially in sexual arousal disorder, endocrine disorders are indicated to contribute to hormonal disorders (Anastasiadis et al., 2002) . The impact of several hormonal parameters on the state of female sexual functions is visible. It emphasizes the need to assess prolactin, adrenal, and thyroid endocrine dysfunction in the development

of sexual dysfunction caused by imbalances in this endocrine axis. The biological system is influenced by genetic, epigenetic, and environmental elements; nevertheless, because of their dynamic and interconnected impacts, the biological system is not static (Tomatis et al., 2021) .

1.14 Reproductive Disorders

Currently, one of the most significant issues that women face during their lifetime is finding out how to deal with various diseases of the reproductive system, such as PCOS, adenomyosis, Endometriosis, and insulin. It offers a robust account of the familiar frameworks facing the integrated multidimensional account of gender (Vannuccini et al., 2016) .

1.14.1 Polycystic ovary syndrome

Polycystic ovarian syndrome, or PCOS, which is a hormonal disorder affecting women of different ethnicities, is the most common hormonal complaint that is familiar to women of reproductive age. Polycystic ovary syndrome (PCOS) is characterized by hyperandrogenism and metabolic abnormalities, including insulin resistance and dyslipidemia that predispose the patients to type 2 diabetes and cardiovascular disease later in life (Fauser et al., 2011) .Girls with PCOS and glucose intolerance, preterm birth and preeclampsia are connected to a higher risk of gestational diabetes which androgens and metabolic disorders can explain. In addition, studies have shown that in some ethnic groups, PCOS has a strong correlation with cervical incompetence. PCOS exposes the newborn to premature birth, perinatal mortality, and admission to the neonatal critical care unit, among others. Generally, this landmark study demonstrated that polycystic ovary syndrome harms pregnancy and fertilization (Vannuccini et al., 2016) .

1.14.2 Premenstrual Syndrome (PMS)

PMS is a common disorder involving about 30% of women in reproductive age with emotional and physical symptoms occurring cyclically during the final two weeks of the menstrual cycle, the luteal phase. Continuous symptoms such as hot flashes, night sweats, sleep disturbances, headache, joint/ muscle aches, poor concentration, and memory loss

may be moderate to severe, interfering with normal functioning. The exact etiology is still not well established, but since the disorder manifests during adolescence, which is a period of significant hormonal changes, hormonal dysregulation, particularly of the hypothalamic-pituitary-adrenal axis, nutritional and environmental factors, may be considered as possibly involved or contributing to it (Direkvand-Moghadam et al., 2014)

1.14.3 Endometriosis

Endometriosis is characterized by the presence of pain in the pelvic region and the failure of conception. It has three spatial distributions: ovarian cysts, deep-infiltrating types, and superficial peritoneal lesions. Consequently, diagnosis is not easy and is generally based on histological analysis or ocular examination. Endometriosis can affect millions of people. However, it often takes years to diagnose it; many women who first turn to a doctor get a mistaken diagnosis as their symptoms are similar to those of other diseases. Based on the information, controlled early diagnosis must address the negative impact (Taylor et al., 2021) .

1.14.4 Postmenopausal Syndrome

Estrogen attaches itself to estrogen receptors and alters DNA and cell function in the brain as it alters the genes that are expressed. This sudden response happens as some neurons in the brain and spinal cord are sensitive to estrogen and act through membrane receptors. Thus, data can demonstrate that estrogen can regulate the availability of CREB and control gene expression. Proteinaceous organic material present in male animals demonstrates increased sensitivity to androgens. One of the examples of cell-specific responses due to palmitoylation of steroid receptors is sexual responses. Memory and learning are two cognitive functions that are known to involve further membrane estrogen receptors (Fauser et al., 2011)

The cancers of the female genital tract; cervical, ovarian, endometrial (mainly endometrial adenocarcinomas), and those of the vulva, Vagina, fallopian tubes, and choriocarcinomas, make up a significant proportion of cancers as measured by the rates of morbidity as well as mortality due to the disease globally. Valvular, vaginal, tubal, and

choriocarcinomas are rare whereas cervical, endometrial, and ovarian carcinomas are rather common (Weiderpass et al., 2020) .

1.14.5 Ovarian Cancer

Most ovarian cell types can produce ovarian cancer; the epithelial type is more frequent in older women, while the germ cell type is more frequent in younger women. Typical serous tumors can arise from cortical inclusion cysts. The genetic background really exists in the development of endometriosis and endometrioid malignant endometrial tumors, as well as in fallopian tube tumors, with the support of several reports. Some of the hormonal and reproductive factors include estrogen receptor, progesterone receptor, androgen receptor, levels of hormones, cycles of cells of epithelium lining during periods of menstruation, menarche, early ovarian surgery, endocrine disrupting chemicals, familial history of ovarian cancer and genetic factors, among others which mess up the gene transcription and cell cycles (Salehi et al., 2008) .

1.14.6 Breast Cancer

The schedule of initiation of menstruation, the age at which women give birth for the first time after 30, childlessness, the age when the menopausal process begins, and the duration of estrogen exposure are rather significant reproductive and hormonal risk factors of breast cancer. For instance, while early menstruation (12) and late menopause (50) doubled the risk, later onset of menstruation at 15 and early menopause at 40 were deemed less hazardous. Childless women or women who are pregnant over the age of thirty are likely to be exposed to higher levels of estrogen, hence a higher risk of breast cancer (Bronowicka-Kłys et al., 2016) .There is a specific aspect to consider when applying the thyroid hormone to impact the disease. T4 increases malignant breast cell proliferation specific to ERα positive cells through integrin αvβ3 receptors. It involves MAPK-dependent protein kinase and estrogen receptor-alpha (ERα). While Hormonal T4 is most effective when bound to αvβ3 receptor site, signal intensity through receptor sites is enhanced with high free T3 levels (Hercbergs et al., 2018) .

1.14.7 Ovarian Cyst

An ovarian cyst is an ovarian tumor, a smooth muscular sac in a woman's ovary. Although they are asymptomatic and discovered casually in most cases, they may raise undue concern because of cancer phobia. Ovarian cysts in most women do not manifest symptoms, which means this form of ovarian cysts does not cause illness. However, simple cysts usually do not require any intervention, and women over 50 years of age with cysts measuring less than 10 cm in diameter with normal CA125 levels are treated conservatively. Large, persistent, or painful cysts may require surgical intervention at times qualified to total ovariectomy, which means the removal of one or both ovaries (Zahidy & Abdulkareem, 2018) .Ovarian cysts are quite prevalent in women and do not necessarily require surgical intervention in many cases. Although primary hypothyroidism has been reported in prepubertal girls, few developed dysgenetic ovarian cysts or Van Wyk-Grumbach syndrome. Although quite an unusual occurrence in adults, hypothyroidism, if left untreated, has been associated with symptoms such as benign ovarian cysts (Senarath et al., 2021) .

1.15 Research Gap

According to studies systematic and extensive cross-sectional epidemiological data on hormonal reproductive health concerns in South Punjab, Pakistan, is scarce. Studies in Pakistan have highlighted the impact of endocrine disruptors on fertility, emphasizing the need for region-specific research (Ali et al., 2021) still, present-day research does not adequately consider specific socio-economic and environmental indicators in this area, thus resulting in poorly formulated healthcare policies. There is a gap that complicates the diagnosis, treatment, and management of conditions such as PCOS, thyroid problems and irregular menstrual patterns This study intends to address this research question by exploring the incidences and nature of hormonal imbalance in women of South Punjab

1.16 Aims And Objectives

The study aims to investigate the factors related to hormonal dysfunctions and their effects on women's fertility in South Punjab in Pakistan. These are explored

systematically and are aimed at establishing the incidences of PCOS, thyroid disorders, and irregular menstruations and their relation to non-gynaecological diseases. This study will conduct hormonal testing and questionnaire surveys to collect data; therefore, the study will use categorical data analysis, including descriptive statistics and chi-square tests, to analyze the data collected and determine the relationships between the variables. Towards increasing healthcare utilization, particularly among women in rural settings, and exploring genetic and environmental antecedents, this study is expected to contribute toward the preservation and improvement of South Punjab Women's health in Pakistan.

CHAPTER 2: LITERATURE REVIEW

Estrogen receptors are classified into three types of nuclear receptors: the estrogen receptor alpha, the estrogen receptor beta, and the G protein-coupled receptor 30. These are crucial in nourishing ovarian granulosa cells, follicular and oocyte growth and differentiation, and follicular structural development and ovulation. Oestrous cycle disorders and related diseases include elements of estrogen signalling, receptors, and synthesis enzyme disorders and include diseases like polycystic ovary syndrome (PCOS) and endometriosis (EMS) (Tang et al., 2019) .

The association explores the crucial link between food and energy consumption, basic metabolism, and protein synthesis required for reproduction. As the subsequent sections of this paper will demonstrate, metabolic disturbances have a significant and far-reaching impact on reproductive health, extending beyond the ability to conceive within women. The preceding analysis confirms that changes in nutrient supply cause a series of reactions of hormonal signaling agents. Understanding these interconnections is crucial to comprehend how metabolic diseases affect the overall health of women (Athar et al., 2024)

The specific topic of a recent study was female teenagers' menstruation status, and its authors are the following: Control participants had an average frequency of cycle regularity and the rest of the participants in the study fell into the higher irregularity rating .The prevalence based on the study indicates the objectives were 31% on MSDs and 5% on PMS. An episode of PCOS attack expenses 2 percent of the affected women. In this respect, the results of such studies underline the need for the development of specific intervention approaches for enhancing the reproductive health in the given population subgroup (Park et al., 2021) The article in focus was devoted to the description of the PCOS as the hormonal disorder which affects a large number of women and remarked the fact that the disease diagnosis and treatment is quite challenging.

PCOS affects females of the child-bearing age, where an estimated 1 in 20 women are sufferers of the disease. This is evidenced by; abnormal menstrual cycles, symptoms

associated with high levels of male hormones known as androgens and low sensitivity to insulin. This condition increases the probabilities of acute conditions in reproductive, metabolic and cardiovascular systems (Maqbool et al., 2019) .

PCOS is a hormonal disorder that impacts between 5-10 percent of women in the reproductive age group. The principal manifestations are outpatient, which include the inability to conceive due to abnormal menses, hirsutism or baldness, enlarged ovaries, and resistance to insulin. Though it has been noted to have embryonic, mutational, hormonal and environmental genesis, its root has not been determined yet. (De Leo et al., 2016) PCOS women are shorter in height, more obese ,have a higher rate of metabolic and cardiovascular diseases than normal persons. From all these research, it is evident that women of childbearing age, from puberty to menopause, have a higher risk as compared to men of developing depression. This heightened risk is linked to mood disorders influenced by hormonal changes during key reproductive phases: depression of the first episode in females during puberty, fluctuating mood associated with menstrual cycle or mood swings, peripartum/postpartum depressions that are expected to affect 10-25% of women, mood disturbances during menopause, and impact estimated to be between 45-68% (Schweizer-Schubert et al., 2021) .

Since type 2 diabetes catches the youth and increases the incidence in females, these problems might be felt during the reproductive age. The occurrence of tumors varies according to the type of cancer; however, the most significant number of cases is noted in breast cancer; 523000 women were diagnosed with it in Europe in 2018. It makes sense to turn to the fact that both breast and thyroid malignancies are also more frequent in postmenopausal age. Research on the association of these cancers has been carried out while paying much attention to hormonal and genetic factors that could explain their relationship (Del Rio et al., 2020) .

As far as endocrine disorders are concerned, most of them are long-standing and have considerable effects on the individual and the community, as well as placing a heavy burden on patients presenting to endocrine services and on the health care systems as a whole. Studying other community populations in Italy and other epidemiological studies

that reveal the prevalence data of such diseases assists in a better understanding of the level of such diseases (Crafa et al., 2021) .It can be due to anorexia nervosa, brain tumor, ovary cancer, hormonal disorders, and other operations like hysterectomy and oophorectomy. Other worth mentioning are pituitary gland disorders, Sheehan syndrome and Polycystic Ovary Syndrome (PCOS). Some of the causes related to adults also contribute. However, the following can be attributed to genetic factors among the people: family history and consanguinity. Perhaps it is important to consider all these elements during the leadership and optimization or the prevention of such events (Chughtai et al., 2020) .

Endometrial cancer is one of the most common gynecologic cancers, and it is strongly associated with the use of hormones. Some mainly consist of early bone age, early age at menarche, late age at menopause, a history of infertility, or estrogen therapy without progestogen (Ignatov & Ortmann, 2020) .

Stress and infertility are related, which, in turn, may impact pregnancy by altering the hypothalamic-pituitary-adrenal system and sex steroidal hormones. Stress levels and requirements affect each other and could influence pregnancy quantitatively and qualitatively (Ramya et al., 2023) .

Some of the gynaecological health issues that are bound to occur when a woman has diabetes are Delayed puberty and menstruation, complex conception, and high risks during pregnancy. These difficulties may be acquired at birth or arise when one is already in a marital relationship and desires to have a child. Even in the presence of new medical discoveries regarding diabetes, issues including men's and women's fertility issues and amenorrhea, which are unique to the lady's diabetic type 1, still exist (Thong et al., 2020)

Study shows a link between irregular menstrual cycles, later age of menarche, and different weights. Coeliac disease prevalence rates of 25% were approximately used in the study. P=0.05) for the treatment of Premenstrual Syndrome (PMS) and 5. Here, the prevalence rate was also 2% for Polycystic Ovary Syndrome (PCOS). These findings highlight the importance of focusing on individual-level interventions in order to improve reproductive health among members of this age group (Park et al., 2021) .

