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NAVIGATING THE MAZE OF FEMALE INFERTILITY: A REVIEW OF FACTORS AFFECTING YOUNG WOMEN ACROSS CULTURES AND CONDITIONS

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ABSTRACT This comprehensive review aims to examine the multifaceted factors affecting infertility among young women across different countries and racial groups. An in-depth review of recent literature was conducted, synthesizing findings from diverse studies on biological, environmental, and societal factors influencing fertility in young women. The review highlights the significant impact of age, reproductive health history, sexually transmitted infections, lifestyle factors, and environmental toxins on fertility. It also explores the effects of chronic diseases such as congenital heart disease, chronic kidney disease, and rheumatoid arthritis on reproductive health as well as emerging factors like elevated serum uric acid levels. The review also addresses the impact of anti-cancer therapies, bacterial colonization, and HIV on fertility. The findings underscore the need for a multidisciplinary approach to fertility preservation and treatment. Healthcare providers should consider a wide range of factors when assessing and treating fertility issues in young women. The review also highlights the importance of preconception counselling and early intervention, particularly for women with chronic health conditions. This review provides a comprehensive overview of both well-established and emerging factors affecting fertility in young women, integrating insights from diverse populations and medical conditions and emphasizes the need for tailored approaches to fertility care.

KEYWORDS : Female infertility, young women, chronic diseases, environmental factors, reproductive health

INTRODUCTION

Infertility is a significant global health issue that affects millions of couples worldwide. The World Health Organization estimates that between 48 million couples and 186 million individuals live with infertility globally (WHO, n.d.). While the global prevalence is estimated to be between 8 percent and 12 percent (Boivin et al., 2007), some regions experience rates as high as 30 percent (Inhorn & Patrizio, 2015). This review examines the multifaceted factors affecting infertility among young women across different countries and racial groups.

The prevalence and types of infertility vary significantly across different regions and populations. For example, in Ethiopia, studies have shown prevalence rates of 2.9% for primary infertility and 16.1% for secondary infertility (Mekonnen & Worku, 2011). In China, infertility rates have ranged from 2.3% to 24.58% in different provinces and time periods (Liu et al., 2005; Liang et al., 2021). These variations highlight the importance of considering regional, cultural, and demographic factors when studying infertility.

This review explores a wide range of factors that can impact fertility in young women. In addition to common factors such as age, reproductive health history, and lifestyle choices, more specific issues like exposure to environmental toxins, chronic diseases, and occupational hazards have been explored. The paper also investigates racial differences in infertility factors, drawing on studies that have compared outcomes between different ethnic groups.

Recent research has shed light on previously understudied areas. For instance, the impact of chronic kidney disease on fertility in Hispanic women has been a subject of recent investigation, with surprising findings challenging some long-held assumptions (Reynolds et al., 2024). Similarly, the relationship between blood types and ovarian reserve has been explored, with studies yielding conflicting results that warrant further investigation (Sun et al., 2022).

The review also delves into the effects of modern lifestyle factors on fertility. Long working hours, for example, have been associated with increased risk of infertility, particularly in younger women (Ahn et al., 2021). Additionally, certain medical conditions and treatments, such as congenital heart disease, rheumatoid arthritis, and cancer therapies, have been found to impact a woman's reproductive health and fertility.

Environmental factors play a crucial role in fertility outcomes. The review examines the impact of heavy metal exposure on female fertility, drawing on both epidemiological and experimental evidence. Recent large-scale studies have provided new insights into the relationship between metals like lead, cadmium, and mercury and women's reproductive health (McClam et al., 2023).

As medical advancements allow more individuals with chronic conditions to reach reproductive age, new questions arise about the impact of these conditions on fertility. The review looks at emerging research on fertility in women with perinatally acquired HIV, comparing outcomes with those of women who acquired HIV horizontally (Teh et al., 2019).

While numerous studies have investigated individual or groups of factors affecting infertility, there is a notable lack of a comprehensive review that collates all the available evidence. Various researchers have analysed the prevalence of risk factors for infertility in specific countries or populations, but few have presented an amalgamation of all possible risk factors affecting young women globally. This represents a significant gap in the existing literature.

