E1. Lifestyle and Fertility

Chapter objectives

Some students are just considering about their fertility and others will not yet be considering whether to have children. Our lifestyle now affects our future health and fertility. There are some lifestyle choices everyone can make. This chapter aims to:

1. Consider the influences of lifestyle, environment and social development on personal empowerment and reproductive health.
2. Discuss the divide between fertility and infertility, and common causes of infertility.

E1.1. Reproduction and Fertility

The capability to bear healthy children depends on our genes, the conditions under which we live and the ways in which we behave. Many environmental and behavioral factors, including nutrition, exercise, poverty and drug abuse, contribute to ill health and poor fertility. Therefore fertility may be a good indicator of an individual’s overall health status in certain circumstances.

About 15% of couples in developed countries are involuntarily infertile, with a much higher percentage in developing countries (30-40% of women in parts of tropical Africa). The main causes of infertility in developing countries are sexually transmitted diseases (principally gonorrhea and chlamydia) and repeated pregnancies coupled with poor hygiene at the time of childbirth, abortion or miscarriage causing secondary infertility.

Pregnancy is the best way to judge a couple’s fertility. A couple is considered infertile if no conception has been achieved after 12 months or more of unprotected sex of average frequency. Fertility problems are equally likely to be caused by a disorder on the man’s side or on the woman’s side. Occasionally there is a problem on both sides, and in about 25% of cases the cause cannot be identified.

Unexplained infertility characterizes childless couples where a thorough examination of both partners fails to reveal a specific cause of infertility. By their mid-thirties about one in four couples is infertile. The decline in fertility has several causes including more frequent failure of ovulation, decreasing sperm counts and sperm quality, and an increased likelihood of spontaneous abortion early in pregnancy.

A woman’s menstrual cycles may become irregular in her early or mid-forties. This is the onset of the climacteric - the period of transition from fertility to infertility – and may last as long as 10 years. The final termination of menstrual cycles, or menopause, occurs at an average age of 50-52. A healthy postmenopausal woman can become pregnant with the aid of reproductive technology; donated oocytes can be fertilized in vitro and the embryo transferred to her womb or uterus. The pregnancy must be supported with hormone treatments.

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Q1. Do you want to have children? How many?

E1.2 Fertility Declines with Age

Female infertility is normally age dependent and increases from 30 years of age to the menopause; while age-related rise in male infertility is more gradual. Children who are born to older parents, especially older mothers, also stand a greater risk of having chromosomal abnormalities. One of these is Downs’s syndrome, caused by an extra copy of chromosome 21. Chromosomal abnormalities increase with maternal age because the mother’s oocytes, or eggs, remain ‘frozen’ in their first meiotic division from early in her fetal life.

Increasing paternal age also raises the chances that a child will have certain medical problems. Genetic anomalies in a man’s sperm also increase over his lifetime because the sperm precursor cell stocks (immature spermatogonia) are constantly dividing to produce new sperm. Thus, an older man’s sperm are the product of a greater total number of cell divisions, and each round of DNA replication carries a chance of introducing a harmful mutation.

Of pregnancies that proceed far enough to be detected clinically, about 15-20% are subsequently lost by spontaneous abortion or miscarriage, usually during the first three months or trimester. The majority of all spontaneously aborted embryos and fetuses have chromosomal abnormalities. This contrasts markedly with a 5% chromosome abnormality rate found in stillbirths, clearly illustrating the natural in utero selection processes that eliminate 95% of chromosomal damaged conceptions.

Figure 1: Causes of Human Congenital Abnormalities at Birth

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 - 60%</td>
<td>Unknown Etiology</td>
</tr>
<tr>
<td>20 - 25%</td>
<td>Multifactorial Inheritance</td>
</tr>
<tr>
<td>7 - 10%</td>
<td>Environmental Agents</td>
</tr>
<tr>
<td>7 - 8%</td>
<td>Mutant Genes</td>
</tr>
<tr>
<td>6 - 7%</td>
<td>Chromosomal Abnormalities</td>
</tr>
</tbody>
</table>

E1.3 Many Conceptuses Do Not Survive

More than half of all human conceptuses are genetically abnormal and have little or no chance of giving rise to a baby. It is generally recognized that human fecundity rate (= the probability of achieving a clinical recognized pregnancy within any given menstrual cycle) is about 25% and high levels of fertilization failures or early developmental death, are the norm at conception. Most abnormal conceptuses are lost at very early stages, failing to implant or
implanting so briefly before they die so that menstruation proceeds regularly and the mother is never aware of their existence.