PCOS is an endocrine disorder that affects women, but the early detection of the disease and its treatment are still unresolved issues. The guidelines published in 2018 provided a structure to enhance care; however, translating them into practice and handling the diagnostical evolutions are crucial challenges. Patients and their healthcare providers also note their current dissatisfaction regarding the methods used in managing PCOS, suggesting that both patients and providers continue to experience difficulties in effectively managing the condition (Hoeger et al., 2021) .

PCOS is a multifactorial endocrinal disorder caused by hormonal imbalance and affects approximately 5 to 10 per cent of women of childbearing age. That is conditions such as the presence of multiple cysts in the ovaries and insulin resistance. It is not clear what causes the disorder precisely, but it is a combination of genetic influence, hormonal imbalance, and perhaps environmental factors as well.

A comparative study of the metabolic risk of PCOS women compared to the general population revealed their higher chances of developing metabolic and PCOD is a hormonal disorder with issues such as high androgens, ovarian cysts, and other related health issues in women, like infertility and heart issues. It remains unclear, but there is a possibility that PCOS has something to do with ovarian cancer, though no slight association has been given. Thyroid dysfunction, which includes hypothyroidism, is evident in women diagnosed with PCOS and hormone imbalance, which creates ovulation disorders. Therefore, there are clinical features in PCOS, such as hirsutism and acanthosis, that reflect the impact of the syndrome on female endocrinology (Mukherjee et al. ,2024). cardiovascular diseases (De Leo et al., 2016) .

Breast cancer is among the most prevalent tumors types, which affects women, and was recorded at 523,000 cases in Europe in 2018 alone. Differences in the distribution of breast and thyroid cancer: While both types of cancer are also common in the postmenopausal period, the incidence is higher. There has been a theoretical study on the relationship between these cancers, explicitly looking at hormonal and genetic characteristics that may affect their correlation (Del Rio et al., 2020) .

Endocrine disorders are characterized by long-term, lifelong, progressive illnesses with extensive implications for affected patients and widespread financial and social burdens on healthcare provision. Exploring the generally available data by breaking down the prevalence data related to these conditions for different population groups in Italy helps to uncover the real epidemiological burden of such diseases (Crafa et al., 2021) .

Pathological and psychological disadvantageous factors accompany early menopause, which occurs prior to 40 years of age. Some of the major causes are anorexia nervosa, brain tumor, ovarian cancer, hormonal abnormalities and surgeries with which hysterectomy and oophorectomy are most common. Some other considerations include pituitary gland disorder, Sheehan Syndrome, or Polycystic Ovary Syndrome. One of the main issues is heredity, genetics, family anamnesis, and the mandatory predisposing factor of consanguinity. Awareness of these precipitating factors is crucial to risk mitigation and containment (Chughtai et al., 2020) .

Neurological disorders cause significant effects on mental and physical operations and are worse when compounded by the ageing influence. These are membrane androgen receptors (mAR), which can potentially start up oxidative stress pathways connected to diseases such as Alzheimer's. Thus, hormonal alterations of menopausal women will show the differences in HrNP that regulate the hormonal balance, according to Crafa et al. (2021). The following are some of the severable factors that influence the immune system of women more than men and, thus, make women more vulnerable to autoimmune diseases than men: Puberty, Pregnancy, and Menopause.

Endometrial cancer is one of the most common gynecologic cancers, and it is strongly associated with the use of hormones. Some mainly consist of early bone age, early age at menarche, late age at menopause, a history of infertility, or estrogen therapy without progestogen (Ignatov & Ortmann, 2020).

Stress and infertility are related, which, in turn, may impact pregnancy by altering the hypothalamic-pituitary-adrenal system and sex steroidal hormones. Stress levels and requirements affect each other and could influence pregnancy quantitatively and qualitatively (Ramya et al., 2023).

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These disorders affect the events concerned with folliculogenesis and implantation, the primary fertility operations. Some of the works carried out on thyroid autoimmunity may not always need intervention, while hypothyroidism, according to the above, would require levothyroxine to improve fertility and obstetric performance. This puts the patient at a higher risk of losing the pregnancy and, thus, deserves proper attention. The thyroid function also has a central role in ART, adding that the thyroid should be normalized before any fertility intervention (Concepción-Zavaleta et al., 2023)

Reproductive implications of hypothyroidism in reproductive women age in India are shown to include issues such as menorrhagia and oligomenorrhea. They have also been positively associated with other challenges like PCOS and, infertility and Repro Mother-Child Transmission (RMCT) (Kumar & Kotur, 2020) .Studies have shown that hypothyroidism affects fertility in women and the outcomes of pregnancy irrespective of the thyroid autoimmunity existing in the organisms of women. This raises a form of doubt as to the success of assisted reproductive technology (Bucci et al., 2022) .

Hormonal disorders of the thyroid gland occur in women and can cause such complications as infertility or even abortion, while Hypothyroidism is most common among them. These substances have a direct impact on the regular menstrual cycle as well as the ovary, leading to impacts on fertility. As stated, it is estimated that prolactin concentration is high and can be held axiomatically for causing shifts in hormonal balance within infertile hypo-thyroids-affected women. Influenced by metabolism, 281 females with menstrual disorders between 18 and 35 were asked about their sleeping habits and late-night eating. The individuals' distribution by their conditions were 83% Euthyroid, 2% Hyperthyroid and 6 % Hypothyroidism. 40% had overt Hypothyroidism,

while 54% had masked Hypothyroidism. The standard thyroid dysfunction observed among the students was subclinical Hypothyroidism (Sadbhawna et al., 2019) .

Some of the reproductive processes are regulated by thyroid hormones and effects of presence and lack of these hormones are severe. The current study is a cross-sectional study, while the participants were 168 infertile women; 79 of these women were grouped with poor health perception. 76% were euthyroid, 18. 45% hyperthyroid, and 1. 78% hypothyroid. Disorders in the menstrual cycle of the female figure was increased among the hyperthyroid group 32. 25% while the hypothyroid group was 66%. 66% for the hyperthyroidism population compared to an euthyroid population of 15%. 67%. Thus, thyroid dysfunction is the cause of infertility (Nasir et al., 2016) .

The sample involved postmenopausal women selected in a cross-sectional, community-based study conducted in rural Punjab, Pakistan, in August-October 2020, with the primary objectives of establishing incidences of obesity and linking it to the menopause period. Obesity prevalence in 189 women aged 28–58 years: Data 29. 6%. Another indicator, BMI, revealed the same pictures and was lesser in premenopausal females than postmenopausal ones, 27. 53 ± 4. 28 resp. Therefore, for the hypothesis test conducted, we got a p = 0. ST4H0001, meaning that, according to the statistics, menopause was significantly positively related to obesity. These results provide additional motivation for the search on how the phase of menopause is associated with obesity in women (Bibi et al., 2021) .

18 out of 493 women from the district of Rahim Yar Khan of Pakistan, a present study, all confirmed to have experienced GBV. 67% infertility, with 65. 4% primary and 34. 5% secondary. Hormonal issues such as endometrial issues, hormonal disorders, PCOS, high body mass index, and age greater than 30 years. Knowledge concerning the modifiable risks is relevant for formulating public health promotion plans (Ateeb et al., 2023) .Hence, the cross-sectional study was conducted in Southern Punjab to determine the socio-demographic features, dyslipidemia, and endocrinal parameters in NW and OB-PCOS women. As expected, the obese patients had increased BMI, abnormal lipid profiles, and decreased testosterone compared to non-obese cases and controls. This data

conflicts with obesity being the single causative factor in PCOS and adds support to more extensive research halting every cause except being overweight (Arshad et al., 2022) .

Research was done to determine the thyroid hormone profile and compare hyperprolactinemia in women with and without PCOS attending DHQ Hospital Bahawal Nagar. The study, conducted using a cross-sectional design, reported raised TSH in obese PCOS females compared to other groups and elevated prolactin in PCOS and obese PCOS groups. Some additional distinctions were also noted concerning estrogen and thyroid antibodies, which stress the significance of thyroid profile analysis in these symptoms (Amjad et al., 2020) .The cross-sectional study, conducted on women with PCOS attending DHQ hospital Bahawal Nagar, also confirmed raised TSH and Prolactin levels, particularly in women with Obesity PCOS. It also observed estrogen level variations and the presence of thyroid antibodies, thereby pointing to the necessity of evaluating the thyroid profile in cases of PCOS symptomologies (Shaheen et al., 2010)

CHAPTER 3: MATERIAL AND METHODS

3.1 Study Design

To this end, this cross-sectional study was carried out to examine hormonal imbalance and its' prevalence about the female reproductive health. The data were collected from the Bahawalpur Victoria Hospital laying in South Punjab, Pakistan.

3.2 Ethical Approval

Before undertaking the study, official approval was sought from the HOD and the appropriate ethical committee of the tertiary hospital.

A lot of concern was taken in ensuring that this research involving hormonal complications of women's reproductive systems complied with ethical standards. Informed consent was observed since all participants signed informed consent forms that described the study, its consequences and risks and informed them that they were free to participate in the study. The subjects had an option of withdrawing from the study at any time without facing least repercussions. To minimize risk of exposing participants 'identity all the variables containing personal information of the subjects were blinded and the data was stored securely with only the research team having access to the data. Those questions, which are potentially touching some sensitive points, were asked carefully and, if someone of the participants looked embarrassed, some special resources for help were offered. Written informed consent was obtained from the patients and the study was reviewed and approved by an ethics committee for following the guidelines of its ethical use as well ethical check-ups were made continuously. The rights of the participants were explained to all the participants and the means by which the research team could be contacted if needed.

3.3 Participants

The total sample for the female patients included 431 participants. The target populations were convenience sampled from the outpatient and in patient departments of Bahawalpur Victoria Hospital with permission from the hospital authority.

3.4 Data Collection

3.4.1 Questionnaire Administration

In the study, the two tools administered were Dr. Randolph's Ageless & Wellness questionnaire and the PHQ-9 (Patient Health Questionnaire).

Dr. Randolph's Ageless & Wellness Medical Center
C.W. Randolph, Jr., M.D. • Lori Leaseburge, M.D. • Nicole Thomas, ARNP •
• Steven Garces, ARNP • Kristin Byers, ARNP •

FEMALE HORMONE IMBALANCE QUESTIONNAIRE

Have you experienced any of the following symptoms recently? Please circle the number that best describes your experience.

Symptoms of Hormone Imbalance	Extremely Mild 1									Extremely Severe 10
Food Cravings	1	2	3	4	5	6	7	8	9	10
Fatigue	1	2	3	4	5	6	7	8	9	10
Hot Flashes	1	2	3	4	5	6	7	8	9	10
Night Sweats	1	2	3	4	5	6	7	8	9	10
Weight Gain	1	2	3	4	5	6	7	8	9	10
Dry Hair	1	2	3	4	5	6	7	8	9	10
Dry Skin	1	2	3	4	5	6	7	8	9	10
Hair Loss	1	2	3	4	5	6	7	8	9	10
Breast Tenderness	1	2	3	4	5	6	7	8	9	10
Fibrocystic Breasts	1	2	3	4	5	6	7	8	9	10
Heart Palpitations	1	2	3	4	5	6	7	8	9	10
Bloating	1	2	3	4	5	6	7	8	9	10
Bladder Symptoms	1	2	3	4	5	6	7	8	9	10
Frequent UTI or Incontinence	1	2	3	4	5	6	7	8	9	10
Painful Intercourse	1	2	3	4	5	6	7	8	9	10
Vaginal Dryness	1	2	3	4	5	6	7	8	9	10
Arthritis/Joint Pain	1	2	3	4	5	6	7	8	9	10
Fluid Retention	1	2	3	4	5	6	7	8	9	10
Foggy Brain/Fuzzy Thinking	1	2	3	4	5	6	7	8	9	10
Headaches	1	2	3	4	5	6	7	8	9	10
Anxiety	1	2	3	4	5	6	7	8	9	10
Depression	1	2	3	4	5	6	7	8	9	10
Irritability	1	2	3	4	5	6	7	8	9	10
Inability to Concentrate	1	2	3	4	5	6	7	8	9	10
Mood Swings	1	2	3	4	5	6	7	8	9	10

Figure 3 is the structure of the validated questionnaire adopted from Dr. Randolph's Ageless & Wellness Medical Center. The questionnaire consists of multiple sections designed to assess various aspects of patient health and wellness

Amongst the questions mentioned in the questionnaire, there were a number of 'Yes/No' questions that were possibly linked to symptoms hormonal dysregulation. To each of the participants, the PHQ-9 in addition to Dr. Randolph's Ageless & Wellness survey were self-completed by the participants in a secluded area for confidentiality.