A comprehensive review of all the factors responsible for primary and/or secondary infertility in young women can be invaluable for several reasons. It can aid in the process of early detection, potentially leading to earlier and more effective treatments. Additionally, such a review can highlight patterns and interconnections between different factors that may not be apparent when studying them in isolation. The present study aims to fill the gap by conducting a thorough review of recent literature to answer the following research questions: *RQ1: What are the factors that affect infertility among young women?*

RQ2: To what extent do each of these factors affect infertility among young women?

AGE

Age is a critical factor in female fertility, with reproductive potential declining as women get older. This decline is primarily due to the natural aging process of the ovaries and the decreasing quality and quantity of oocytes (eggs) over time (Broekmans et al., 2009).

The effect of age on human physiology, particularly the female reproductive system, is multifaceted. As women age, there is a decrease in the number of primordial follicles, which are the source of oocytes. This decline accelerates around age 37-38 and is accompanied by a reduction in oocyte quality (te Velde & Pearson, 2002). The aging process also affects the endocrine system, leading to changes in hormone levels that can impact fertility (Nelson et al., 2013).

In young women, while age-related fertility decline is less pronounced than in older women, it still plays a role. A study by Liang et al. (2021) found that fertility starts declining around age 32 and rapidly declines after age 37. The study also noted that women aged 30-39 and 40-49 were 3.359 and 2.170 times more likely to develop secondary infertility than women aged 20-29, respectively.

Several studies support the impact of age on fertility. A large-scale study by Dunson et al. (2002) found that the probability of conception decreased from 0.25 on the day of ovulation for women aged 19-26 years to 0.12 for women aged 35-39 years. Another study by van Noord-Zaadstra et al. (1991) showed that fecundability (the

probability of achieving a pregnancy in a single menstrual cycle) decreased by 50% between ages 30 and 35.

The impact of age can vary among individuals depending upon overall health, genetics, and lifestyle (Liu & Case, 2011).

REPRODUCTIVE HEALTH HISTORY

A woman's reproductive health history includes previous pregnancies, miscarriages, abortions, and gynaecological conditions or surgeries. This history can significantly influence future fertility (Bhattacharya et al., 2009).

The impact of reproductive health history on physiology can be diverse. For instance, certain gynaecological surgeries may alter the anatomy of the reproductive organs, while conditions like endometriosis or pelvic inflammatory disease can cause inflammation and scarring that affect fertility (Practice Committee of the American Society for Reproductive Medicine, 2012).

In young women, a history of reproductive health issues can impact fertility in several ways. Previous pregnancies, even if they didn't result in live births, can affect future fertility. Induced abortions and post-abortion complications, in particular, have been associated with an increased risk of secondary infertility (Gan et al., 2014).

Several studies support the impact of reproductive health history on fertility. In Rwanda, Dhont et al. (2011) found that adverse pregnancy outcomes, stillbirths, and postpartum infections were associated with secondary infertility. A study in Nigeria identified induced abortion and post-abortion sepsis as significant risk factors for secondary infertility (Dhont et al., 2011).

Liang et al. (2021) found that a history of gynaecological surgery was associated with infertility, especially secondary infertility. The study reported that women with a history of gynaecological surgery were 1.829 times more likely to develop infertility compared to those without such history.

SEXUALLY TRANSMITTED INFECTIONS (STIS)

Sexually transmitted infections (STIs) are infections that are primarily spread through sexual contact. Common STIs include chlamydia, gonorrhoea, HIV, and human papillomavirus (HPV) (World Health Organization, 2019).

STIs can have significant effects on human physiology, particularly the reproductive system. They can cause inflammation, scarring, and damage to reproductive organs. For example, chlamydia and gonorrhoea can lead to pelvic inflammatory disease (PID), which can cause scarring of the fallopian tubes (Haggerty et al., 2010).