In some cases, environmental factors such as alcohol consumption, general anesthesia, or X-ray exposure around the time of ovulation or fertilization may trigger chromosomal abnormalities. Spontaneous abortion is one of nature’s way to counter negative environmental factors.

The causes of most human congenital anomalies at birth are unknown because the majority of common disorders, such as heart disease, diabetes and cancer, are caused by a combination of genetic and environmental factors. If there are many factors we say that the cause is multifactorial in origin (Figure 1). Reproductive health depends upon the smooth succession of physical, physiological, behavioral, intellectual, emotional and spiritual change through which each individual passes from conception to death.

Q2. Can you think of anything you do now which might affect your fertility?

Q3. Make a list of factors which people think affect your fertility in positive and negative ways.

Q4. Do you think that everyone has a right to have a child?

E1.4. Maximizing Health and Fertility
This section describes some of the factors that affect fertility. Think about what you can do.

(i) Nutrition and Reproduction

Food restriction and abnormal eating behavior (as in obesity and anorexia nervosa) lower normal fertility levels. Good nutrition is also vital during pregnancy. Underweight women risk producing an underweight child who will be more likely to suffer a variety of medical problems. Being either underweight or overweight increases the likelihood of premature birth, which is bad for both mother and baby. Besides enough calories, a pregnant woman needs to consume adequate amounts of other nutrients, especially protein, calcium, iron, vitamin A and folic acid (folate).

Women who are overweight face an additional increased risk of certain serious disorders during pregnancy including diabetes and hypertension. Under normal conditions the fetus is adept at taking these nutrients from its mother and does not usually suffer any deficiency, but the mother may do so.
(ii) Exercise and Reproduction

There is a positive correlation between exercise, improved fitness and enhanced sexuality and bearing a healthy child. Traditionally, pregnant women were thought of as fragile creatures who needed to avoid exercise. It’s now clear that, except in the case of certain problem pregnancies, exercise has a positive value in maintaining the woman’s health and sense of wellbeing. Therefore pregnant women should engage in moderate, low-impact forms of exercise, such as brisk walking and swimming, but should avoid exercises that significantly raise the body temperature. That’s because high maternal temperatures may increase the likelihood of fetal abnormalities and may also cause dehydration, which can over-stress the mother and her fetus.

As well as consuming the right foods and maintaining physical fitness, a couple wishing to make a baby has to avoid a number of agents that can harm the fetus. Alcohol and tobacco heads this list. Fetal Alcohol Syndrome (FAS) has a specific cluster of symptoms. It is not clear whether moderate drinking, like one or two drinks per day, is harmful but several studies have reported that two drinks a day does have ill effects, including reduced intelligence, on genetically vulnerable fetuses. The average IQ of the FAS children is about 70 with the severity of intellectual disability being related to the degree of alcohol exposure in utero.

(iii) Substance Abuse and Reproduction

Heavy alcohol consumption during fertilization and pregnancy increases the likelihood of birth defects and infant death. Drinking whilst pregnant is also associated with Fetal Alcohol Syndrome (FAS). FAS children have characteristic facial appearance and other physical anomalies, are intellectually disabled and may have behavioral problems such as attention-deficit hyperactivity disorder (ADHD). Since no safe level of alcohol intake has been established, women should abstain completely from drinking whilst attempting to conceive as well as during pregnancy.

One of the most harmful practices a couple can engage in whilst planning to become pregnant and during pregnancy is smoking. It is testimony to the addictive power of tobacco that, even though its ill effects on fetal health are widely known, only about 20% of female smokers in the US actually quit during pregnancy.

Smoking by either the father or mother increases the likelihood of spontaneous abortion, premature birth, low birth weight, congenital malformations and childhood cancer. Smoking's ill effects continue after a child is born where 25-40% of all cases of sudden infant death syndrome can be attributed to the mother’s smoking during pregnancy, and babies whose mothers smoke during pregnancy have a 59% higher chance of dying during infancy than those born to nonsmokers.