3.4.2 Blood Sample Collection

For the information, daily 20-30 blood samples were taken from the females of intended interest. Blood sample collection

For the purpose of hormone testing in this study, blood samples were collected using standardized procedures to ensure accuracy and reliability of the results. The following steps outline the method used for blood collection

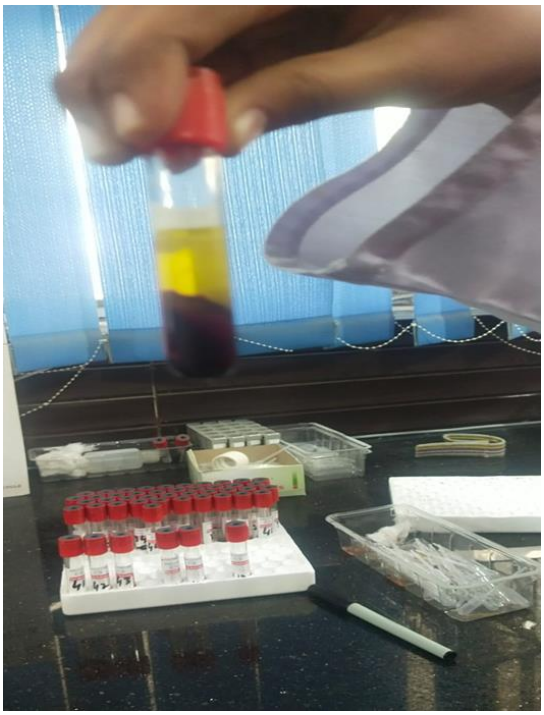


Figure 4 Blood sampling and serum collection process

3.5 Collection Method

Blood samples were collected via venipuncture. This involved drawing blood from a vein, typically located in the antecubital fossa (the inner elbow area). A sterile needle and a vacutainer system were used to ensure a clean and efficient collection process.

3.5.1 Collection Tube

The type of tube used for blood collection varied depending on the specific hormone test.

3.5.2 Serum Separator Tube (SST)

Also known as a gold top or red-gray top tube, this tube contains a gel that separates the serum from blood cells upon centrifugation. It is commonly used for tests measuring hormones such as thyroid-stimulating hormone (TSH), free T3, and free T4.

3.5.3 Plain Red Top Tube

This tube contains no additives and is used for various hormone assays requiring serum.

3.5.4 EDTA Tube (Lavender Top)

This tube contains the anticoagulant EDTA and is used for specific tests that require whole blood or plasma, such as certain reproductive hormone assays.

3.6 Procedure

The participant’s arm was cleaned with an antiseptic wipe to prevent contamination.

A tourniquet was applied to the upper arm to engorge the veins, making them easier to locate. A sterile needle was inserted into the vein, and the required amount of blood was drawn into the appropriate collection tube.After collection, the needle was removed, and pressure was applied to the site to stop any bleeding.The collected blood sample was then labeled with the participant's identification number and the date of collection

3.7 Handling And Storage

Blood samples were immediately transported to the laboratory.

Serum Separator Tubes (SST) were centrifuged to separate the serum from blood cells.

Samples were stored at appropriate temperatures according to laboratory standards until analysis. By adhering to these standardized procedures for blood sample collection, the study ensured the integrity and reliability of hormone test results, while also maintaining the safety and comfort of the participants

3.8 Serum Preparation

To obtain serum, 2-3ml of blood sample was taken in a centrifuge tube, and it was then centrifuged at 3000 rpm for 10 minutes. The serum was pipetted out carefully into another new tub and placed into microcentrifuge tubes with corresponding labels on them. Blood samples for the hormone analysis was left to clot and then centrifuged The serum samples were frozen and stored at -20°C until hormone testing was done.

3.9 Hormone Testing

Serum concentration of the hormones was determined with the use of Cobas e 411 analyzer. Cobas e 411 is designed with electro chemiluminescence immunoassay or more commonly known as ECLIA techniques for precise measurement of hormones.

Since hormone testing was performed using the Cobas e 411 analyzer, the following detailed procedure was used:

Figure 5 Cobas e 411

3.10 Daily Calibration And Maintenance

Daily calibration of the analyzers was done using the calibrators that accompanied the tests, to enhance accuracy.

Some of the routine things that were done on the probe involved washing and testing of the reagents as warranted by the manufacturer's protocol.

3.11 Loading Reagents And Samples

Certain assay reagents were pipetted to the reagent strips of the Cobas e 411 analyzer.

At this point the serum samples were placed and positioned on the sample racks in the correct identification.

3.12 Assay Procedure

The operator chose the assays they wanted from the test menu through the touch screen panel.

The analyzer then aspirated a certain volume of the serum and reacted the same with a biotinylated antibody which has been tagged to the specific hormone.

The mixture was then pipetted into a reaction cell which was coated with the streptavidin, hence binding the biotinylated antibody.

A second marker-labeled antibody was then added to the reaction cell through electro chemiluminescent.

An electric control was used and the marker begun emitting light while the amount of light was being detected by the analyzer photodetector.

Concentration of hormones was determined with the help of light intensity and calibration curves.

3.13 Quality Control

To increase the reliability of the results, high and low control samples were also tested together with the patient's samples.

Any exceptions to the control values to be achieved called for recalibration and rechecking to be conducted.

3.14 Data Recording

The information concerning the hormone levels in the patients was recorded together with the data on their increase or decrease, or their levels being normal

3.15 Data Analysis

3.15.1 Statistical Analysis

Data was eventually recorded on SPSS version 2021 for analysis.

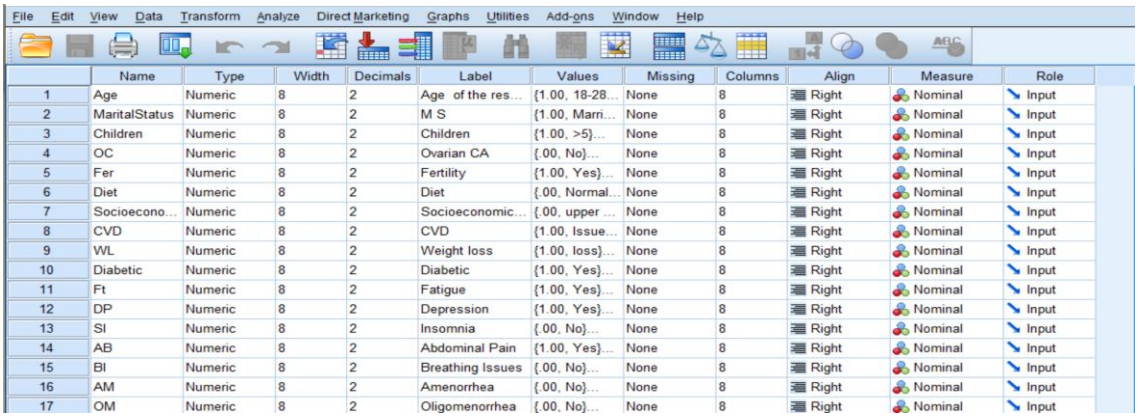
Frequencies and percentages were used in this study due to the descriptive nature of the independent variable. Two by two contingency tables with chi-square tests of independence were employed to study the association between hormonal disruption and numerous illnesses.

3.15.2 Graphical Representation

Graphs and charts were prepared using GraphPad version 10. 2. 3 just in order to show the graphical representation

CHAPTER 4: RESULTS

Since the purpose of research is to explore how much hormonal imbalances impact reproductive health among females in South Punjab, Pakistan. To investigate the prevalence and patterns of hormonal dysregulation among women in South Punjab with various reproductive track diseases It seeks to understand the frequency and occurrence of these health issues, identifying factors that contribute to their prevalence. Additionally, the study aims to introduce methods to raise awareness and enhance reproductive health for women in this population.



	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
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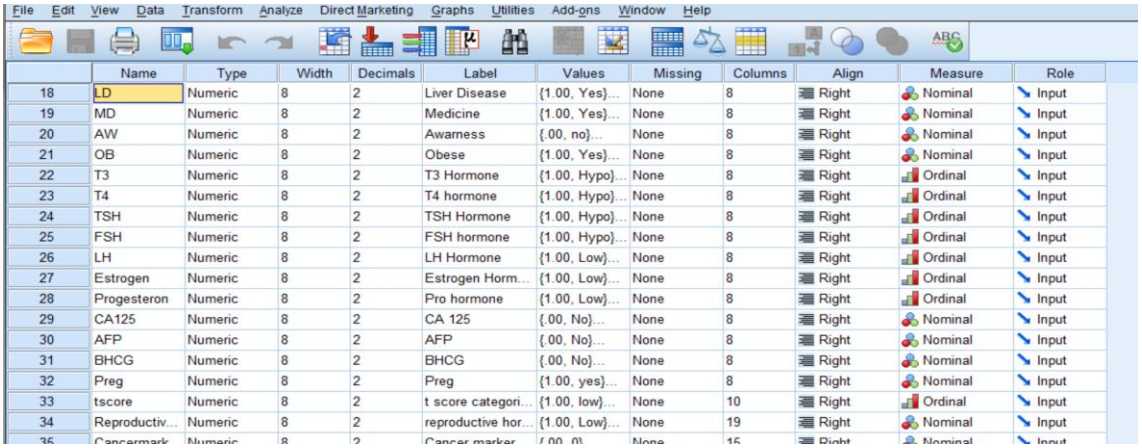
2	MaritalStatus	Numeric	8	2	M S	{1.00, Marri...	None	8	Right	Nominal	Input
3	Children	Numeric	8	2	Children	{1.00, >5}...	None	8	Right	Nominal	Input
4	OC	Numeric	8	2	Ovarian CA	{.00, No}...	None	8	Right	Nominal	Input
5	Fer	Numeric	8	2	Fertility	{1.00, Yes}...	None	8	Right	Nominal	Input
6	Diet	Numeric	8	2	Diet	{.00, Normal...	None	8	Right	Nominal	Input
7	Socioecono...	Numeric	8	2	Socioeconomic...	{.00, upper ...	None	8	Right	Nominal	Input
8	CVD	Numeric	8	2	CVD	{1.00, Issue...	None	8	Right	Nominal	Input
9	WL	Numeric	8	2	Weight loss	{1.00, loss}...	None	8	Right	Nominal	Input
10	Diabetic	Numeric	8	2	Diabetic	{1.00, Yes}...	None	8	Right	Nominal	Input
11	Ft	Numeric	8	2	Fatigue	{1.00, Yes}...	None	8	Right	Nominal	Input
12	DP	Numeric	8	2	Depression	{1.00, Yes}...	None	8	Right	Nominal	Input
13	SI	Numeric	8	2	Insomnia	{.00, No}...	None	8	Right	Nominal	Input
14	AB	Numeric	8	2	Abdominal Pain	{1.00, Yes}...	None	8	Right	Nominal	Input
15	BI	Numeric	8	2	Breathing Issues	{.00, No}...	None	8	Right	Nominal	Input
16	AM	Numeric	8	2	Amenorrhea	{.00, No}...	None	8	Right	Nominal	Input
17	OM	Numeric	8	2	Oligomenorrhea	{.00, No}...	None	8	Right	Nominal	Input

Figure 6 dataset variables in SPSS software, displaying variable names, types, and value ranges for a study on patient health.



	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
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21	OB	Numeric	8	2	Obese	{1.00, Yes}...	None	8	Right	Nominal	Input
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23	T4	Numeric	8	2	T4 hormone	{1.00, Hypo}...	None	8	Right	Ordinal	Input
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25	FSH	Numeric	8	2	FSH hormone	{1.00, Hypo}...	None	8	Right	Ordinal	Input
26	LH	Numeric	8	2	LH Hormone	{1.00, Low}...	None	8	Right	Ordinal	Input
27	Estrogen	Numeric	8	2	Estrogen Horm...	{1.00, Low}...	None	8	Right	Ordinal	Input
28	Progesteron	Numeric	8	2	Pro hormone	{1.00, Low}...	None	8	Right	Ordinal	Input
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30	AFP	Numeric	8	2	AFP	{.00, No}...	None	8	Right	Nominal	Input
31	BHCG	Numeric	8	2	BHCG	{.00, No}...	None	8	Right	Nominal	Input
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34	Reproductiv...	Numeric	8	2	reproductive hor...	{1.00, Low}...	None	19	Right	Nominal	Input

Figure 7 dataset variables in SPSS software, displaying variable names, types, and value ranges for a study on patient health

4.1 Demographic Prevalence Analysis

For the demographic analysis, I used SPSS 2021 to find frequency percentages for factors including age, socioeconomic status, marital status, number of children, rural and urban areas and awareness and fertility ratio

4.1.1 Age of Respondents

Table 1: Age of Respondents

Age of Respondents	Frequency	Percentage
18-28	116	26.9
29-38	175	40.6
39-48	99	23.0
49 and above	40	9.5
Total	430	100.0

Among the 431 respondents in the demographic analysis shown in Table 1, the age distribution is as follows: 26.9% (116) were between 18-28 years and 40%. 6% or 175 were 29 to 38 years old, 23.0% were 39-48 years old, 9.5% were 49-60, and patients were 62 and above. The majority of patients were between the age of 29-38 years

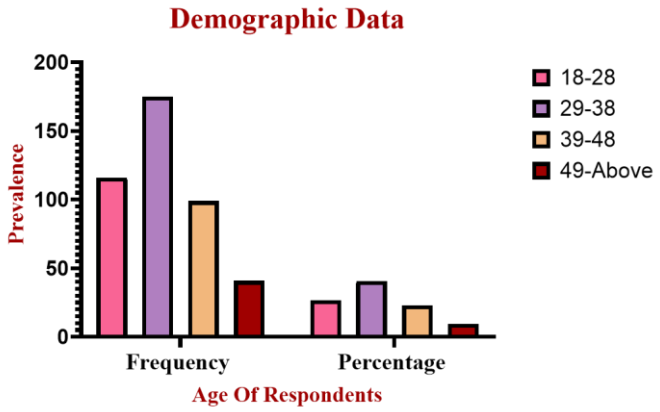

Figure 8: Demographic data representing the graph of prevalence of age among respondents

The following figure shows the response to endocrine dysregulation symptoms among the respondents. The x-axis identifies various signs and indications of endocrine dysregulation, whereas the y-axis shows the prevalence of the mentioned symptoms. The legend to the right is used to further divide the respondents into those with symptoms and those without.

