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Lifestyle Determinants of Reproductive Health in Adolescents: A Multidimensional Review

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ABSTRACT

Adolescence is a crucial developmental stage characterized by significant biological, psychological, and social transitions. During this period, individuals begin to form lifestyle habits that may have long-term implications for their overall and reproductive health. This article examines how various lifestyle factors—including diet and nutrition, physical activity, substance use, psychological stress, environmental exposure, screen time, and sexual behavior—affect adolescent reproductive health. Evidence shows that unhealthy behaviors during adolescence can disrupt hormonal balance, impair reproductive function, and increase the risk of menstrual irregularities, infertility, sexually transmitted infections (STIs), and unintended pregnancies. Nutritional deficiencies, excessive intake of high-fat and sugary foods, and physical inactivity negatively influence hormonal regulation. Similarly, smoking, alcohol consumption, and chronic stress are linked to reproductive hormone disruption and dysfunction. Environmental pollutants, particularly fine particulate matter (PM2.5), have been shown to interfere with reproductive organ development and accelerate sexual maturation, posing long-term risks. Excessive screen time and poor sleep patterns also contribute to hormonal imbalances, while risky sexual behavior—exacerbated by a lack of comprehensive sex education—remains a major concern. The article underscores the importance of early, accurate, and accessible reproductive health education tailored to adolescents. In the digital age, technology-based interventions such as mobile apps and interactive platforms offer promising tools to deliver this education effectively. With the support of families, schools, and healthcare providers, these approaches can empower adolescents to make informed decisions, fostering healthier reproductive outcomes throughout life.

Keywords: Adolescent, reproductive health, lifestyle, health education

INTRODUCTION

Adolescence is a critical transitional stage in an individual's life, characterized by significant physical, psychological, and social changes. During this phase, adolescents begin to develop their identity and establish habits that may have long-term implications for their health, including reproductive health.

Adolescent lifestyle factors—including dietary habits, physical activity, sexual behavior, and substance use—play a vital role in shaping reproductive health outcomes. Risky sexual behaviors, such as unprotected sex, having multiple sexual partners, and early sexual debut, have been strongly associated with a higher risk of sexually transmitted infections (STIs) and unintended pregnancies. A study by Arafa et al. (2024) revealed

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that adolescents engaging in risky sexual behavior had significantly higher rates of STIs, including chlamydia and gonorrhea, as well as a notable incidence of unintended pregnancy.

Other lifestyle factors, such as poor dietary patterns and lack of physical activity, also negatively impact reproductive health. Morris (2015) emphasized that adolescents in low- and middle-income countries face substantial barriers to accessing reproductive health services, often exacerbated by unhealthy lifestyle practices.

In addition, the lack of comprehensive sex education and limited access to accurate information contribute to the prevalence of risky behaviors among youth. Nkata et al. (2019) reported that Tanzanian adolescents possessed low levels of reproductive health knowledge, leading to high rates of teen pregnancy and STI transmission.

Understanding the influence of lifestyle on adolescent reproductive health is essential for designing effective interventions. This article aims to explore how various lifestyle factors affect adolescent reproductive health and to propose recommendations for prevention and health promotion strategies.

REPRODUCTIVE HEALTH DEFINITION

According to the International Conference on Population and Development (ICPD), reproductive health is a state of complete physical, mental, and social well-being in all matters related to the reproductive system—not merely the absence of disease. It includes the ability to have a satisfying and safe sex life, the capacity to reproduce, and the freedom to decide if, when, and how often to do so. It also implies the right of individuals to access accurate information and a range of safe, effective, affordable, and acceptable family planning methods, as well as appropriate health services that ensure safe pregnancy and childbirth, giving couples the best chance of having a healthy child. This definition, put forward by the WHO, serves as the global standard for understanding the scope of reproductive health (WHO, 2006).

Reproductive health encompasses the right of individuals to access information and services that enable them to make informed and responsible decisions regarding reproduction, including the right to safe, effective, and affordable healthcare related to pregnancy, contraception, and the prevention of sexually transmitted infections (STIs) (Starrs et al., 2018).