In young women, STIs can impact fertility through various mechanisms. Untreated infections can ascend the reproductive tract, causing inflammation and potential blockage of the fallopian tubes. This can prevent the egg and sperm from meeting, or impair the transport of a fertilized egg to the uterus. Additionally, some STIs can affect hormonal balance and ovarian function (Tsevat et al., 2017).

Several studies support the impact of STIs on fertility. Dhont et al. (2011) found that HIV, HSV-2, and other STIs were significantly more common in Rwandan women with secondary infertility. The study reported that 53% of women with secondary infertility were HIV positive, compared to 16% of fertile women. Additionally, 75% of secondary infertile women tested positive for HSV-2, compared to 58% of fertile women.

A study by Weisenfeld et al. (2012) found that women with chlamydial or gonococcal upper genital tract infection were three times more likely to have infertility compared to women without these infections. Another study by Tsevat et al. (2017) reported that chlamydia infection increases the risk of PID by 30%, and PID is associated with a 50% increased risk of ectopic pregnancy and infertility.

LIFESTYLE FACTORS

Lifestyle factors include a wide range of daily habits and choices that can influence overall health and, consequently, fertility. These factors include diet, exercise, smoking, alcohol consumption, and stress levels (Sharma et al., 2013).

The effects of lifestyle factors on human physiology are diverse and can impact multiple systems, including the reproductive system. For instance, obesity can lead to hormonal imbalances, while smoking can affect blood flow to reproductive organs and damage genetic material in eggs (Dağ & Dilbaz, 2015).

In young women, lifestyle factors can impact fertility through various mechanisms. Poor nutrition can lead to vitamin deficiencies that affect ovulation. Excessive exercise can disrupt menstrual cycles. Smoking can accelerate egg loss and lead to earlier menopause. High stress levels can affect hormone balance and ovulation (Sharma et al., 2013). Numerous studies support the impact of lifestyle factors on fertility. Akalewold et al. (2022) found that in Ethiopia, the frequency of coitus and the number of sex partners were significantly associated with infertility. The study reported that women who had sex more than twice a week were 2.399 times more likely to be fertile compared to those who had sex less frequently.

Wellons et al. (2008) found a strong association between smoking and infertility. The study reported that current smokers had 1.7 times higher odds of infertility compared to never smokers. A meta-analysis by Augood et al. (1998), as cited in Wellons et al., 2008) showed that smokers have 1.6 times higher odds of infertility compared to non-smokers.

The Chinese study by Liang et al. (2021) found that eating sweet foods was associated with infertility. Women who frequently consumed sweet foods were 1.331 times more likely to develop infertility compared to those who did not. Obesity has also been linked to fertility issues. A study by Pandey et al. (2010) found that obese women (BMI $\geq$ 30 kg/m^2) were 2.84 times more likely to have fertility problems compared to women with normal BMI.

ENVIRONMENTAL TOXINS

Environmental toxins are harmful substances present in our surroundings that can negatively impact human health, including reproductive function. These toxins include heavy metals, pesticides, endocrine disruptors, and air pollutants (Bhatt, 2000).

The effect of environmental toxins on human physiology is complex and can involve multiple systems. These substances can interfere with hormonal pathways, damage genetic material, and induce oxidative stress, all of which can impact reproductive health (Sharma et al., 2013). For instance, heavy metals like lead and cadmium can accumulate in reproductive organs, affecting their function (Wdowiak et al., 2017).

In young women, exposure to environmental toxins can impact fertility through various mechanisms. These include disruption of the hypothalamic-pituitary-gonadal axis, impairment of oocyte maturation, and alteration of uterine receptivity (Rattan et al., 2017). Chronic exposure can lead to long-term reproductive issues, even if the initial exposure occurred earlier in life (Gore et al., 2015).

Several studies support the impact of environmental toxins on fertility. McClam et al. (2023) found that blood concentrations of lead and heavy metal mixtures were significantly higher in ever-infertile women than in pregnant women. The study reported that exposure to lead was positively associated with women's historical infertility.

A study by Buck Louis et al. (2012) found that women with higher blood mercury levels took longer to become pregnant. Specifically, for every 1 µg/L increase in blood mercury, there was an 18% decrease in fecundability.