4.1.2 Demographic Characteristics of Respondents

Table 2: Demographic Characteristics of Respondents

Demographic Data	**Frequency**	**Percentage**
Married	330	76.5
Unmarried	101	23.4
Fertile	175	54.4
Infertile	150	45.5
Children<5	110	61.4
Children>5	69	38.5

Table 2 Illustrated demographic data of the respondents, highlighting their marital status, fertility, and the number of children. Among the participants, 329 are married, representing 76.5% of the total sample, while 101 are unmarried, making up 23.4%. Regarding fertility, 179 respondents (54.4%) are fertile, whereas 150 (45.5%) are infertile. In terms of the number of children, 110 respondents have fewer than five children, accounting for 61.4%, while 69 respondents have more than five children, representing 38.5%.

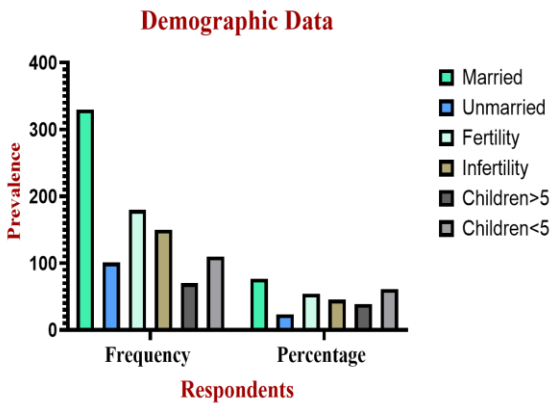

Figure 9: Demographic data of respondents, displaying the prevalence of various categories among the surveyed individuals

The above figure presents the distribution of respondents in the given categories. The x-axis indicates the number of categories of respondents, while the y-axis shows the prevalence. The legend on the right shows different colors to categorize the respondents.

Table 3: Demographic distribution of respondents by residence and awareness levels

Demographic Data	Frequency	Percentage
Urban	148	34.3
Rural	282	65.6
Aware	93	21.6
Unaware	337	78.4

The table shows the data from the survey of 430 female respondents regarding hormonal testing reveals various patterns in awareness levels between urban and rural populations. Of the respondents, 148 (34.3%) hailed from urban areas, while 282 (65.6%) were from rural settings. Within this sample, 93 respondents (21.6%) demonstrated awareness of the specific health issues or information being surveyed, while a substantial majority of 337 respondents (78.4%) were unaware.

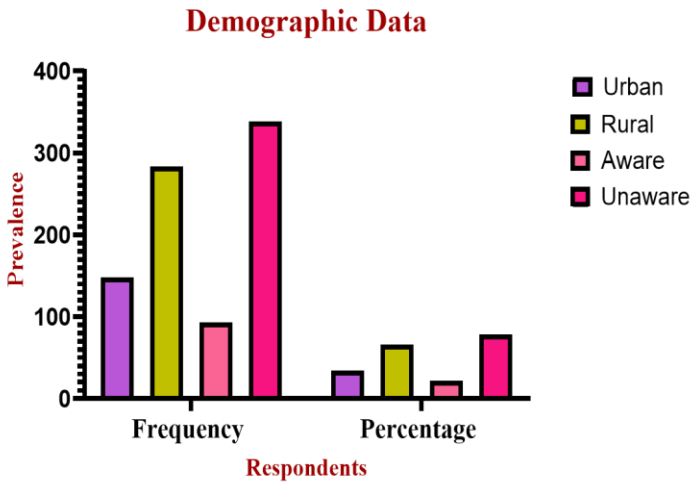

Figure 10: Prevalence rates of respondents across different age groups, highlighting demographic data

The image presents demographic data with prevalence rates displayed on the vertical axis and different respondent categories along the horizontal axis. Various colors represent specific demographic groups: purple indicates moderate prevalence, yellow shows a higher rate, green represents the highest rate among the groups, and pink depicts the highest overall prevalence. The vertical axis is labeled "Prevalence," and the horizontal axis is labeled "Respondents," both in red text. Each color corresponds to a unique demographic group, although the legend clarifying these groups isn't fully visible

4.2 Descriptive Analysis

4.2.1 Prevalence

The descriptive analysis revealed that among the patients surveyed, are symptomatic and asymptomatic displaying signs such as food cravings, fatigue, obesity, hair loss, hirsutism, breast tenderness, fibrocystic breasts, night sweats, bloating, vaginal dryness, bladder symptoms, depression, anxiety, inability to concentrate, Mood swings and headaches. This indicates a significant prevalence of the population experiencing hormonal dysregulation.

Table 4: Frequency and percentage of symptomatic and asymptomatic respondents for various symptoms of endocrine dysregulation

Symptoms Of Endocrine Dysregulation	Symptomatic (f)	Symptomatic (%)	Asymptomatic (f)	Asymptomatic (%)
Food Cravings	193	44.8	237	55.2
Fatigue	282	65.6	148	34.4
Bloating	181	42.0	249	58.0
Obesity	150	34.9	280	65.1
Hair loss	150	34.9	280	65.1
Hirsutism	159	36.9	271	63.0

The data on hormonal dysregulation reveal significant symptomatic frequencies and percentages among the participants. Food cravings were reported by 193 participants (44.8%), fatigue by 282 participants (65.6%), bloating by 118 participants (27.4%), obesity by 192 participants (44.7%), hair loss by 150 participants (34.9%), and hirsutism by 159 participants (36.9%)

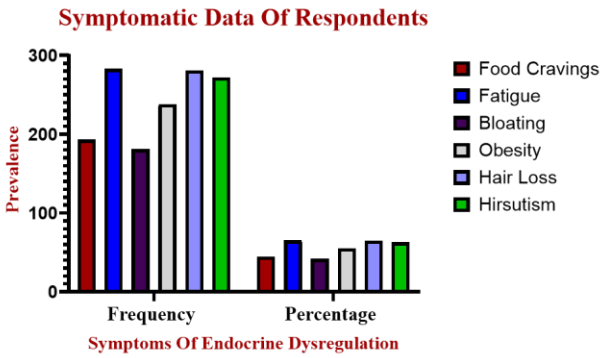

Figure 11 Prevalence of Endocrine Dysregulation Symptoms

This Figure illustrates the prevalence of various symptoms of endocrine dysregulation among symptomatic respondents. The x-axis indicated the different symptoms, such as fatigue, weight gain, and mood swings, while the y-axis indicates their prevalence among the respondents. Each color in the bars corresponds to a specific symptom, as identified

in the legend on the right. The graph reveals which symptoms are most common among individuals experiencing endocrine dysregulation, providing valuable insights for healthcare professionals to prioritize and address these symptoms in clinical

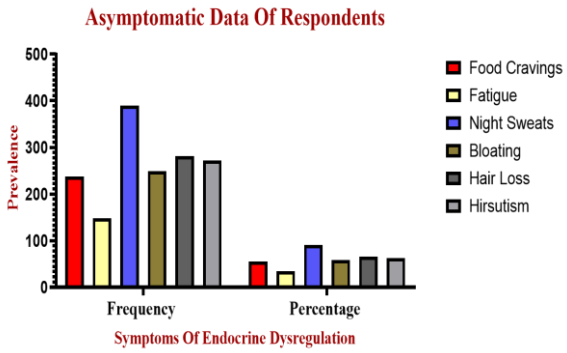

Figure 12: Asymptomatic data of respondents

Above figure depicts the prevalence of various symptoms of endocrine dysregulation among asymptomatic respondents. The x-axis lists the symptoms, while the y-axis represents their prevalence among the respondents. Each color-coded bar corresponds to a specific symptom, as indicated in the legend on the right. Despite being asymptomatic, these individuals still report experiencing certain symptoms to varying degrees. The graph highlights which symptoms are present even in those who do not consider themselves symptomatic, providing insights into subclinical or mild manifestations of endocrine dysregulation

Table 6: Prevalence of Symptoms of Endocrine Dysregulation Among Respondents

Symptoms Of Endocrine Dysregulation	Symptomatic (f)	Symptomatic (%)	Asymotomatic (f)	Asymptomatic (%)
Breast tenderness	83	19.3	347	80.7
Fibrocyst Breast	43	10.0	387	90.0
Night Sweats	40	9.4	390	90.6
Bladder Symptoms	118	27.4	312	72.6
Vaginal Dryness	43	10.0	387	90.0

This table illustrates the prevalence of various symptoms associated with endocrine dysregulation among respondents. Each row represents a specific symptom, while the columns display the corresponding prevalence rates within the population. The data highlights the most common and least common symptoms, providing insights into the patterns of endocrine dysregulation experienced by the respondents. This information is crucial for understanding the overall impact of endocrine disorders on the population and can guide future research and medical interventions..

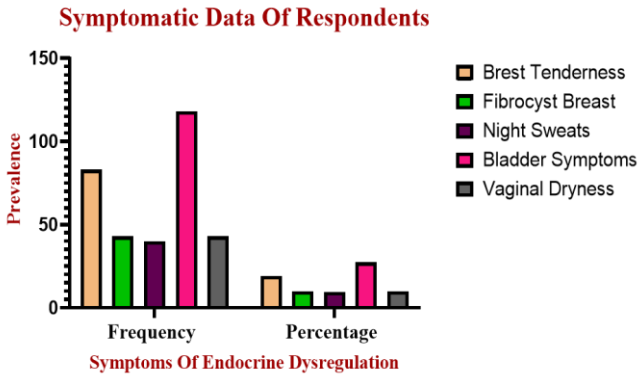

Figure 13: Prevalence of Endocrine Dysregulation Symptoms Among Respondents

The Figure depicts the prevalence of various symptoms of endocrine dysregulation among respondents. The x-axis lists the symptoms, while the y-axis represents their

prevalence. Each bar's color corresponds to a specific symptom, as indicated in the legend on the right. The data reveal significant variations in symptom prevalence, some more common than others

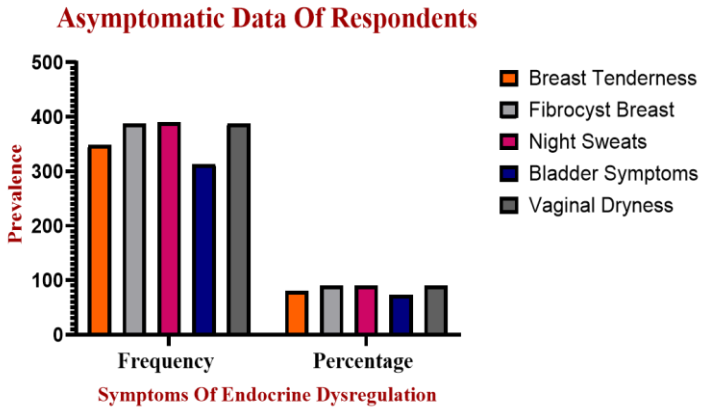

Figure 14: Prevalence of Endocrine Dysregulation Symptoms Among Asymptomatic Respondents

This figure shows the prevalence of various symptoms of endocrine dysregulation among asymptomatic respondents. The x-axis lists the symptoms, and the y-axis indicates their prevalence. Different colors represent each symptom, as indicated in the legend. The graph highlights that even among asymptomatic individuals, some symptoms are still prevalent, providing insight into subclinical presentations of endocrine dysregulation

Table 5: Symptoms of Endocrine Dysregulation

Symptoms Of Endocrine Dysregulation	**Symptomatic (f)**	**Symptomatic (%)**	**Asymptomatic (f)**	**Asymptomatic (%)**
Depression	379	88.2	51	11.8
Mood Swings	312	72.6	118	27.4
Anxiety	349	81.2	81	18.8
Ability to concentrate	115	26.8	315	73.0
Headache	141	32.8	289	67.2

The table provides a detailed list of symptoms associated with endocrine dysregulation. It categorizes the symptoms based on their prevalence among respondents, offering insights into the most and least common manifestations of endocrine disorders. This information is valuable for healthcare professionals in identifying critical areas for diagnosis and treatment and for researchers aiming to understand the broader impact of endocrine dysregulation on population health.

