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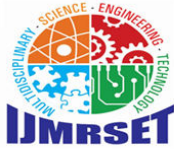
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Impact of Lifestyle Choices on Female Fertility: A Comprehensive Review

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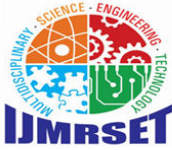
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ABSTRACT: The relationship between lifestyle factors and female fertility is a complex area of study, essential for understanding reproductive health. This paper aims to provide a review on how various lifestyle choices impact female fertility levels. Key factors examined include diet, physical activity, body weight, stress, sleep patterns, smoking, alcohol consumption, and exposure to environmental toxins.

KEYWORDS: Fertility, women, hormone, lifestyle.

I. INTRODUCTION

The population of adolescent girls in India is approximately 253 million, which accounts for about 23 percent of the total population. Adolescence is a pivotal phase in the process of moving from childhood to adulthood. The teenage phase encompasses various aspects such as physical, emotional, and cognitive development, which significantly influence adulthood. The skills obtained during this era also contribute to shaping the experience of adult life. Although adolescence as a whole is a critical and diverse stage, there are variations in the kind of changes and experiences that girls go through even within this phase of life. It is crucial to separate the age group of 10 to 19 years in order to have a better understanding of the difficulties experienced by girls throughout this stage of their lives. Various polls categorize females aged 15-19 and those older than this age range together as a single group, referring to them as 'women of reproductive age'. Adolescent girls are classified together with children in the age group under 18 years. A significant portion of the Indian population still considers menstruation to be a taboo subject. Frequently, adolescent females experience the onset of puberty without receiving appropriate guidance or instruction. This results in misunderstandings on the topic, which in turn contributes to reinforcing the social stigma. Adolescent females have substantial physiological and psychological transformations with the onset of puberty. The modifications also encompass the social milieu. An adolescent girl's social status undergoes transformation. Women's freedom of movement, choice, and equality are constrained by societal norms. There is anecdotal evidence suggesting that there are different limitations on movement. Encountering a change of this magnitude for the first time undoubtedly intensifies the stress of experiencing a substantial transformation. Adolescent girls not only experience bodily changes throughout puberty, but they also face additional stress from societal expectations and limitations. Menstruation is a hindrance to their ability to obtain education, as it becomes a challenging and inconvenient task to manage. In addition, the lack of sufficient or non-existent restroom facilities in schools worsens the problem. Researches have extensively demonstrated the robust correlation between inadequate sanitation facilities in educational institutions and elevated rates of discontinuation among adolescent females. Menstrual health should be prioritized, with a particular focus on adolescent girls. Interventions should address societal taboos, feelings of shame, incorrect knowledge, and inadequate access to sanitation facilities and menstrual supplies that are associated with menstruation. The ICRW (2013) report emphasizes the necessity of developing more effective programs on menstrual awareness. Adolescence is a critical period for shaping a girl's comprehension of menstruation. We must put an end to taboos that are passed down from one generation to another. It is crucial to educate girls about menstruation hygiene and reproduction for this specific purpose. Adolescence is a susceptible period characterized by significant transformations. It is crucial to emphasize the value of maintaining menstrual hygiene and engaging in discussions about sexuality with females in a manner that does not reinforce patriarchal norms. Overall, these all processes that result in change (growth) in an individual are controlled by a complex system in which specific messengers, i.e., hormones play a crucial role.



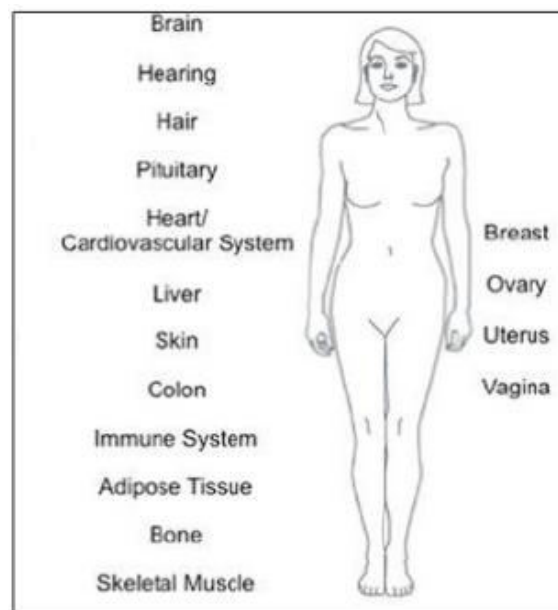
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Hormones are chemical messengers that travel in minute quantities via the bloodstream to the body's tissues and organs. They send messages that instruct the organs on what actions to take and when to do them. These chemical messengers have a significant impact on regulating mental, bodily, and emotional well-being. Typically, endocrine glands secrete an exact quantity of each hormone necessary for different physiological activities. Moreover, specific hormones exhibit a fall as individuals grow older, and certain individuals may undergo a more pronounced decrease than others. Endocrine gland secretions are released into the bloodstream; however, each hormone only impacts certain target organs through dedicated hormone receptors. Precise quantities of hormones are required for the body to operate at its highest level of efficiency.