In the context of adolescence, reproductive health also entails ensuring that young people have the knowledge, skills, and support necessary to make healthy and responsible choices concerning their sexuality and reproductive lives. This is particularly important as adolescence marks a developmental stage where individuals begin to engage in sexual activity, yet often lack access to adequate information or youth-friendly health services (Chandra-Mouli et al., 2015).

LIFESTYLE FACTORS AFFECTING REPRODUCTIVE HEALTH

Adolescent reproductive health is significantly influenced by various aspects of daily lifestyle. Dietary habits, physical activity, harmful behaviors such as smoking and alcohol consumption, stress levels, environmental exposure, screen time, and sexual behavior all play critical roles in either maintaining or disrupting the function of the reproductive system (Figure 1).

Figure 1 Lifestyle factors affecting reproductive health

During adolescence—a phase marked by intense hormonal changes—an unhealthy lifestyle can have long-term consequences, including menstrual irregularities, reduced sperm quality, and increased risk of infertility. Therefore, understanding and raising awareness of the impact of lifestyle on reproductive health is crucial in both preventive and promotive efforts within adolescent health frameworks.

Early and appropriate education can help shape healthy behaviors that support the optimal development and balance of reproductive function. Promoting lifestyle awareness among adolescents not only protects reproductive health in the short term but also contributes to their well-being in adulthood.

Diet and Nutrition

Diet and nutritional intake are critical components of lifestyle that significantly contribute to reproductive health, particularly during adolescence. This stage of life is characterized by rapid growth and development, which increases the body's demand for essential nutrients to support hormonal and physiological changes associated with puberty (Koletzko et al., 2015).

Micronutrient deficiencies can disrupt hormonal balance and endometrial function, both of which are essential to the reproductive system. For example, iron deficiency—even in the absence of anemia—has been associated with symptoms such as menorrhagia (Gupta et al., 2022). Conversely, excessive caloric intake and the consumption of foods high in fat and sugar can lead to obesity, which disrupts hormonal balance and reduces fertility in both males and females (Silvestris et al., 2019).

A review has also shown that frequent consumption of trans fatty acids may promote greater insulin resistance which could adversely affect ovulatory function, and intake of trans and saturated fats has consistently been related to poor semen quality (Gaskins and Chavarro, 2018).

Therefore, nutritional interventions and health education about balanced eating habits are vital in promoting reproductive health. A balanced diet rich in fruits, vegetables, lean proteins, and healthy fats plays an important role in maintaining hormonal stability and optimal reproductive function during adolescence.

Physical Activity and Exercise

Physical activity plays a significant role in adolescent growth and hormonal function. Exercise stimulates the release of growth hormone (GH) and insulin-like growth factor-1 (IGF-1), which are essential for tissue development, muscle mass, and bone growth. Engaging in physical activity from childhood through adolescence strengthens bones and enhances bone mineral density (BMD) (Richmond and Rogol., 2016). Regular exercise also increases testosterone levels and improves sperm quality in young males (Vaamonde et al., 2017).

However, it is important to note that excessive physical activity without adequate energy intake can lead to reduced bone mass (Richmond & Rogol, 2016) and serious physiological disturbances, particularly in adolescent females. This condition is described within the framework of Relative Energy Deficiency in Sport (RED-S), an expansion of the Female Athlete Triad, which consists of disordered eating, amenorrhea, and low bone mineral density (Mountjoy et al., 2014).

Achieving a balance between physical activity and energy intake is key to maintaining reproductive health. Promoting an active lifestyle—such as walking, cycling, swimming, or aerobic exercise—should be emphasized during adolescence as a preventive strategy against reproductive disorders.

Harmful Habits (Smoking, Alcohol, and Substance Use)

Smoking and the use of electronic cigarettes (vaping) among adolescents can damage the reproductive system through various mechanisms. In females, these habits are linked to reduced levels of AMH, an indicator of ovarian reserve. A study by Plante et al. (2010) found that women who smoke have lower AMH levels, suggesting a possible direct effect of smoking on the depletion of the antral. The direct impact of active smoking on AMH levels in younger women requires further investigation.