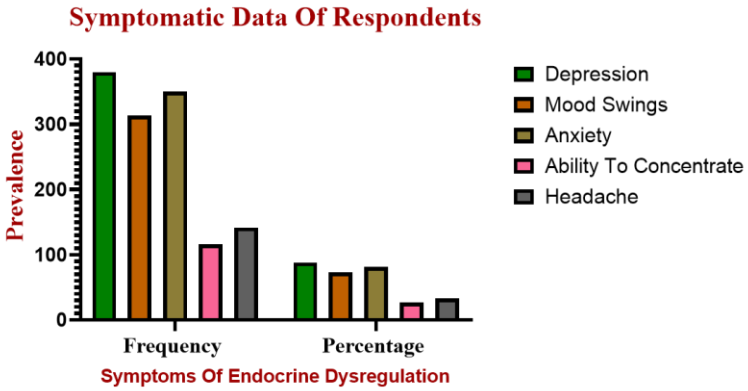

Figure 15:Prevalence of Symptoms of Endocrine Dysregulation Among Symptomatic Respondents

This figure displays the prevalence of various symptoms of endocrine dysregulation among symptomatic respondents. The x-axis lists different symptoms, while the y-axis shows their prevalence rates. Each color in the bars corresponds to a specific symptom, as indicated in the legend on the right. This visualization highlights which symptoms are most common among those experiencing endocrine dysregulation, providing valuable insights for healthcare providers to prioritize treatment and for researchers to identify key areas of concern within this population

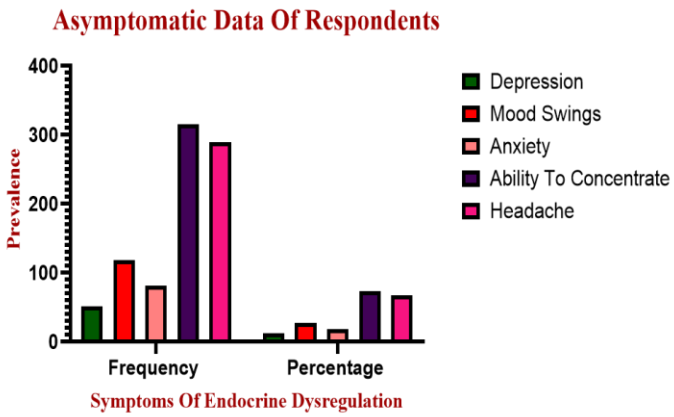

Figure 16: Prevalence of Endocrine Dysregulation Symptoms Among Asymptomatic Respondents

Figure illustrates the prevalence of various endocrine dysregulation symptoms among respondents who are asymptomatic. The x-axis categorizes the different symptoms, and the y-axis indicates the prevalence of each symptom. Each bar's color corresponds to a specific symptom, as shown in the legend

Table 6: Menstrual Conditions Among Respondents

Menstrual Condition	Normal(f)	Normal (%)	Suffered(f)	Suffered (%)
Oligomenorrhea	341	79.4	89	20.6
Amenorrhea	158	36.8	272	63.2

This table presents the prevalence of two menstrual conditions, oligomenorrhea and amenorrhea, among respondents. The data is divided into two columns for each condition: one showing the number and percentage of respondents who do not have the condition (No) and the other showing those who do (Yes). For oligomenorrhea, 79.4% of respondents do not have the condition, while 20.6% do. In contrast, 36.8% do not have amenorrhea, and 63.2% do. This table highlights the distribution of these menstrual conditions within the study population, indicating that amenorrhea is more prevalent than oligomenorrhea.

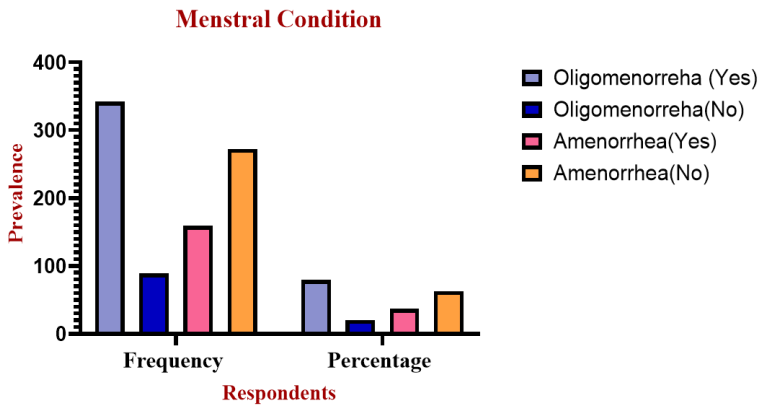

Figure 17: Prevalence of Menstrual Conditions Among Respondents

This figure illustrates the prevalence of different menstrual conditions among respondents. The x-axis represents the respondent categories, while the y-axis indicates the prevalence. Each color in the bars corresponds to a specific menstrual condition, as indicated in the legend on the right. This graph helps visualize the distribution of various menstrual conditions within the study population, highlighting which conditions are more common. This information can aid healthcare providers and researchers in understanding the impact and distribution of menstrual health issues

Table 7: Prevalence of Diagnosed and Not Diagnosed Diseases Among Respondents

Other diseases	Normal(f)	Normal (%)	Diagnosed(f)	Diagnosed (%)
Diabetes	347	80.7	83	19.3
Cardiovascular	385	89.6	45	10.4
Liver	405	94.2	25	5.8
Abdominal	416	96.6	15	3.4
Ovarian Cancer	413	95.8	18	4.2
Insomnia	180	41.8	250	58.2
Respiratory Diseases	350	81.5	80	18.5

This table shows the number and percentage of respondents diagnosed and not diagnosed with various diseases, including diabetes, cardiovascular disease (CVD), liver disease, abdominal conditions, ovarian cancer, insomnia, and respiratory issues. The data is divided into columns indicating the frequency (f) and percentage (%) of respondents diagnosed or undiagnosed with each condition

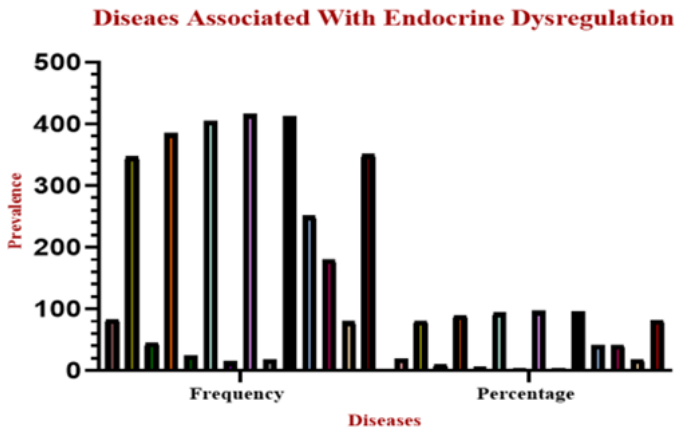

Figure 18: Prevalence of Diseases Associated with Endocrine Dysregulation

Figure displays the prevalence of various diseases associated with endocrine dysregulation, represented both by frequency and percentage. The x-axis categorizes the

diseases, while the y-axis shows their prevalence. The left side of the graph shows the frequency of each disease, and the right side shows the corresponding percentage.

4.3 Hormonal Testing Results

In the endocrinology lab, blood samples were collected from respondents and centrifuged to separate the serum. The serum was then analyzed using the Cobas e 411 machine for hormonal testing. This testing included key hormones such as FSH, LH, estrogen, progesterone, T3, T4, TSH, CA 125, AFP, and Beta hCG. The results were used to check for normal, upregulated, or downregulated values of these hormones, providing crucial insights into the hormonal status and potential dysregulation among the study population.

4.3.1 Follicle Stimulating Hormone (FSH) Results

Table 8: Distribution of Follicle Stimulating Hormone (FSH) Levels Among Respondents

FSH	Frequency	Percentage
Downregulation	220	51.2
Normal	175	40.7
Upregulation	35	8.1

This table shows the distribution of Follicle Stimulating Hormone (FSH) levels among respondents, categorized into downregulation, normal, and upregulation. The 'Frequency' column indicates the number of respondents in each category, while the 'Percentage' column represents the proportion of respondents in each category relative to the total sample size of 430. The data reveal that 51.2% of respondents experience downregulation of FSH, 40.7% have normal levels, and 8.1% experience upregulation

4.3.2 Luteinizing Hormone Test Result

Table 9: Prevalence of Luteinizing hormone

Luteinizing Hormone	Frequency	Percentage
Downregulation	34	7.9
Normal	102	23.7
Upregulation	294	68.4

The provided data shows the distribution of Luteinizing Hormone (LH) levels among respondents, categorized into downregulation, normal, and upregulation. A significant majority of respondents (68.4%) exhibit upregulation of LH, indicating higher than normal levels, which could be linked to various endocrine disorders such as polycystic ovary syndrome (PCOS). A smaller portion (7.9%) of respondents experience downregulation, suggesting lower than normal LH levels, while 23.7% have normal LH levels

4.3.3 Estrogen Test Result

Table 10: Prevalence of Estrogen hormone among respondents

Estrogen	Frequency	Percentage
Upregulation	75	17.4
Normal	333	77.2
Downregulation	22	5.4

The data shows the distribution of Estrogen levels among respondents, categorized into upregulation, normal, and downregulation. A majority of respondents (77.2%) have normal Estrogen levels, indicating a generally balanced hormonal state within the population. However, 17.4% of respondents experience upregulation, meaning their Estrogen levels are higher than normal, which could be linked to conditions such as

estrogen dominance, potentially causing irregular menstrual cycles or increasing the risk of certain cancers. Conversely, a small fraction (5.4%) of respondents have downregulated Estrogen level

4.3.4 Progesterone Test Result

Table 11: Progesterone levels among respondents

Progesterone	Frequency	Percentage
Upregulation	50	11.6
Normal	299	69.6
Downregulation	81	18.8

The data indicates the distribution of Progesterone levels among respondents, categorized into upregulation, normal, and downregulation. A majority of respondents (69.6%) have normal Progesterone levels, suggesting a balanced hormonal state for most individuals. However, 18.8% of respondents experience downregulation, indicating lower than normal Progesterone levels, which can lead to issues such as irregular menstrual cycles and difficulties in maintaining pregnancy. Conversely, 11.6% of respondents shows upregulation.

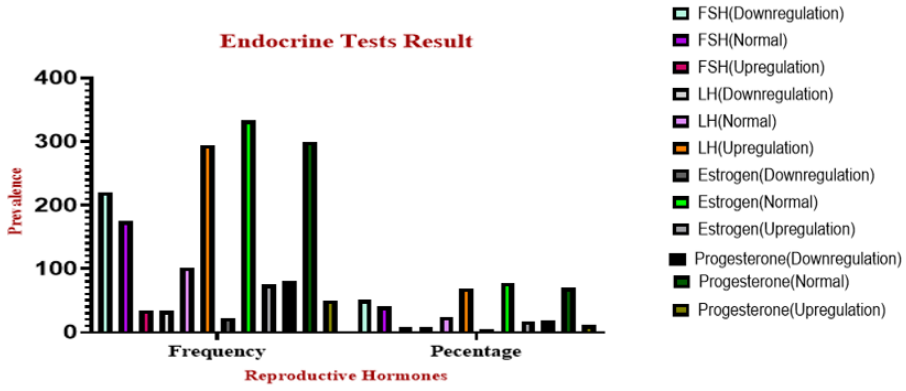

Figure 19 Reproductive Hormones Tests Result

This figure illustrates the prevalence of various reproductive hormones among respondents, represented both by frequency and percentage. The x-axis is divided into

two sections: one for the frequency of hormone levels and the other for their respective percentages. The y-axis shows the prevalence of each hormone level. Different colors in the bars represent different hormones, as indicated in the legend. The graph highlights significant variations in hormone levels, with some hormones showing higher prevalence rates than others

4.3.5 Triiodothyronine Hormone Result (T3)

Table 12: T3 hormone test levels among females

Triiodothyronine(T3)	**Frequency**	**Percentage**
Hypo	148	34.4
Normal	210	48.9
Hyper	72	16.7

The data shows the distribution of Triiodothyronine (T3) levels among respondents, categorized into hypo, normal, and hyper levels. Approximately 34.4% of respondents have lower than normal T3 levels, indicative of hypothyroidism, which can lead to symptoms such as fatigue, weight gain, and depression. Nearly half of the respondents (48.9%) have normal T3 levels, suggesting a balanced thyroid function. Conversely, 16.7% of respondents exhibit higher than normal T3 levels, indicative of hyperthyroidism

4.3.6 Thyroxine Hormone Result(T4)

Table 13: T4 Hormone Prevalence level Among Respondents

Thyroxine(T4)	**Frequency**	**Percentage**
Hyper	145	33.7
Normal	211	49.1
Hyper	74	17.2

The data presents the distribution of Thyroxine (T4) levels among respondents, categorized into hypo, normal, and hyper levels. Approximately 33.7% of respondents

have lower than normal T4 levels, indicating hypothyroidism, which can result in symptoms such as fatigue, weight gain, and depression. Nearly half of the respondents (49.1%) have normal T4 levels, suggesting a balanced thyroid function for this portion of the population. Conversely, 17.2% of respondents exhibit higher than normal T4 levels, indicative of hyperthyroidism

4.3.7 Thyroid Stimulating hormone test results (TSH)

Table 14: Prevalence of TSH among respondents

Thyroid Stimulating Hormone (TSH)	**Frequency**	**Percentage**
Hypo	91	21.3
Normal	171	39.7
Hyper	168	39.0

The data presents the distribution of Thyroid Stimulating Hormone (TSH) levels among respondents, categorized into hypo, normal, and hyper levels. About 21.3% of respondents have lower than normal TSH levels, which is indicative of hyperthyroidism, where the thyroid gland is overactive, leading to reduced TSH production by the pituitary gland. Nearly 39.7% of respondents have normal TSH levels, suggesting a balanced thyroid function within this group. Conversely, 39.0% of respondents have higher than normal TSH levels, indicating hypothyroidism