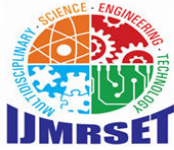
There are three distinct physiological times in a female's life where sex steroid hormones either increase or decrease their production. These stages include the onset of menstruation, pregnancy, and the beginning of menopause. However, these "imbalances" are physiological in nature and do not provide any health risks. However, apart from these imbalances, other abnormalities are typically harmful. Hormonal imbalances arise when there is an excess or deficiency of a hormone in the circulatory system. Minor disruptions in hormone levels can have widespread impacts on the body due to their crucial functions and interconnected reactions. The regulation of various bodily systems, including metabolism, hunger, heart rate, sleep cycles, reproductive cycles, sexual activity, growth and development, mood, stress levels, and body temperature, is mostly controlled by hormones. In the human body, over 200 hormones or hormone-like compounds have been identified.

Fig 1: Female Endocrine Glands and The Target Organs



Source: Gupta (2020)

Reproduction is the result of an event in nature that follows perfect synchronization to guarantee a successful outcome. The physiological and biochemical processes associated with female fertility and the potential for conception are tightly controlled, ensuring a precise hormonal equilibrium throughout the whole menstrual cycle. The coordinated release of hormones during the menstrual cycle initiates the necessary physiological changes in the endometrium to prepare it for the implantation of a fertilized egg and provide a suitable environment for its development. A consistent menstrual cycle serves as a reliable measure of women's well-being. On the other hand, several aspects support the control and normal occurrence of ovulation. These factors include adopting healthy behaviors and lifestyle, maintaining a calm demeanor in stressful situations, restoring normal circumstances in pathological processes, and considering individual



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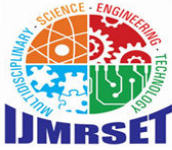
needs through evaluation.

The ovaries also go through many stages that influence their level of functioning. The development of follicles during infancy is a progressive process. However, it is not until puberty that there is a surge in gonadotropic hormones, leading to a pre-ovulatory state and the first ovulation, often occurring at around 12-13 years of age. Until that point, anovulation is a typical expression of a young woman's well-being. Starting at that point, the woman's ovaries begin to undergo cyclical activity, which may exhibit some anomalies until she reaches roughly 18 years of age. During adolescence, it is common for menstrual cycle irregularities to occur. However, as the hypothalamic-pituitary axis activity gradually develops, the menstrual cycle becomes more regular, which is indicative of a woman's reproductive age. The menstrual cycle continues regularly in women who are in good health until their ovarian function declines, along with a drop-in activity of the hypothalamic-pituitary axis. This decline occurs gradually and marks the onset of a pre-menopausal phase that can endure for several years. The ovaries in women undergo normal organ evolution as they age, resulting in a decrease in both the amount and quality of the oocytes. An inherent physiological characteristic of continuous transformation is the "ovarian reserve," which refers to the ovarian ability to produce ovules that are capable of being fertilized. The ability to produce eggs can be evaluated using biomarkers that reflect the current condition of the ovaries, such as antimullerian hormone (AMH), antral follicle count (AFC), and ovary volume. AMH is secreted by the follicles, and its serum level indicates the number of viable eggs present in a woman's ovaries, regardless of her fertility. Ultrasound is used to evaluate the AFC and volume of the ovaries. These biomarkers analyze the ovarian state to determine reproductive issues in women who currently use or have previously used oral contraceptives.