Research by Pollack et al. (2011) found that in premenopausal women, blood concentrations of cadmium, lead, and mercury were associated with altered means and amplitudes of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), two gonadotropins that regulate ovarian follicle maturation, hormone secretion, and ovulation.

HYPERURICEMIA

Uric acid is the final product of purine metabolism and has been traditionally recognized for its antioxidant properties at normal physiological levels (Hu et al., 2021). However, elevated levels of serum uric acid, known as hyperuricemia, have been associated with various health issues, including potential impacts on fertility.

The effect of elevated serum uric acid on human physiology is

multifaceted. While uric acid accounts for approximately two-thirds of the total antioxidant capacity of plasma (de Oliveira & Burini, 2012), excessive levels can lead to oxidative stress and inflammation, which may affect various bodily systems, including reproductive function (Glantzounis et al., 2005).

In young women, elevated serum uric acid levels can potentially impact fertility through several mechanisms. These may include hormonal interactions, effects on oocyte maturation, and induction of oxidative stress in reproductive organs (Mu et al., 2016). However, the exact pathways through which uric acid affects female fertility are still being researched.

A recent study by Hong et al. (2023) using data from the National Health and Nutrition Examination Survey (NHANES) found a positive correlation between high serum uric acid levels and the risk of female infertility. The study reported that women with serum uric acid levels in the third (4.4-5.1 mg/dL) and fourth (5.1-18.0 mg/dL) quartiles showed a significant positive association with infertility compared to those in the lowest quartile.

The same study observed a non-linear correlation between serum uric acid levels and infertility risk. Using the 25th percentile of uric acid (3.7 mg/dL) as a reference, serum uric acid values higher than this increased the risk of female infertility. The risk of infertility increased gradually as uric acid values approached 5.5 mg/dL.

Factors such as diet, which can influence uric acid levels, may play a role in this relationship (Wang et al., 2020).

CONGENITAL HEART DISEASE (CHD)

Congenital heart disease (CHD) is a group of heart abnormalities present at birth, affecting approximately 1% of all live births worldwide (van der Linde et al., 2011). CHD encompasses a range of subtypes, varying in severity and prognosis, from relatively benign conditions like bicuspid aortic valve to more complex ones like hypoplastic left heart syndrome (Wander et al., 2023).

The effect of CHD on human physiology extends beyond the cardiovascular system, impacting various bodily functions including reproduction. CHD can affect the body's ability to adapt to the physiological changes of pregnancy, potentially leading to complications for both mother and foetus (Cauldwell et al., 2017).

In young women, CHD can impact fertility through various mechanisms. Women with CHD are known to have a higher incidence of menstrual dysfunction compared to the general population (Drenthen et al., 2007). The severity of CHD appears to correlate with the degree of fertility impact, with more complex conditions having a more pronounced effect (Udholm et al., 2023a).

Several studies support the impact of CHD on fertility. Udholm et al. (2023a) found that fertility is reduced in women with CHD, particularly those with cyanotic complex CHD like Fontan palliation. The study reported that both men and women with CHD have lower birth rates compared to those without CHD, independent of the CHD severity.

A study by Wander et al. (2023) noted that women with CHD face increased maternal and foetal risks during pregnancy. They reported higher rates of adverse obstetrical events (8.4%) and foetal and neonatal events (24%) compared to the general population. Women with CHD also face an increased risk of miscarriage, preeclampsia, foetal growth restriction, and preterm delivery.

CHRONIC KIDNEY DISEASE (CKD)

Chronic kidney disease (CKD) is a condition characterized by a gradual loss of kidney function over time. It affects approximately 10% of the global population and can have significant impacts on various aspects of health, including fertility (Jha et al., 2013).

CKD can impact not only kidney function but also hormonal balance, cardiovascular health, and metabolic processes. In the context of reproduction, CKD can affect the hypothalamic-pituitary-gonadal axis, leading to hormonal disturbances (Holley & Schmidt, 2013).