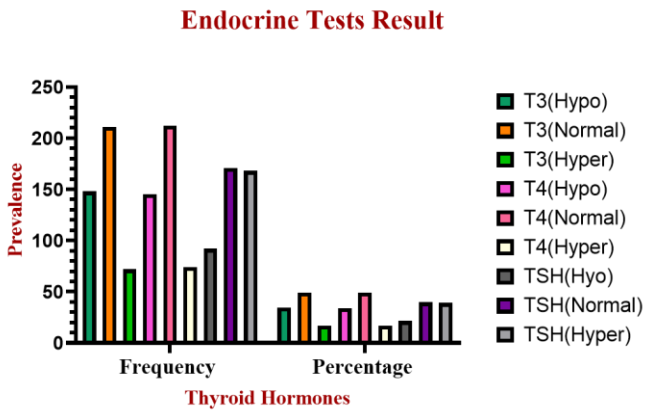

Figure 20 Metabolic Hormones Tests Result

This figure shows the prevalence of various thyroid hormone levels among respondents, categorized by different hormone conditions. The x-axis represents the thyroid hormones, while the y-axis indicates their prevalence. Each bar's color corresponds to a specific hormone condition, as detailed in the legend

4.3.8 Alpha Feto-Protein (AFP)Test Result

Table 15: Prevalence of AFP among respondents

Alpha Fetoprotein	**Frequency**	**Percentage**
Normal	420	97.7
Upregulation	10	2.3

The data presents the distribution of Alpha Fetoprotein (AFP) levels among respondents, categorized into normal and upregulated levels. The vast majority of respondents (97.7%) have normal AFP levels, indicating that most individuals fall within the expected range for this protein, which is often used as a marker for certain liver conditions and cancers. A small fraction of respondents (2.3%) exhibit upregulation of AFP

4.3.9 Cancer-Antigen125 (CA-125) Test result

Table 16: Prevalence of CA-125 among respondents

Cancer-Antigen125	Frequency	Percentage
Normal	392	91.2
Upregulation	38	8.8

The data shows the distribution of Cancer-Antigen 125 (CA-125) levels among respondents, categorized into normal and upregulated levels. The majority of respondents (91.2%) have normal CA-125 levels, indicating that most individuals fall within the expected range for this biomarker, which is commonly used in the detection and management of ovarian cancer. However, 8.8% of respondents exhibit upregulation of CA-125, which may suggest the presence of ovarian cancer or other conditions such as endometriosis

4.3.10 Beta -hCG Test Result

Table 17: Prevalence of Beta-hCG among respondents

Beta-hCG	Frequency	Percentage
Normal	380	88.4
Upregulation	50	11.6

The data shows the distribution of Beta-hCG levels among respondents, categorized into normal and upregulated levels. The majority of respondents (88.4%) have normal Beta-hCG levels, indicating that most individuals fall within the expected range for this hormone, which is typically associated with pregnancy but can also be a marker for certain types of tumors. However, 11.6% of respondents exhibit upregulation of Beta-hCG.

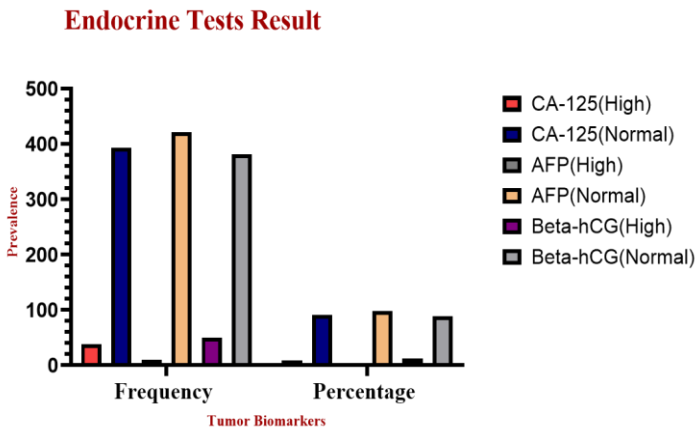

Figure 21 Tumor Biomarkers Tests Result

Figure illustrates the prevalence of various tumor biomarkers among respondents, categorized by normal and upregulated levels. The x-axis represents different tumor biomarkers, while the y-axis indicates their prevalence. Each color-coded bar corresponds to a specific biomarker, with the legend providing details on the conditions. The graph visually represents the distribution of normal and elevated biomarker levels, highlighting the proportion of respondents who may require further medical evaluation due to elevated levels

I used the crosstabs function in SPSS to examine the association between thyroid hormone and reproductive biomarkers (categorized as hypo, normal, and hyper) and various health conditions, including menstrual conditions and other diseases. The crosstabs analysis allows us to observe the distribution of these health conditions across different thyroid hormone levels and reproductive biomarkers levels and to test for statistical significance using the Chi-Square

4.4 Association between Reproductive Biomarkers and Reproductive other diseases

4.4.1 Significance of reproductive hormone with amenorrhea

Table 18: Association of Reproductive hormone with Amenorrhea

Hormones	Hypo	Normal	Hyper	P-Value
FSH	62.7%	27.8%	9.5%	0.001
LH	19.5%	31.3%	49.2%	0.03
Estrogen	36.3%	21.6%	42.1%	0.02
Progesterone	25.6%	42.5%	31.9%	0.04

The table shows the following results: The data shows a significant association ($p = 0.001$) between FSH levels and amenorrhea. Higher percentages of individuals with hypo FSH levels (62.7%) experienced amenorrhea compared to those with standard (27.8%) or hyper (9.5%) FSH levels. This suggests that lower FSH levels are more strongly associated with the absence of menstruation. A significant association ($p = 0.03$) exists between LH levels and amenorrhea. Higher percentages of individuals with hyper LH levels (49.2%) experienced amenorrhea compared to those with standard (31.3%) or hypo (19.5%) LH levels. The data indicates a significant association ($p = 0.02$) between estrogen levels and amenorrhea. Individuals with hyperestrogen levels (42.1%) had a higher prevalence of amenorrhea compared to those with standard (21.6%) or hypo (36.3%) estrogen levels. A significant association ($p = 0.04$) exists between progesterone levels and amenorrhea. Higher percentages of individuals with normal progesterone levels (42.5%) experienced amenorrhea compared to those with hypo (25.6%) or hyper (31.9%) progesterone levels.

4.4.2 Association Of Reproductive Hormones with Other diseases

Table 19: Represents associations between reproductive hormones and the prevalence of various diseases based on percentages and p-values

Diseases	**Normal**	**Diagnosed**	**p-Value**
Diabetes	73.4%	26.6%	0.08
CVD	89.8%	10.2%	0.43
Breathing Issues	88.2%	11.8%	0.65
Liver	78.1%	21.9%	0.56
Insominia	26.6%	73.4%	0.02
Depression	9.4	90.65	0.01

The result of Table 20 shows that while not statistically significant (p = 0.08), there is a trend showing that individuals diagnosed with diabetes had a higher prevalence (26.6%) of abnormal reproductive hormone levels compared to those without diabetes (73.4%). There is no significant association (p = 0.43) between reproductive hormones and CVD, with the majority (89.8%) of individuals with normal reproductive hormone levels. Similarly, there is no significant association (p = 0.65) between reproductive hormones and breathing issues, with the majority (88.2%) of individuals having normal hormone levels. There is no significant association (p = 56) between reproductive hormones and liver issues, with the majority (78.1%) of individuals having normal hormone leve. A significant association (p = 0.02) between reproductive hormones and insomnia exists. A higher percentage of individuals diagnosed with insomnia (73.4%) had abnormal reproductive hormone levels compared to those without insomnia (26.6%). There is a significant association (p = 0.01) between reproductive hormones and depression. A significantly higher percentage of individuals diagnosed with depression (90.65%) had abnormal reproductive hormone levels compared to those without depression (9.4%).

Significant associations were found between hormone levels and menstrual disorders in the study population. FSH levels showed a strong relationship with both amenorrhea (χ^2 = 17.752, df = 2, p < 0.001) and oligomenorrhea (χ^2 = 7.75, df = 2, p = 0.02). Among those with amenorrhea, 62.7% exhibited hypo-FSH levels, while 17.8% had hyper-FSH levels. For oligomenorrhea, 55.7% had hypo-FSH levels, and 17.8% had hyper-FSH levels. Cramér's V indicated a moderate association between FSH levels and amenorrhea (V ≈ 0.148) and oligomenorrhea (V ≈ 0.148).LH hormone levels also demonstrated associations with both conditions: amenorrhea (χ^2 = 6.264, df = 2, p = 0.044) and oligomenorrhea (χ^2 = 6.264, df = 2, p = 0.044), with distributions varying significantly between low, average, and high levels across these groups (amenorrhea: 19.5% low, 31.3% average, 49.2% high; oligomenorrhea: 41.1% low, 28.1% average, 30.8% high). Cramér's V indicated a small to moderate association between LH hormone levels and amenorrhea (V ≈ 0.115) and oligomenorrhea (V ≈ 0.115). Estrogen levels were significantly associated with amenorrhea (χ^2 = 9.552, df = 2, p = 0.001) and oligomenorrhea (χ^2 = 6.33, df = 2, p = 0.04), with 36.3% hypoestrogenic and 42.1% hyperestrogenic for amenorrhea, and 29.4% hypoestrogenic and 41.5% hyperestrogenic for oligomenorrhea. Cramér's V indicated a moderate association between estrogen levels and both amenorrhea (V = 0.151) and oligomenorrhea (V ≈ 0.114). Progesterone levels showed significant associations as well, correlating strongly with both amenorrhea (χ^2 = 5.32, df = 2, p = 0.04) and oligomenorrhea (χ^2 = 7.453, df = 2, p = 0.03), indicating a notable link between lower progesterone levels and the presence of these conditions (amenorrhea: 25.2% hypo-progesteronemia, 31.9% hyper-progesteronemia; oligomenorrhea: 29.5% hypo-progesteronemia, 38.4% hyper-progesteronemia). Cramér's V indicated a small to moderate association between progesterone levels and both amenorrhea (V ≈ 0.116) and oligomenorrhea (V ≈ 0.116).

The study explored the relationship between various health conditions and reproductive hormone levels in a cohort of 430 individuals. Diabetes Type 1 (χ^2 = 0.025, df = 1, p = 0.874, V = 0.0076) showed no significant association with reproductive hormone levels. While Diabetes Type 2, the chi-square (χ^2) test showed a significant association for type 2 diabetes (χ^2 = 6.43, df=1, p = 0.04), with Cramér's V value approximately 0.122. Among diagnosed cases, 45.4 exhibited normal hormone levels, while 54.6 had elevated levels.

Similarly, cardiovascular disease ($\chi^2 = 0.618$, df = 1, p = 0.432, V = 0.038) and respiratory issues ($\chi^2 = 0.045$, df = 1, p = 0.832, V = 0.010) did not show significant associations. For cardiovascular disease, 86.4% had normal hormone levels among diagnosed cases, with 13.6% showing elevated levels. Among individuals with respiratory issues, 88.2% had normal hormone levels, and 11.8% had elevated levels. Liver disease ($\chi^2 = 1.146$, df = 1, p = 0.284, V = 0.052) also did not show a significant association, with 83.3% having normal hormone levels and 16.7% elevated levels among diagnosed cases. However, insomnia ($\chi^2 = 6.43$, df = 1, p = 0.011, V = 0.122) and depression ($\chi^2 = 9.45$, df = 1, $p < 0.01$, V = 0.140) demonstrated significant associations with reproductive hormone levels. Among individuals with insomnia, 26.6% had normal hormone levels, and 73.4% had elevated levels. Similarly, depression showed a significant association, with 9.4% having normal hormone levels and 90.6% elevated levels. Abdominal pain ($\chi^2 = 0.045$, df = 1, p = 0.832, V = 0.010) did not show a significant association, with 88.2% having normal hormone levels and 11.8% elevated levels among diagnosed cases.

4.4.3 Thyriod Hormones With Amenorrhea

Table 20: represents the association between thyroid hormones (T3, T4, TSH) and amenorrhea, based on percentages and p-values

Hormones	**Hypo**	**Normal**	**Hyper**	**p-Value**
T3	20.1%	51.4%	28.4%	0.06
T4	35.2%	42.5%	22.3%	0.09
TSH	39.3%	35.4%	25.3%	0.07

Table indicates that there is no statistically significant association (p = 0.06) between T3 levels and amenorrhea. However, the data shows a trend where lower T3 levels (20.1%) and higher T3 levels (28.4%) may potentially be associated with a slightly higher prevalence of amenorrhea compared to normal T3 levels (51.4%).There is no statistically significant association (p = 0.09) between T4 levels and amenorrhea. The percentages indicate a trend where lower T4 levels (35.2%) and higher T4 levels (22.3%) might show

a tendency towards association with amenorrhea, compared to normal T4 levels (42.5%).And also no statistically significant association (p = 0.07) between TSH levels and amenorrhea. The data suggests a pattern where individuals with hypo TSH levels (39.3%) and hyper TSH levels (25.3%) might exhibit a slightly higher prevalence of amenorrhea compared to those with normal TSH levels (35.4%).