II. INFLUENCE OF LIFESTYLE FACTORS ON FEMALE FERTILITY LEVELS

The study named "*Lifestyle patterns in relation to female infertility*" aimed to evaluate the lifestyle patterns of women in relation to their fertility. The study was a descriptive study. The tool used for data gathering was a structured interview questionnaire sheet. The study was carried out at the Assisted Reproductive Technology Unit of Benha University Hospital, as well as other private institutions in Benha city. Researchers enrolled a total of 100 women who were unable to conceive, including those with both primary and secondary infertility. The survey found that the average age of women was 27.20 years with a standard deviation of 5.61 years. Over two-thirds of the women were housewives residing in rural areas, and they had intermediate education. The study found that over 75% of the females who were unable to conceive had unhealthy lifestyle habits that contribute to infertility. Additionally, a majority of these females had limited understanding of the relationship between lifestyle patterns and infertility. Furthermore, there exists a statistically significant disparity between the knowledge possessed by females and their lifestyle behaviors.

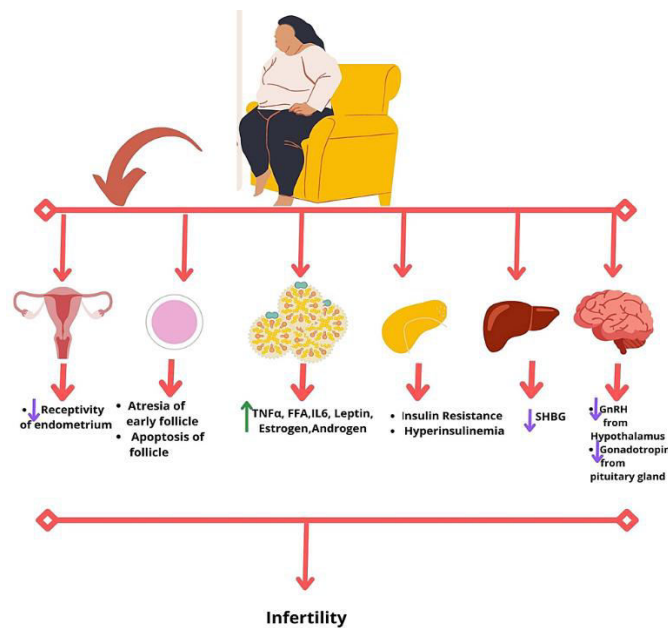
Altering lifestyle habits has the capacity to enhance reproductive performance, and there is a chance to implement measures to prevent reproductive health issues. Infertile females seeking help for infertility should be provided with advice regarding modifiable lifestyle patterns to assist them in making positive changes that could enhance their chances of getting pregnant. Premarital counseling should also be offered, with a focus on the significance of healthy sexual relationships and their impact on infertility. Additionally, a counseling program should be developed and implemented by a nurse to address the psychological well-being of infertile females and support them in effectively managing their situation. Offer infertile couples an informative program, such as a dietary program, to enhance their knowledge and understanding. Conducting research on the influence of infertility on the coping mechanisms employed by women experiencing infertility.



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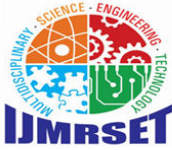
Fig 2: Complications of Obesity in Females Leading to Infertility



Source: Ahmad and Haque (2022)

The study titled “*The impact of modifiable lifestyle factors on women’s fertility*” focused on evaluating the influence of different lifestyle factors, such as nutrition, physical activity level, sleep pattern, and stress level, on women’s fertility. This study, done at Avicenna Medical College and Hospital in Lahore, Pakistan, involved 104 female volunteers aged 18-40 years. 50% of the patients had a previous medical condition of infertility, and 51.8% had a BMI greater than 25. Approximately 43% and 85% of participants reported consuming “junk food” and “fruit and vegetable (F&V)” respectively, twice a week. The DASS-21 scale indicated that 58% of the participants experienced a level of stress ranging from moderate to high. Additionally, 30% of the participants engaged in moderate physical activity, whereas 20% engaged in vigorous physical activity. Approximately 37% of individuals reported sleeping for 5 hours or less per day. There was a strong negative correlation between fertility and diet of fruits and vegetables, stress level, and BMI. Insufficient sleep and a lack of physical activity had a notably adverse effect on fertility. In study titled “*The Impact of Lifestyle Risk Factors on Female Infertility*”, it was discussed that in the United States, infertility affects about 2 million couples. While many lifestyle factors have been linked to the onset of this illness, few studies have examined all of these factors at once. Health care practitioners for women will be better able to screen for, and help their patients change, reproductive risks if they have a greater understanding of the significance of behavioral hazards to fertility. Increasing age, a history of ectopic pregnancy, current smoking, obesity, and self-reported health condition were all factors directly connected to infertility. Condom usage and recent Pap smear screenings were shown to be protective factors. Regular checkups for women provided a great chance to start addressing the effects of certain infertility risk factors.