In young women, CKD can potentially impact fertility through various mechanisms. These include menstrual irregularities, impaired ovarian function, and an increased risk of pregnancy complications (Palmer & Clegg, 2017). The severity of these effects often correlates with the stage of CKD, with more advanced stages generally having a greater impact on fertility (Jesudason et al., 2014).

Several studies have investigated the impact of CKD on fertility, with some conflicting results. Traditional understanding suggests that women with CKD, including those on dialysis, experience impaired fertility, menstrual irregularities, and early menopause (Dumanski & Ahmed, 2019). Women receiving dialysis have been reported to have higher rates of early pregnancy loss (Manisco et al., 2015).

However, a recent study by Reynolds et al. (2024) on Hispanic/Latino women in the United States found that the presence of CKD, largely represented by early-stage CKD, did not confer a significant risk of infertility, cessation of menses, or nonviable pregnancy loss. This study included 2,589 women aged 18-45 and suggests that the impact of CKD on fertility may vary depending on the stage of the disease and potentially on racial or ethnic factors.

ANTI-CANCER THERAPY

Anti-cancer therapy comprises a range of treatments designed to combat cancer, including chemotherapy, radiotherapy, and targeted therapies. While these treatments have significantly improved cancer survival rates, they can have substantial impacts on fertility (Sonmezer & Oktay, 2004).

The effect of anti-cancer therapies on human physiology, particularly the reproductive system, can be profound. These treatments often target rapidly dividing cells, which includes not only cancer cells but also healthy cells in the ovaries and other reproductive organs. This can lead to damage to ovarian tissue, depletion of the ovarian follicle pool, and hormonal disruptions (Morgan et al., 2012).

In young women, anti-cancer therapies can impact fertility through various mechanisms. These include direct damage to oocytes and ovarian follicles, alterations in hormone production, and in some cases, necessitating the surgical removal of reproductive organs (Lambertini et al., 2016).

Several studies support the impact of anti-cancer therapies on fertility. Sonmezer and Oktay (2006) reported that the rate of chemotherapy-induced amenorrhea in women with breast cancer treated with cyclophosphamide, methotrexate, and 5-fluorouracil (CMF) was 68% with classical oral CMF. Even a single cycle of CMF resulted in the loss of ovarian function in about 30% of patients.

A study by Lorenzi et al. (2016) found that only about 6.3% of premenopausal women suffering from breast cancer, lymphoma, ovarian cancer, or colon cancer could become pregnant after chemotherapy, highlighting the significant impact of these treatments on fertility.

The type of cancer and treatment can influence the degree of fertility impact. For instance, alkylating agents like cyclophosphamide are particularly gonadotoxic (Ljungman et al., 2018). Radiotherapy can also lead to ovarian damage, with the extent depending on the radiation dose and field (Jeelani et al., 2017).

The impact of anti-cancer therapies on fertility can vary among individuals depending on factors such as age at treatment, type and dose of treatment, and individual susceptibility (Wallace et al., 2005).

BACTERIAL COLONIZATION

Bacterial colonization refers to the presence and growth of bacteria in or on the body without causing immediate disease. In the context of reproductive health, this often refers to the colonization of the reproductive tract, particularly the uterus and cervix (Moreno & Franasiak, 2017).

The human reproductive tract, particularly the uterus, has traditionally been considered sterile under normal conditions. However, recent research has challenged this view, suggesting that even the uterus may have its own microbiome (Mitchell et al., 2015). The cervix, on the other hand, is known to be colonized by various microorganisms and serves as a barrier to prevent the ascension of potentially harmful bacteria (Hare, 1988).

In young women, bacterial colonization can impact fertility through

various mechanisms. These include altering the local immune environment, affecting the receptivity of the endometrium, and potentially interfering with implantation and early pregnancy (Moreno et al., 2016).