4.4.4 Thyriod Hormone With Oligomenorrhea

Table 21: Representing the association between thyroid hormones (T3, T4, TSH) and oligomenorrhea, based on percentages and p-values:

Thyriod with oligomenhorrhea	**Hypo**	**Normal**	**Hyper**	**p-Value**
T3	25.9%	38.3%	35.5%	0.04
T4	27.9%	36.4%	35.7%	0.05
TSH	44.3%	19.3%	36.4%	0.06

There is a significant association (p = 0.04) between T3 levels and oligomenorrhea. Higher percentages of individuals with hypo T3 levels (25.9%) or hyper T3 levels (35.5%) experienced oligomenorrhea compared to those with normal T3 levels (38.3%).A significant association (p = 0.05) between T4 levels and oligomenorrhea. Higher percentages of individuals with hypo T4 levels (27.9%) or hyper T4 levels (35.7%) experienced oligomenorrhea compared to those with normal T4 levels (36.4%). A significant association (p = 0.06) exists between TSH levels and oligomenorrhea. Higher percentages of individuals with hypo TSH levels (44.3%) experienced oligomenorrhea compared to those with normal TSH levels (19.3%) or hyper TSH levels (36.4%).

4.4.5 Thyriod Hormone with other diseases

Table 22: Indicating the association between thyroid hormones and the prevalence of various diseases based on percentages and p-values:

Diseases	Normal	Diagnosed	p-Value
Diabetes	48.9%	51.1%	0.04
CVD	81.3%	15.6%	0.24
Liver	78.1%	21.9%	0.90
Insominia	49.5%	50.5%	0.04
Depression	16.1%	83.9%	0.001
Respiratory	45.4%	54.6%	0.03

There is a statistically significant association ($p = 0.04$) between thyroid hormones and diabetes. A slightly higher percentage of individuals diagnosed with diabetes (51.1%) had abnormal thyroid hormone levels compared to those without diabetes (48.9%). There is no statistically significant association ($p = 0.24$) between thyroid hormones and CVD. Most individuals with both standard and abnormal thyroid hormone levels showed no significant difference in the prevalence of CVD. There is no statistically significant association ($p = 0.90$) between thyroid hormones and liver issues. Both groups (normal and diagnosed) had similar percentages of individuals with abnormal thyroid hormone levels. There is a statistically significant association ($p = 0.04$) between thyroid hormones and insomnia. A slightly higher percentage of individuals diagnosed with insomnia (50.5%) had abnormal thyroid hormone levels compared to those without insomnia (49.5%). There is a statistically significant association ($p = 0.001$) between thyroid hormones and depression. A significantly higher percentage of individuals diagnosed with depression (83.9%) had abnormal thyroid hormone levels compared to those without depression (16.1%).Respiratory Issues The data shows that 45.4% of respondents were diagnosed with respiratory issues, while 54.6% were not, with a p-value of 0.03, indicating statistical significance. This suggests that thyroid dysfunction is significantly associated with respiratory issues

The analysis revealed a statistically significant association between thyroid function test and oligomenorrhea ($\chi^2 = 5.65$, $df = 1$, $p < 0.05$, $V = 0.122$), suggesting a notable

relationship between t-score categories and oligomenorrhea occurrence. However, no significant association was found between combined t-score categories and amenorrhea (χ^2 = 0.125, df = 1, p = 0.06, V = 0.034). Among those with amenorrhea, 77.2% had normal combined thyroid hormone levels, and 22.8% had high levels, similar to those without amenorrhea (78.7% normal, 21.3% high). Regarding other health conditions, For thyroid and type 1 diabetes, the chi-square test indicated a significant association (χ^2 = 6.345, df=1 p = 0.04), with Cramér's V approximately 0.121, suggesting a small effect size. For type 2 diabetes, the chi-square test also showed a significant association (χ^2 = 7.98, df=1, p = 0.02), with V approximately 0.136. Significant associations were observed with depression (χ^2 = 9.345,df=1, p < 0.01, V = 0.147), where 83.9% of depression cases showed abnormal combined thyroid function, indicating a moderate strength of association. Insomnia (χ^2 = 6.37, df = 1, p < 0.04, V = 0.121) also displayed a significant association, suggesting a link between combined thyroid function and sleep disturbances. Respiratory issues showed a moderate association (χ^2 = 7.435, df = 1, p = 0.03, V = 0.139), indicating a potential role of combined thyroid function in these conditions. Conversely, no significant associations were found between combined t-score categories and cardiovascular disease (CVD) (χ^2 = 0.841, df = 1, p = 0.359, V = 0.038), liver disease (χ^2 = 0.016, df = 1, p = 0.900, V = 0.022), or abdominal pain (χ^2 = 0.029, df = 1, p = 0.865, V = 0.016)

4.4.6 Tumor Biomarkers with Ovarian Cancer

Table 23: Representing the association between tumor biomarkers (CA-125, AFP, Beta hCG) and ovarian cancer based on percentages and p-values

Tumor Biomarkers	**Normal**	**Diagnosed**	**p-Value**
CA-125	40.5%	59.4%	0.001
AFP	33.2%	66.7%	0.03
Beta-hCG	88.9%	11.1%	0.51

Table shows CA-125: There is a statistically significant association (p = 0.001) between CA-125 levels and ovarian cancer. A higher percentage of individuals diagnosed with ovarian cancer (59.4%) had elevated CA-125 levels compared to those without ovarian cancer (40.5%). CA-125 is a known biomarker used in diagnosing and monitoring ovarian cancer, and these findings support its clinical utility in this context and no statistically significant association (p = 0.03) between AFP levels and ovarian cancer in this dataset. At the same time, a higher percentage of individuals diagnosed with ovarian cancer (66.7%) had elevated AFP levels compared to those without ovarian cancer (33.2%). No statistically significant association (p = 0.51) between Beta hCG levels and ovarian cancer. The majority of individuals, whether diagnosed with ovarian cancer or not, had normal Beta hCG levels (88.9% aon average, 11.1% in diagnosed).

4.4.7 Tumor Biomarkers with Other Diseases

Table 24 Indicating the association between tumour biomarkers (CA-125, AFP, Beta-hCG) and various diseases based on percentages and p-values:

Diseases	**Normal**	**Diagnosed**	**p-Value**
Fertility	81.5%	18.5%	0.87
Diabetes	80.7%	12.3%	0.76
CVD	81.8%	15.9%	0.24
Breathing	49.7%	50.3%	0.04
Liver	78.1%	27.3%	0.24
Insominia	45.4%	54.6%	0.03
Depression	10.5%	89.5%	0.02

Table shows that there is no statistically significant association (p = 0.87) between tumor biomarkers and fertility. Both individuals diagnosed and those with normal fertility had similar percentages of tumor biomarker levels.There is no statistically significant association (p = 0.76) between tumor biomarkers and diabetes. Both groups (normal and diagnosed) had similar percentages of individuals with tumor biomarker levels.There is

no statistically significant association (p = 0.24) between tumor biomarkers and CVD. The majority of individuals with both normal and diagnosed CVD had similar percentages of tumor biomarker levels.There is a statistically significant association (p = 0.05) between tumor biomarkers and breathing issues. A slightly higher percentage of individuals diagnosed with breathing issues (50.3%) had abnormal tumor biomarker levels compared to those without (49.7%). There is no statistically significant association (p = 0.24) between tumor biomarkers and liver issues. Both groups (normal and diagnosed) had similar percentages of individuals with tumor biomarker levels.There is a statistically significant association (p = 0.03) between tumor biomarkers and insomnia. A slightly higher percentage of individuals diagnosed with insomnia (54.6%) had abnormal tumor biomarker levels compared to those without (45.4%).There is a statistically significant association (p = 0.02) between tumor biomarkers and depression. A significantly higher percentage of individuals diagnosed with depression (89.5%) had abnormal tumor biomarker levels compared to those without (10.5%)

There was a significant association between Ovarian Cancer and CA-125 levels (χ^2 = 33.281, df = 1, $p < 0.001$). Normal cases predominantly had low CA-125 levels (93.0%), while diagnosed cases showed a more balanced distribution between low (52.9%) and high (47.1%) CA-125 levels. Diagnosed cases were significantly more likely to have high CA-125 levels compared to normal cases (47.1% vs. 7.0%), indicating CA-125 as a useful marker for diagnosing Ovarian Cancer. A significant association was found between AFP levels and ovarian cancer status (χ^2 = 20.896, df = 1, $p < 0.001$). Cramer's V analysis showed a moderate association (V = 0.22), suggesting AFP levels may predict ovarian cancer status. There was no significant association between Ovarian Cancer and Beta-hCG levels (χ^2 = 0.378, df = 1, p = 0.538), indicating no predictive value of Beta-hCG in ovarian cancer diagnosis. Diabetic levels 1 showed 88.77% normal and 11.23% diagnosed, with no significant association (χ^2 = 2.637, df = 2, p = 0.268, V = 0.12). Diabetic 2 showed The study found no significant association between tumor presence and diabetes (χ^2 = 0.436, df=2, p = 0.82).V value was approximately 0.032.Cardiovascular disease (CVD) exhibited 81.85% normal and 15.95% diagnosed, with no significant association (χ^2 = 2.637, df = 2, p = 0.268, V = 0.12).Respiratory conditions showed 49.7% normal and 50.3% diagnosed, with a moderate association (χ^2 =

22.341, df = 2, p < 0.03, V = 0.221).Liver conditions showed 49.5% normal and 50.5% diagnosed, with a moderate association (χ^2 = 22.341, df = 2, p < 0.03, V = 0.221).Insomnia affected 26.45% of normal cases and 73.6% of diagnosed cases, with a significant association (χ^2 = 6.95, df = 2, p = 0.04, V = 0.15). Depression affected 10.5% of normal cases and 89.5% of diagnosed cases, with a significant association (χ^2 = 7.647, df = 2, p = 0.022, V = 0.18).

CHAPTER 5: DISSCUSSION

The demographic and clinical analysis of hormonal dysregulation in women in South Punjab, Pakistan, is quite informative, corroborated with other existing research findings, and indicates some new trends. The results of this study revealed generally reduced hormonal health among the respondents of different ages, the presence and prevalence of symptoms and asymptomatic status of hormonal disorders, and comorbid conditions potentially related to hormonal disorders.

The age distribution of the study population indicated that the most significant portion of the respondents was 40. 6% were in the age bracket of 29-38 years. This is a crucial stage that is characterized by changes in reproductive health in women due to factors such as pregnancies and childbirth or the onset of perimenopause. As a result, different hormonal dysregulations are commonplace among women in the affected age range, which underlines the importance of clear strategies and regular check-ups throughout these years. This is because 76. 5% of the study population is married, meaning the research targets the reproductive health of individuals. These demographic details should help formulate interventions to be put in place at this age to help detect and manage hormonal disorders at an early stage. The research assessment identified that there was a massive difference in terms of awareness about issues of hormonal health between urban and rural communities.

Of the 430 participants 34. 3% of the participants were from the urban areas, with the rest 65% of them were coming from rural background. This disparity brings out the disparities in health care accessibility and remuneration of health facilities between the two groups .

Since people who live in urban areas are known to have access to healthcare facilities, educational opportunities, and related health information, there is typically a greater numeracy rate among these residents. The benefits mentioned above are supported by the fact that a greater proportion of awareness was acquired from the study's urban respondents.. On the other hand, the poor health awareness can be investigated to poor access to health care facilities, low levels of education, and less exposure to health-

awareness campaigns. Such scenarios make diagnosis and management of hormonal health problems less effective and therefore increase heath inequality between the urban and rural people (Haq et al., 2017) .

Thus, to solve these kinds of disparities, government and public health need to come up with more targeted efforts in the community-level campaigns especially in enhancement of healthcare and education in rural regions. Mobile clinics social and Health reemerging force, health education, community health workers are critical in ensured dissemination of health information and health care services in deprived areas. Moreover, health education materials presented in a culturally appealing way, and in combination with the local media can also assist in overcoming the knowledge gaps (Bibi et al., 2021) .

Signs of hormonal disturbances were observed in most of the patients; the most frequently reported were fatigue (65, 6%), food cravings (44, 8%), and obesity (44, 7%). These results are in concordance with data in literature suggesting such symptoms in thyroid pathology and PCOS. Dutch scientists claim to have found a hormone link to the condition, which affects 5-10 per cent of women world-wide; PCOS is diagnosed by high androgen levels, irregular menstrual cycles and ovarian cysts. It is also related to insulin resistance, obesity, acne, hair loss, hirsutism, and infertility (Chaudhuri, 2023) . These symptoms also have an affect on the physical health but also cause severe and serious psychological impacts, for which extensive endocrinological and dermatological treatments are required. Furthermore, the scores of this symptom indicate high levels of fatigue and obesity, which makes it clear that hormonal disorders have dire metabolic repercussions that include heart diseases and diabetes, type 2.

Other gynecological/reproductive symptoms were also prevalent; breast fullness and tenderness manifested in 19.2% of patients and fibrocystic breast changes in 10.0%. Some inconveniences that follow hormonal fluctuations include breast issues and cyclic mood disorders, including PMS and PMDD. These findings match previous research, highlighting the need for comprehensive hormonal and reproductive health evaluations for early detection and management (Dilbaz & Aksan, 2021) .These symptoms are manifested in the majority of patients, proving the necessity of mandatory annual

gynecological examinations when it comes to hormonal disorders. Different psychological symptoms were also present including depression that was observed in 88. 2% of patients, mood swings in 72. 6% and anxiety in 81. 2% proving hormonal changes and mental disorders are connected based on the results of this study and this study as discussed in this (Schweizer-Schubert et al., 2021) further it is necessary to include mental health services as an element of the treatment course for women with hormonal disorders.