In study titled “*Environment, Lifestyle, and Female Infertility*”, there was an attempt to explore how long-term changes in the female physiology due to lifestyle and environmental variables could lead to reproductive incompetence and deconstruct the likely connectivity between these factors and distinct neuroendocrine pathways. In study titled “*Working Women’s Lifestyles and Quality of Life in the Information Society*”, researchers studied major indices of lifestyle as determinants of quality of life among working-age Spanish women in the information and communication society. A total of 207 females between the ages of 19 and 54 participated in this research by answering questions about their everyday lives and filling out a quality-of-life questionnaire. The results of this research revealed that Spanish women had consistent and healthy dietary and preventative behavior patterns, and researcher also found major



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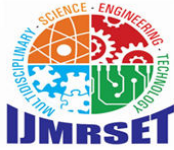
determinants of quality of life in matters of time management.

In study titled “*Lifestyle as a choice of necessity: Young women, health and obesity*”, it was argued that when it comes to the social determinants of health, sociologists of health have often voiced their support for communal action over knowledge-based health promotion methods that emphasize individual lifestyle modification. Recently, these arguments have been made in response to the obesity epidemic. While there is mounting evidence linking poor economic conditions to increased body fat and poor health outcomes. There are very few researches have addressed the unique health and lifestyle problems of marginalized groups. Fifteen young, low-income women participated in in-depth interviews for this qualitative study, and their responses helped researchers understand their attitudes toward health practices by elaborating on the socio-cultural factors that encouraged (or discourage) them from adopting healthier lifestyles. Using concepts from Pierre Bourdieu’s habitus, practical sense, and ‘choice of the necessary,’ the findings suggested that people were less likely to follow normative health guidelines because of family and financial responsibilities and pressing health concerns. In study titled “*Lifestyle and gynecological health among women*”, the researcher conducted a descriptive study in Pune city. A non-probabilistic purposive sample of 300 women was taken from various locations in Pune. A systematic questionnaire meant to evaluate both lifestyle and gynecological health was used as the data collecting tool. A total of 64% of respondents said they had an average lifestyle, while 36% said they led an excellent one. There were no women in the research who claimed being in poor gynecological health, and only 12.33% reported being in ordinary health. The correlation between lifestyle score and gynecological health was not statistically significant. Study results indicated that there was no correlation between a woman’s lifestyle and her gynecological health. Gynecological issues were rare in women who maintained a healthy lifestyle. Culture, family, friends, and social status all had a role in shaping an individual’s lifestyle by providing either direct or indirect motivation and determining basic necessities. Females generally had a higher risk for a variety of illnesses.

Gynecological issues were a common source of distress for women of childbearing age. Hormones, which play a crucial part in women’s bodies, were negatively impacted when women disregarded their own health. Disturbance of normal body physiology resulted in a variety of illnesses, including menstrual abnormalities, excessive bleeding, polycystic ovary syndrome, genital tract infection, and recto-vaginal fistula. A lack of energy and poor dietary choices were the most prominent causes of malnutrition among Japanese young women. These dietary restrictions were purely aesthetic. Dietary psychological stress was caused by a lack of exercise and a poor diet low in protein, carbohydrates, and necessary fatty acids. The study titled “*Investigating Lifestyle Effects on Female Fertility*” aimed to examine the influence of nutrition, exercise, and stress on women’s reproductive health. The results indicated a substantial correlation between menstruation regularity and factors such as food, exercise, and stress levels. The study revealed a strong and statistically significant correlation between diet and menstrual regularity ($p < 0.001$, $\beta = 0.24$), emphasizing the crucial role of dietary choices in promoting consistent menstruation. The regularity of menstrual cycles was positively influenced by exercise behaviors ($p = 0.005$, $\beta = 0.18$). These findings highlighted the significant impact of lifestyle factors on the regularity of menstrual cycles and, consequently, on female fertility. Recommended corroborating research emphasizes the need of enhancing one’s diet, engaging in consistent physical activity, and effectively managing stress to enhance reproductive health. The findings of this study provided valuable insights that might guide the development of initiatives to enhance women’s reproductive health. Women can improve their fertility by comprehending the connections between nutrition, exercise, stress, and monthly regularity, and making well-informed decisions accordingly. These observations also emphasized the significance of incorporating lifestyle factors into conversations about reproductive health and establish a basis for future study in this field.