Several studies support the impact of bacterial colonization on fertility, particularly in the context of caesarean section (CS) defects. Hsu et al. (2022) investigated bacterial colonization in women with secondary infertility who had previous CS. The study found that a high percentage (60%) of women with a previous CS suffered from secondary infertility, partly due to complications arising from uterine niches. Among women with a previous CS, bacterial colonies were identified in 89.6% of women with CS defects (CSDs) and 69.8% of women without CSDs. In contrast, only 49.7% of women without a previous CS showed bacterial colony growth in endocervical samples.
The presence of certain bacteria in the reproductive tract has been associated with infertility. For instance, Dehkordi et al. (2020) found that the presence of virulent and resistant uropathogenic E. coli strains in the upper vagina of infertile women with a history of urinary tract infections suggests a significant role of these pathogens in female infertility.

The impact of bacterial colonization on fertility is further supported by studies showing improved reproductive outcomes after treatment of uterine niches. Gubbini et al. (2011) reported that surgical treatment of uterine niches can be effective in improving reproductive outcomes.

HIV (HUMAN IMMUNODEFICIENCY VIRUS)

HIV is a virus that attacks the body's immune system, specifically the CD4 cells (T cells), reducing the body's ability to fight off infections and disease. If left untreated, HIV can lead to AIDS (Acquired Immunodeficiency Syndrome) (CDC, 2021).

The effect of HIV on human physiology is systemic, impacting multiple bodily functions including reproduction. HIV can affect the reproductive system directly through viral infection of reproductive organs and indirectly through its impact on the immune system and overall health status (Kushnir & Lewis, 2011).

In young women, HIV can impact fertility through various mechanisms. These include alterations in menstrual function, increased susceptibility to reproductive tract infections, and potential impacts on ovarian reserve (Ohl et al., 2010). The use of antiretroviral therapy (ART) to treat HIV may also have effects on fertility, both positive (by improving overall health) and potentially negative (due to drug side effects) (Kushnir & Lewis, 2011).

Several studies support the impact of HIV on fertility. A study by Dhont et al. (2011) in Rwanda found that HIV was significantly more common in women with secondary infertility. The study reported that 53% of women with secondary infertility were HIV positive, compared to 16% of fertile women.

Research has shown an increased prevalence of infertility in women living with horizontally acquired HIV (HaHIV) compared to age-matched populations without HIV (Hunter et al., 2003). These women have been found to have higher incidences of idiopathic tubal occlusions and tubo-ovarian abscess formation (Barnes et al., 2014), as well as prolonged periods of amenorrhea and early onset of menopause (Savasi et al., 2013).

Interestingly, a study by Teh et al. (2019) on young women with perinatally acquired HIV (PaHIV) found that their reproductive health status was comparable to the general population. This suggests that the impact of HIV on fertility may vary depending on the mode and timing of HIV acquisition.

RHEUMATOID ARTHRITIS

Rheumatoid arthritis (RA) is an autoimmune disorder characterized by chronic inflammation and pain in multiple joints. Research suggests that women with RA may face greater challenges in conceiving, which could be attributed to both disease-related complications and the side effects of common treatments (Wallenius et al., 2011, 2012; Skomsvoll et al., 2001).

The effect of RA on human physiology extends beyond joint inflammation. It can impact various bodily systems, including reproductive function. The chronic inflammatory state associated with RA can affect hormonal balance, ovarian function, and overall reproductive health (Brouwer et al., 2013). In young women, RA can impact fertility through various mechanisms. These include decreased ovarian reserve, as indicated by lower levels of anti-Müllerian hormone (AMH) in women with established RA (Brouwer et al., 2013). Additionally, pain and fatigue associated with RA can negatively impact sexual function, potentially reducing the frequency of intercourse and, consequently, the chances of conception (Provost et al., 2014). Women with RA also tend to experience earlier menopause, further limiting their reproductive window (Provost et al., 2014).

Several studies support the impact of RA on fertility. Wallenius et al. (2011, 2012) found that women with RA had higher rates of nulliparity and were more likely to have fewer children compared to women without RA. This suggests that RA may affect a woman's ability to conceive or carry a pregnancy to term.

The treatment of RA can also impact fertility. NSAIDs, commonly used for pain management in RA, have been associated with fertility issues. They may decrease ovulation rates by suppressing prostaglandin production, which is crucial for ovulation and implantation (Hester et al., 2009; Li et al., 2003). Several studies have reported an increased risk of miscarriage with NSAID use during pregnancy (Nielsen et al., 2001; Li et al., 2003; Nakhai-Pour et al., 2011).