Smoking negatively affects nearly all components of the female reproductive system, including diminished ovarian reserve, reduced oocyte quality, early menopause, decreased levels of estrogen and progesterone, increased androgen levels, oocyte damage, ovulatory dysfunction, oligomenorrhea, dysmenorrhea, and heavy menstrual bleeding (Dhage et al., 2024). In males, heavy smoking has been associated with reduced semen volume, sperm concentration, total sperm count, progressive motility, increased teratozoospermia, and significant sperm DNA damage (Osadchuk et al., 2023).

Alcohol consumption during adolescence disrupts pubertal development and the balance of reproductive hormones. It interferes with the production of LH and FSH, both of which are essential for ovulation and spermatogenesis. According to Dees et al. (2017), alcohol delays puberty by lowering key hormone levels such as GH, LH, and estradiol (E2) in females, as well as testosterone in males. It also reduces testicular weight, secondary sex organ size, and delays developmental milestones such as menarche and breast development in adolescent girls.

Stress and Mental Health

Adolescence is one of the most vulnerable periods for experiencing both physical and psychological stress. It is also a time when individuals are particularly susceptible to depression, with prevalence rates ranging from 9.3% to 24%, and approximately 11% of adolescents experiencing mild depression (Krapić et al., 2015). Stress—stemming from academic, social, or family pressures, malnutrition, illness, or traumatic experiences such as abuse or neglect—can significantly interfere with growth and pubertal development (Mousikou et al., 2023).

Among adolescent girls, high stress levels are significantly associated with menstrual irregularities, including amenorrhea, dysmenorrhea, and PMS. Psychological stress plays a key role in disrupting the menstrual cycle by activating the hypothalamic–pituitary–adrenal (HPA) axis, which disturbs hormonal balance (Rafique & Al-Sheikh, 2018). Common sources of adolescent stress—such as academic pressure, family conflict, bullying, and emotional instability linked to social media—further contribute to reproductive health problems. Rafique & Al-Sheikh (2018) reported that 39% of female university students aged 18–25 with high stress levels had a fourfold increased risk of amenorrhea, double the risk of dysmenorrhea, and a 2.8-fold increased risk of PMS compared to those with lower stress. Similarly, a global study by Kubal & Malawade (2022) found that females with higher stress levels were more likely to experience multiple menstrual disorders and PMS symptoms than those with lower stress levels.

Environmental Exposure and Pollution

Air pollution, particularly from vehicle emissions and industrial activities, can cause tissue damage and induce oxidative stress. Long-term exposure to polluted air has been linked to hormonal imbalances, decreased sperm quality, and menstrual irregularities.

PM2.5, a major component of air pollution, is capable of penetrating various biological barriers such as the blood-testis barrier, placental barrier, and epithelial barrier, subsequently accumulating in reproductive organs. In males, PM2.5 exposure has been associated with reduced sperm quality, structural abnormalities in the testes, and decreased levels of testosterone and luteinizing hormone (LH). In females, PM2.5 has been shown to diminish ovarian reserve and alter levels of estradiol, follicle-stimulating hormone (FSH), and LH, while also increasing the risk of miscarriage, preterm birth, and low birth weight (Wang et al., 2021).

A study by Li et al. (2024) demonstrated that prolonged exposure to PM2.5 and its components—such as sulfate, nitrate, and ammonium—was strongly associated with earlier menarche in adolescent girls. These findings support the hypothesis that atmospheric pollutants containing EDCs can interfere with hormone synthesis and accelerate neuroendocrine maturation. Such alterations may lead to long-term consequences, including an increased risk of breast cancer, metabolic disorders, and psychological issues.

Gadget Use and Sleep Patterns

Technological advances have profoundly altered adolescent lifestyles, particularly through the widespread use of gadgets such as smartphones, tablets, and laptops. Excessive use—especially during nighttime—adversely affects sleep patterns, hormonal function, and reproductive health. An imbalance between screen exposure and adequate rest may directly or indirectly disrupt the reproductive system.

Blue light emitted from electronic devices at night suppresses melatonin production, a hormone that regulates sleep cycles and plays a vital role in maintaining reproductive hormone balance. Melatonin also acts as an antioxidant, supports progesterone production, enhances LH receptor expression, and helps prevent follicular atresia (Gelen et al., 2022).