Fetal exposure to addictive drugs such as cocaine, heroin and nicotine cause the baby to be born in an addicted state, as well as having the other harmful effects listed above. Lifestyle of both mother and father influences the health of the reproductive cells (sperm and eggs or gametes) and the baby.

Drugs such as nicotine, alcohol, certain recreational drugs and narcotics including marijuana, cocaine, heroin and amphetamines, transmit their effects by increasing the frequency of abnormal sperm, and reducing sperm number, motility and fertilization ability. Self-induced infertility in fathers is a major concern not least because it increases the demand for assisted reproductive technology and associated risks.

Q5. Do alcohol and tobacco have warnings for pregnancy written on them? What do the warnings say? Do you think people should smoke?
(iv) Other causes of male infertility and the environment

There are many possible causes for insufficient or defective sperm. Overheating of the testes by prolonged strenuous exercise or wearing too-tight clothing can also cause a transient reduction in sperm count. More serious, however, are chemical and physical toxins introduced into the environment by human activity that may affect fertility rates in all animals including humans.

The average sperm counts in a number of Western societies have dropped by nearly one-half (from 113 to 66 million sperm per milliliter of semen) between 1940 and 1990. During this period the prevalence of certain male reproductive disorders such as undescended testicles (called cryptorchidism) and testicular cancer, have significantly increased. **Endocrine disruptors** disturb sex hormone function regulating adult fertility by mimicking or antagonizing sex hormone activity. These hormone disruptors include agricultural pesticides and a variety of industrial chemicals such as the polychlorinated biphenyls (PCBs). Agricultural workers experience a decline in their sperm number proportional to the degree of pesticide exposure. Whether endocrine disruptors are also responsible for the observed sperm decline in the general population is not clear. However, if this steady decline continues then male fertility would be severely reduced within a few generations.

Undescended testicles, sex chromosome anomalies, infections that cause blockage of the reproductive tract and chemotherapy can all cause irreversible reduction or failure of spermatogenesis.

Environmental toxins that contribute to reducing male fertility are made more severe in individuals with pre-existing genetic or behavioral risk factors. There are many environmental concerns that may be explored in this context just one is given because it provides a good example illustrating the interconnectedness of all biological systems. Many factors may contribute to falling sperm counts and associated anomalies but most attention has been focused on a specific class of environmental pollutants.
(v) **Immunological Factors in Human Infertility**

**Immunological factors** in human infertility are now easily bypassed by *in vitro* fertilization techniques such as intracytoplasmic sperm injection or ICSI (see the chapter on assisted reproductive technology). However, immunological factors are important in the understanding of infertility treatments because the presence of anti-sperm antibodies in the serum of the female partner may explain persistent infertility and IVF failure.

(vi) **Poverty, Population and Development**

Today in the industrialized countries the prospects for pregnant women and their fetuses are far better than they were in the past. For example, in the USA 80% of all established pregnancies culminate in the delivery of a live child, and once a child is born it has 99.3% chance for surviving infancy. Further, less than one in 10,000 pregnancies now leads to the death of the mother.

However, certain social/ethnic minority groups are significantly disadvantaged compared to the general population. Indigenous people in Australia and the United States, for example, experience various forms of difficulties simultaneously, including social discrimination, which can be recognized by the high level of low birth weight infants and excessive neonatal mortality.

“Good health is a basic human right, especially among poor people afflicted with disease who are isolated, forgotten, ignored, and often without hope. Just to know that someone cares about them can not only ease their physical pain but also remove an element of alienation and anger that can lead to hatred and violence.”


Too often indigenous people live on a lower average family income, have a lower level of education, suffer a greater level of unemployment and are relegated to unacceptable overcrowded housing and poor sanitation. As a result many of the persistent health problems relate to alcoholism, other drug dependencies and depression, which then becomes the legacy for the next and subsequent generations.

The relationships among environment, poverty and social development are complex and varied; however in the spirit of reconciliation major inequities are increasingly being addressed and it is hoped that this lesson will accelerate the process. In general terms there is broad agreement that personal empowerment and reproductive health is part of an essential package of health care and education. Reproductive health includes ensuring that individuals and couples can make their own choices about family size, spacing of their children and have confidence in a healthy outcome.

**Q6. Does every child in your society have an equal chance to grow up healthy?**