Disease-Modifying Antirheumatic Drugs (DMARDs) used in RA treatment have varying effects on fertility and pregnancy. Methotrexate is teratogenic and strongly contraindicated during pregnancy due to its association with miscarriages and birth defects (Østensen et al., 2006; Weber-Schoendorfer et al., 2014). However, other DMARDs such as leflunomide, hydroxychloroquine, sulfasalazine, cyclosporine, and azathioprine have not shown significant adverse effects on pregnancy outcomes (Østensen et al., 2006; Cassina et al., 2012).

Interestingly, RA symptoms often improve during pregnancy, possibly due to the immunomodulatory effects of foetal antigens and pregnancy hormones (Förger et al., 2012; Østensen et al., 2012). However, the postpartum period is frequently associated with exacerbated symptoms as these protective factors diminish (Østensen & Villiger, 2007; Förger & Villiger, 2020).

While studies indicate a higher rate of infertility among women with RA, the exact mechanisms remain unclear. The decreased fertility may result from a combination of factors, including inflammatory cytokines, reduced sexual activity, medication side effects, maternal age, and personal choice (Fattah et al., 2020).

IMPLICATIONS AND INTERVENTIONS FOR FERTILITY MANAGEMENT IN YOUNG WOMEN

The various factors affecting fertility in young women have significant implications for healthcare providers, policymakers, and individuals. This section outlines potential interventions and considerations grouped by type.

MEDICAL INTERVENTIONS:

Preconception Counselling: Healthcare providers should offer comprehensive preconception counselling to young women, especially those with chronic conditions like congenital heart disease (CHD), chronic kidney disease (CKD), or rheumatoid arthritis (RA) (Canobbio et al., 2017; Piccoli et al., 2017).

Fertility Preservation: For women undergoing cancer treatment, options such as oocyte or embryo cryopreservation, ovarian tissue cryopreservation, and the use of GnRH agonists during chemotherapy should be discussed early (Oktay et al., 2018).

Multidisciplinary Approach: Women with complex medical conditions (e.g., CHD, CKD, RA) require care from a multidisciplinary team including specialists in their condition, obstetricians, and fertility experts (Smith et al., 2021; Piccoli et al., 2017; Fattah et al., 2020).

Medication Management: Careful consideration of medication effects on fertility is crucial. For example, in RA patients, balancing disease control with fertility preservation may involve adjusting medications like NSAIDs or methotrexate (Østensen et al., 2006; Weber-Schoendorfer et al., 2014).

Reproductive Tract Infections: Early detection and treatment of sexually transmitted infections and other reproductive tract infections are essential to prevent tubal damage and preserve fertility (Dhont et al., 2011).

ENVIRONMENTAL AND LIFESTYLE INTERVENTIONS:
Reducing Toxin Exposure: Awareness programs and interventions to reduce exposure to environmental toxins, particularly heavy metals, should be implemented (Genuis, 2012).

WORK-LIFE BALANCE: Policies to prevent excessively long working hours, especially for younger women, may help preserve fertility (Ahn et al., 2021).

Healthy Lifestyle Promotion: Encourage maintaining a healthy weight, balanced diet, regular exercise, and avoiding smoking and excessive alcohol consumption (Sharma et al., 2013).

STRESS MANAGEMENT: Implement stress reduction strategies, as stress can affect hormone balance and ovulation (Sharma et al., 2013).

SCREENING AND MONITORING:
Regular Fertility Assessments: For women with conditions that may affect fertility (e.g., CHD, CKD, RA), regular assessments of ovarian reserve and overall reproductive health should be conducted (Brouwer et al., 2013).

METABOLIC MONITORING: Regular screening for metabolic disorders, including hyperuricemia, especially in women with fertility concerns (Hong et al., 2023).

Early Detection of Reproductive Issues: Implement screening programs for early detection of conditions like polycystic ovary syndrome (PCOS), especially in high-risk groups such as women with perinatally acquired HIV (Teh et al., 2019).