The use of electronic devices, particularly smartphones before bedtime, is associated with shorter sleep duration, difficulty falling asleep, and increased daytime sleepiness and fatigue. This behavior has also been linked to disrupted sleep patterns such as early awakening and restless sleep. Moreover, nighttime smartphone use negatively impacts not only physical health but also adolescent mental health. Several studies have linked this habit to depressive symptoms, low self-esteem, and behavioral problems (de Sá et al., 2023).

Risky Sexual Behavior

Adolescence is a transitional stage characterized by increased curiosity about sexuality and the formation of personal identity. However, the absence of comprehensive sex education and a lack of supportive environments often lead adolescents to engage in risky sexual behaviors. These behaviors carry both immediate and long-term consequences for reproductive health.

According to the World Health Organization (WHO), adolescents are among the most vulnerable populations to sexually transmitted infections (STIs), including HIV, chlamydia, gonorrhea, and syphilis. Unsafe sexual practices also heighten the risk of unintended pregnancies, which can profoundly impact adolescents' educational attainment, psychosocial well-being, and future opportunities.

The prevalence of risky sexual behavior among adolescents aged 15–19 is reported at 17.2%. These behaviors include premarital sex, having multiple sexual partners, unprotected intercourse, and early sexual debut (before age 14). Contributing factors significantly associated with such behaviors include poor social support, living without family, parental neglect, and alcohol consumption (Srahbzu et al., 2020).

REPRODUCTIVE HEALTH EDUCATION

Reproductive health education is a vital foundation for supporting the physical, mental, and social development of adolescents. This transitional stage is marked by major biological and emotional changes, and without adequate knowledge, adolescents are more likely to engage in behaviors that endanger their reproductive health, such as unprotected premarital sex, substance use, and neglect of genital hygiene.

Reproductive health education provides accurate information on reproductive anatomy and physiology, pubertal changes, STI prevention, contraception, and the psychosocial aspects of sexuality. With this knowledge, adolescents can make informed and responsible decisions, reducing health risks associated with sexual behavior and lifestyle choices.

The effectiveness of reproductive health education relies heavily on support from multiple sectors—especially families, schools, and healthcare providers. Families serve as the first source of values and information, schools provide structured and scientific learning environments, and health services offer youth-friendly counseling and medical support.

A systematic review by the UNESCO International Technical Guidance on Sexuality Education (2018) found that comprehensive sexuality education (CSE) does not increase sexual activity or risk-taking, but instead delays sexual initiation and promotes safer sexual behaviors (UNESCO, 2018).

In the digital era, reproductive health education must adapt to the rapid advancement of information technology. Digital innovations offer new opportunities for delivering sexual health education. Technology-based interventions—such as mobile applications, interactive websites, and social media platforms—are increasingly utilized to reach adolescents in ways that align with their tech-savvy lifestyles (Widman et al., 2018).

However, this approach requires careful content curation and supervision to ensure accuracy and prevent misinformation. Therefore, collaboration between health institutions, educators, and technology developers is essential to create a trustworthy and healthy digital reproductive education ecosystem.

CONCLUSION

Adolescence is a critical period in life during which lifestyle factors significantly influence long-term reproductive health. Elements such as diet, physical activity, stress, smoking or alcohol consumption, exposure to pollution, and excessive use of electronic devices can disrupt hormonal balance and reproductive function. Moreover, risky sexual behaviors driven by a lack of comprehensive sex education increase the incidence of sexually transmitted infections (STIs) and unintended pregnancies.

To address these issues, comprehensive and technology-based reproductive health education presents a promising solution. With support from families, schools, and healthcare providers—alongside the use of accurate and safe digital platforms—adolescents can be equipped with the knowledge and skills necessary to make informed and responsible decisions regarding their reproductive lives.

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Conflicts of Interest

The authors declare no conflict of interest.

Abbreviations

AMH	Anti-Müllerian Hormone
DNA	Deoxyribonucleic Acid
EDC	endocrine-disrupting chemical
FSH	Follicle-Stimulating Hormone
HIV	Human Immunodeficiency Virus
HPA	Hypothalamic-Pituitary-Adrenal
LH	Luteinizing Hormone
PM2.5	Particulate Matter 2.5 microns or less
PMS	Premenstrual Syndrome
STI	sexually transmitted infections
WHO	World Health Organization

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