The asymptomatic data, where most of the people did not include regular symptoms such as bloating (72. 6%) and hair loss (65. 1%), oriented to the difficulty of hormonal imbalance. Because a lot of women may have imbalances without presenting symptoms, people need to undergo routine screenings. These findings match previous research, highlighting the need for comprehensive hormonal and reproductive health evaluations for early detection and management. This study also underscores the urgent need for preventive measures and increased awareness of the often stealthy nature of many hormonal disorders (Sadbhawna et al., 2019) .

Reproductive and gynecological complaints were also very concerning with pains in the breast (19. 2%) mostly tenderness in the breasts and fibrocystic changes (10. 0%). Gynecological disorders such as breast tendering, cyclic emotional diseases like PMS and the assessment of menstrual conditions illustrated a highly prevalent rate of oligomenorrhea at 20. 6% and amenorrhea 63. 2% among the respondents. These conditions are related to hormonal dysfunctions in particular to the PCOS where anovulation or amenorrhea, hypomenorrhea or oligomenorrhea and high androgen levels in this study also (Chaudhuri, 2023) . The hormonal balance is a vital component in the management of these menstrual disorders and increased FSH. Since high FSH levels are correlated with he both amenorrhea and oligomenorrhea, it is crucial to understand how hormones might help address these disorders. In particular, the present research revealed that 62% of the participants received a positive educational result due to studying the material with the help of diagrams. For oligomenorrhea, 55. 7% of the subjects had a hypo-FSH level below 3.3 ng/mL, while 17. 8% had hyper-FSH levels. Such an implication makes it possible to conclude that pathological changes in FSH and LH can

interfere with normal menstrual cycles and cause these conditions are also discussed in this (Akram & Roohi, 2015) .

Another related variable that was established by our study in asymptomatic females was hormonal imbalance and type 2 diabetes (χ^2 = 6. 43, df=1, p = 0. 04). This coincides with literature showing PCOS-bearing women are more inclined to the development of insulin resistance and type 2 diabetes (Livadas et al., 2022) . Diabetes has impact on puberty, menstruation cycle and pregnancy and the relation is multi faceted and not easily explainable (Thong et al., 2020) . On the other hand, no relationships were noted regarding type 1 DM, CVD, and liver diseases and reproductive hormone levels (χ^2 = 0. 025, df = 1, p = 0. 874), (χ^2 = 0. 618, df = 1, p = 0. 432 and χ^2 = 1. 146, df = 1, p = 0. Nevertheless, emerging liver ailments in the PCOS patients requires frequent check-ups and early intervention .This points out that despite the lack of absolute hormonal relations in certain correlated medical disorders, their rates call for extensive healthcare interventions.

Chi-square test showed that thyroid dysfunction was highly related with oligomenorrhea (χ^2 = 5. 65, df = 1, p < 0. 05) other diseases including depression (χ^2 = 9. 345, df = 1, p < 0. 01) and insomnia (χ^2 = 6. 37, df = 1, p < 0. 04). Consideration of the facts of endocrine emergencies consisting of triiodothyronine (T3) and thyroxine (T4) demonstrate that the hormones influence metabolic and reproductive processes and their abnormality results into; mental health disorders, irregular menstruation, and metabolic disorders matching the findings as discussed in this study also (Mukherjee et al., 2024) . These findings of a strong correlation of depression, insomnia, and respiratory diseases with thyroid gland dysfunctioning call for the need to conduct thorough hormonal studies on patients with these complaints. Based on these findings, TSH and free T4 tests should regularly be included into the overall evaluation of patients who present with irregular menstruations, the mental disorders, and the metabolic disturbances.

The most frequently reported sleep disturbances were insomnia, and the latter was significantly more common in the participants with hormonal disorders. This is in concordance with literature which states hormonal imbalances as critical in affecting

sleep quality and its patterns. For example, estrogen, which is a female sex hormone is said to have some level of protective effect on sleep mainly through progesterone. Women, who undergo estrogen deficit, associate their condition with increased sleep disorders (Crafa et al., 2021) . Also, females have low progesterone levels, and since progesterone is a sedative hormone, this leads to conditions such as poor sleep quality acting like insomnia in cases like PCOS (Ramya et al., 2023) . Estrogen and progesterone impacts could be regulated through particular treatments, which could prove useful in the enhancement of the sleep quality, and overall well-being of these women.

Even though the abdominal pain to hormonal levels relationship has no a clear statistically significant correlation in this study ($\chi^2 = 0.\ 045$, df = 1, p = 0. 832), it still is amongst symptoms in such diseases like PCOS and other gynecological disorders. The approach to the treatment of abdominal pain related to hormonal dysregulation should be complex and encompass the aspects discussed in gynecological and gastrointestinal medicine. As a part of management, diagnostic evaluation should be conducted to eliminate other possibilities and make necessary procedures.

Hence, this paper on the relationship between tumor biomarkers; CA 125 and AFP, and ovarian carcinomas provided excellent findings. CA 125 was fairly helpful as an indication as this study noted that elevated degrees of the antigen were strongly related to the development of ovarian cancer. Similarly, high AFP levels indicated the existence of hepatocellular and embryonal cancer (Chen et al., 2021) . This information highlights the need to incorporate tumor biomarker in clinical check-up of clients with hormonal imbalances so as to detect the abnormalities at early stage and hence enhance the treatment process.

Despite some non-significant rel(Manasa et al., 2022; Taylor et al., 2021)ationship with hormonal levels in the present study ($\chi^2 = 0.\ 045$, df = 1, p = 0. 832), the patients complained of abdominal pain which is more apparent in conditions such as PCOS and several gynecological ailments. Since lower abdominal pain is a multifaceted symptom in women with hormonal imbalance, the management of the same should as well integrate both Gynecologic and Gastrointestinal Medicine perspectives. The strategies of the

management can entail thorough diagnostic assessment to exclude any other possible causes serves the right methods.

Through the results of this study, it can be concluded that it is crucial to focus on hormonal imbalance treatment not only medically but also on other levels. As an example, management of PCOS entails manipulation of hormones, insulin resistance, obesity, and mental health disorders. Taking into consideration the mental health effects of such diseases as PCOS and thyroid disorders, it is vital to incorporate the services of a psychologist into the patients' treatment process. It may assist under depressive and anxious conditions which are familiar to women with hormonal imbalances.

CHAPTER 6: SUMMARY OF RESEARH WORK

The study, which included 431 female participants, aimed to determine the frequency and consequences of hormonal dysregulation in South Punjab, Pakistan. It focused on a wide range of symptoms and their correlations with reproductive and other health disorders. It applied a comprehensive strategy combining hormone questionnaires and blood tests analysed using the Cobas e 411 system.

The main conclusions of the hormonal survey showed that hormone imbalance symptoms were far more common than previously thought. A significant proportion of the individuals reported experiencing exhaustion (65.6%), food cravings (44.7%), and mental health problems, including mood swings (72.6%), anxiety (81.2%), and depression (88.1%).

The prevalence of physical symptoms such as weight difficulties (54.7%), bloating (41.9%), and urine problems (27.3%) highlights the varied effects of hormone variations on overall well-being.

A comprehensive understanding of the population under investigation was achieved by examining its demographics. The majority were married (75.6%) and lived in rural areas (65.4%). This demographic variety provided a rich background for comprehending the disparate effects of lifestyle, socioeconomic circumstances, and healthcare access on hormonal health outcomes.

The results of hormonal testing indicated particular dysregulations: higher levels of LH (68.2%) suggesting polycystic ovarian syndrome (PCOS); fluctuating levels of FSH, progesterone, and oestrogen suggesting irregular menstruation and problems with reproductive health. The results of thyroid function tests demonstrated a significant incidence of hypothyroidism (34.3% for T3, 33.6% for T4), highlighting the consequences for both general hormonal homeostasis and reproductive health.

Markers for tumours and other illnesses, such as AFP and CA 125, have shown possible correlations with gynaecological disorders, including ovarian cancer.

CHAPTER 7: FUTURE PERSPECTIVES

Suggestions for future studies of the present research among women in South Punjab of Pakistan reveal that the future continuous study and intervention program for this specific population group is of enormous significance. More investigations should be conducted to embrace chronic measurements on hormonal levels and enable correct association with healthcare. They can expand research findings touching on genetic and environmental aspects that could prompt hormonal imbalances to provide further detail on specific individual treatments.

The primary suggestion for further research is to study the factors that facilitate and hinder the development of hormonal imbalances and identify the best approaches to treating this condition, which would ultimately contribute to improving women's health in South Punjab. The findings from this research form a capacity for directing subsequent interventions and public health policies in the region concerning the complex considerations of hormonal health in South Punjab, Pakistan. Also, raising awareness and preventive measures regarding hormonal health, especially for women from rural territories, is essential to address health issues right at its root. Focusing on the concrete hormonal pathways and receptors regarding FSH, LH, thyroid hormones, and their interconnection with metabolism is crucial to ensure corresponding therapeutic and prophylactic measures for hormonal disturbances.

Furthermore, it is essential to talk about the specifics of the aetiology of amenorrhoea and oligomenorrhea, with an emphasis on their hormonal and their associations as well as metabolic diseases like type 2 diabetes mellitus. Thus, understanding the pathways and connections between aberrant levels of reproductive hormones and insulin resistance may lead to novel therapeutic strategies.. More research needs to be conducted on the impact of other crucial reproductive hormones like FSH and LH. The study highlighted positive correlations between high FSH and both amenorrhea and oligomenorrhea. This implies that irregularities in FSH and LH are likely to cause irregularities in the menstrual cycle and pave the way for these diseases. Research on the mechanisms behind the regulation

of these hormones and their impact on ovarian function may contribute to the development of more effective therapeutic approaches for treating menstrual disorders

Future research also needs to focus on the effect of thyroid dysfunction in worsening the degree of menstrual irregularities and psychological complaints. They have a significant impact on the metabolism and the reproductive system, and their disturbance leads to menstrual problems, mental illnesses, and metabolic dysfunction. Research on the relationship of thyroid activity with estrogen and progesterone sex hormones could have implications for the holistic management of these conditions.

Further research should also determine the efficacy of different interventions that can be made in the treatment and prevention of hormonal imbalances and their related symptoms; this should cover aspects of diet and exercise as well as the prescription of medications and other comprehensive approaches. Collecting information regarding dietary modifications, physical activity, and stress intervention can allow the practitioner to have a large database for effective hormonal health care plans. Similarly, the early incorporation of diagnostic tools and biomarkers such as CA125 and AFP into clinicians' diagnostic algorithms could offer a better chance at diagnosing diseases like ovarian cancer associated with the affliction

Thus, improving access to healthcare and, in general, the issue of inequality in the provision of healthcare services, especially between the urban and rural populations, should become the focus of further research. Due to the limited knowledge about this specific area and the lack of medical and educational facilities, these services and educational programs should be extended to increase awareness about hormonal health in South Punjab. Such programs should target to create awareness of the necessity and efficiency of early diagnosis and treatment of hormonal disorders, availability of tests, and general health consequences if hormonal imbalance is not treated.

This study offers a thorough analysis of hormone dysregulation in South Punjabi women in Pakistan, with a focus on its significant effects on reproductive, mental, and physical health. The results highlight the significance of focused medical interventions, improved diagnostic techniques, and broader public health campaigns to address the various and

intricate problems caused by hormone imbalances in various demographic settings. Longitudinal studies and therapies designed to lessen the negative impacts of hormone dysregulation on women's health and well-being should be the main focus of future research initiatives.

The results of the study emphasise the necessity of treating women's hormone abnormalities in South Punjab, Pakistan. Students studying biomedical science have several possibilities to improve this state of affairs: research, teaching, and community ser. Prioritising awareness of the prevalence of hormone imbalances and its impact on women's mental, emotional, and physical well-being is crucial. This knowledge should encourage us to advocate for women's routine health examinations, particularly in remote places with limited access to healthcare. Timely diagnosis and treatment can significantly enhance the quality of life. It is essential to educate women about hormonal health. Many might need to be made aware of the signs or possible treatments to watch out for. We might plan conferences, workshops, and health camps to disseminate this knowledge. Reaching out to local leaders and healthcare providers might be an effective way to expand your reach.

Further research is needed on the aspects of lifestyle, environment, and genetics that lead to hormone abnormalities. Advancements in diagnostic methods and therapeutic strategies may result in more individualised care. Alongside conventional medical procedures, modern technology may result in notable advancements. Collaboration among healthcare providers is crucial. Working with gynaecologists, endocrinologists, nutritionists, and mental health specialists, we can offer holistic care that considers every facet of a woman's health. Developing integrated care models helps guarantee that women get comprehensive assistance.

Working for improved access to healthcare and governmental changes is also critical. Significant changes can be achieved by interacting with lawmakers and highlighting the need for better healthcare services in rural areas. The gap between urban and rural standards might be closed by endorsing programmes that provide accessible and affordable healthcare.Hormone imbalance management can also be aided by encouraging

healthy lifestyle modifications. Symptoms can be reduced by promoting regular exercise, a healthy diet, and stress management. Women can be empowered to take charge of their health through community programmes that address these issues. Giving talks at conferences can encourage more study and increase knowledge. Working with researchers from other countries can provide fresh insights and solutions for regional health problems.

Treating hormone abnormalities in women necessitates a team effort, including policy advocacy, community involvement, education, and research. Our role as aspiring biomedical scientists is crucial in spearheading these initiatives. By using research, technology, and community involvement, we can enhance the health and well-being of women in South Punjab and other regions.

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