PUBLIC HEALTH AND POLICY INTERVENTIONS:
Education and Awareness: Develop public health campaigns to educate young women about factors affecting fertility and the importance of early planning for those wishing to conceive.

Workplace Policies: Implement policies that support work-life balance and consider the reproductive health of female employees (Ahn et al., 2021).

ENVIRONMENTAL REGULATIONS: Strengthen regulations to reduce environmental toxins that may affect fertility (McClam et al., 2023).

HEALTHCARE ACCESS: Improve access to reproductive health services, particularly for underserved populations and those with chronic health conditions.

By implementing these interventions, healthcare providers and policymakers can work towards preserving and optimizing fertility in young women, particularly those with health conditions or environmental exposures.

CONCLUSION

This comprehensive review has explored a wide range of factors affecting fertility among young women, providing insights into the complex interplay of biological, environmental, and societal influences on reproductive health.

Age remains a critical factor in female fertility, with a decline in reproductive potential observed as women get older, even in younger age groups (Broekmans et al., 2009). Reproductive health history, including previous pregnancies, miscarriages, and gynecological surgeries, also plays a significant role in future fertility outcomes (Dhont et al., 2011; Liang et al., 2021).

Sexually transmitted infections (STIs) emerged as a significant concern, with studies showing their prevalence among women with secondary infertility (Dhont et al., 2011). The impact of lifestyle factors, including diet, exercise, smoking, and alcohol consumption, on fertility was also highlighted, emphasizing the importance of health education and lifestyle interventions (Sharma et al., 2013).

Environmental toxins, particularly heavy metals like lead and mercury, were found to have potential negative impacts on female fertility (McClam et al., 2023). This underscores the need for increased awareness and regulatory measures to reduce exposure to these harmful substances.

Chronic diseases such as congenital heart disease (CHD) and chronic kidney disease (CKD) were shown to have varying effects on fertility. While CHD was associated with reduced fertility, particularly in complex cases (Udholm et al., 2023a), the impact of early-stage CKD on fertility in Hispanic/Latino women was found to be less severe than previously thought (Reynolds et al., 2024).

The review also highlighted the potential impact of elevated serum uric acid levels on female fertility, suggesting a new avenue for fertility assessment and treatment (Hong et al., 2023). Long working hours were found to potentially affect fertility, particularly in younger women (Ahn et al., 2021), while the impact of perinatally acquired HIV on fertility was found to be less significant than horizontally acquired HIV (Teh et al., 2019).

Rheumatoid arthritis (RA) was shown to potentially impact fertility through various mechanisms, including decreased ovarian reserve and the effects of medications used in its treatment (Brouwer et al., 2013; Fattah et al., 2020).

Despite these comprehensive findings, this study has several limitations. The review relied on existing literature, which may have inherent biases or gaps. The quality and methodology of the included studies varied, potentially affecting the strength of the conclusions drawn. Additionally, some factors may have been underrepresented due to limited available research.

Practical implications of this review are numerous. Healthcare providers should consider a wide range of factors when assessing and treating fertility issues in young women. This includes not only traditional factors like age and reproductive history but also environmental exposures, chronic diseases, and lifestyle factors. The review also highlights the importance of preconception counselling and early intervention in preserving fertility, particularly for women with chronic health conditions.

Future research should focus on several key areas. Longitudinal studies are needed to better understand the long-term impacts of various factors on fertility. More research is required on the effects of emerging environmental toxins and lifestyle factors on reproductive health. Studies on diverse populations are crucial to understand how fertility factors may vary across different ethnic and socioeconomic groups. Additionally, research on the impact of chronic diseases on fertility should be expanded, particularly for conditions where current evidence is limited or conflicting.

In conclusion, this review provides a comprehensive overview of the factors affecting fertility in young women. As our understanding of these factors continues to evolve, it is crucial that healthcare providers, researchers, and policymakers work together to develop strategies that can effectively address the fertility challenges faced by young women in diverse contexts and with varying health conditions.

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