III. HORMONAL IMBALANCE AND CAUSES

Almost everyone encounters at least one or two episodes of hormone imbalance throughout their lifespan. Hormonal imbalances have become more prevalent due to the rapid and demanding nature of modern lifestyles. Hormonal imbalances are frequently observed during the stages of puberty, menstruation, and pregnancy. However, certain individuals may encounter persistent and sporadic hormonal fluctuations. If females are exposed to estrogen for extended or abbreviated durations throughout their lifespan, they may have hormone-dependent ailments. Our epidemiological investigation revealed a decline in the average age of menarche, while simultaneously observing an increase in the age of menopause. Menopausal hormone alterations may increase the likelihood of abdominal weight



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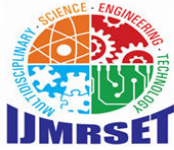
gain compared to weight gain in the hips and thighs. However, the increase in weight is typically associated with the process of becoming older, as well as one’s lifestyle and genetic predisposition. As an illustration, muscular mass often declines as one gets older, while fat tends to grow. The usual weight gain during menopause is approximately 10 to 15 pounds, according to estimates. The occurrence referred to as menopause belly is caused by hormonal fluctuations, the activation of a specific gene associated with menopause, and alterations in physical activity and dietary patterns. A decrease in estrogen levels leads to an increase in fat accumulation by abdominal fat cells. It could potentially impair your body’s capacity to metabolize fat. During perimenopause and menopause, hormonal fluctuations can lead to accelerated weight gain, especially in the abdominal region. Even post-menopause, women still retain these hormones within their bodies. External influences, such as stress or hormone prescriptions, can create various hormonal abnormalities. Nevertheless, hormonal imbalances can also arise from any medical illness that affects or includes the endocrine system or glands. Both men and women can experience hormone imbalances. However, there are differences in sex hormones between the sexes, at least in terms of amount if not quality. Women commonly encounter disruptions in the levels of estrogens and progesterone, whilst men are prone to experiencing imbalances in testosterone levels.

Fig 3: Causes of Hormonal Imbalance



Source: Gupta (2020)

Women are more susceptible to several sorts of hormone imbalance diseases compared to men due to their distinct endocrine organs and more intricate cycles. Women undergo multiple periods of hormonal imbalance as a natural necessity during various stages of life. In contrast, men do not experience these physiological phases. Women are susceptible to various hormonal imbalance problems caused by medical conditions. Estrogens exert a diverse array of effects on both the body and the brain. The genetic transcription of estrogen receptors can regulate emotional behavior, and estrogens can impact emotional processing through neuropsychological mechanisms. It improves the coding of emotions and increases the accuracy of recognizing facial expressions. Elevated estrogen levels can result in an increase in body weight, namely in the hip and waist regions. Excessive levels of estrogen can also lead to menstruation irregularities.



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Every individual will inevitably go through times of hormonal imbalance or changes at specific stages in their lives. However, hormonal imbalances may also arise due to malfunctioning of the endocrine glands. Various medical problems can affect one or more of the endocrine glands. Various lifestyle habits and environmental variables might also contribute to hormone abnormalities.

IV. CONCLUSION

In conclusion, lifestyle factors play a critical role in influencing female fertility, with significant implications for reproductive health management. This review showed that different factors such as dietary choices, physical activity, body weight, stress levels, sleep quality, smoking, alcohol consumption, and environmental exposures all contribute to fertility outcomes. Chronic stress, poor sleep, smoking, and excessive alcohol intake have been identified as detrimental to reproductive health, while exposure to endocrine-disrupting chemicals in the environment poses additional risks.

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