Eating Disorders and Reproduction in Women

Bayramova AN*
Department of Gynecology, Russia
Submission: April 05, 2017; Published: June 05, 2017
*Corresponding author: Bayramova AN, Department of Gynecology, Russia, Tel: +79610220184; Email: afa.bayramova@yandex.ru

Abstract
Malnutrition is a major problem in developing countries, and obesity and eating disorders are increasingly common in developing as well as developed countries. The reproductive axis is closely linked to nutritional status, especially under nutrition in the female, and inhibitory pathways involving detectors in the hind brain suppress ovulation in subjects with weight loss. Recovery may occur after minimal reacquisition of weight because energy balance is more important than body fat mass. Anorexia nervosa and bulimia nervosa affect up to 5% of women of reproductive age causing amenorrhea, infertility and, in those who do conceive, an increased likelihood of miscarriage.

Keywords: Contraception; Miscarriage; Nutrition; Obesity; Reproduction

Introduction
Nutrition problems are strikingly different in developing nations (deprivation and under nutrition) and developed nations (eating disorders and obesity), although obesity is on the increase even in developing countries. Malnutrition is associated with 55% of deaths among children under the age of five. Over 4 million of the 12 million annual deaths are in sub-Saharan Africa alone, where every third child is underweight and two out of five are stunted. Iron deficiency anaemia is a contributing factor in over 20% of post-birth maternal deaths in Africa and Asia. Nearly 67 million children are wasted (weigh less than they should for their height); and about 183 million weigh less than they should for their age. Unfortunately, reducing poverty and increasing food production by themselves cannot solve the nutrition problems of the poor in developing countries [1]. Major public health and social expenditures are needed to address these devastating conditions that at present cannot be remedied substantially by medical practice.

In contrast, developed nations experience little deprivation, but eating disorders and obesity are increasingly common and may be amenable to medical intervention. For females, reproduction involves much greater energy expenditure than for males, and as a protective mechanism against under nutrition, the reproductive axis is closely linked to nutritional status. As one consequence, eating disorders leading to loss of weight are associated with reduced frequency or cessation of ovulation. Since energy balance more than absolute weight loss is the key factor, there may be a return of ovulation after no more than a small percentage change in body weight recovery. Obesity, however, is a less reliable risk factor of infertility except among obese women who also have polycystic ovarian disease. This review of nutrition and reproduction will address the clinical conditions that are associated with underweight in developed countries. It will outline the physiological mechanisms and clinical conditions associated with under nutrition.

Under Nutrition
Physiological mechanisms
The reproductive system is extremely sensitive to influences from the external environment [2]. Most animals adjust their pattern of reproduction so that the chances of their offspring surviving are maximal. A common strategy involves timing of conception by photoperiod and/or rainfall which usually ensures that birth takes place in a season when food and climatic conditions are favorable, such as spring.

Reproduction involves much greater energy expenditure in the female than in the male. The nourishing of the offspring during pregnancy and lactation and their subsequent rearing to adulthood are the biggest expenditure of energy that a female mammal will make in her lifetime. Hence, the female reproductive system is much more sensitive to disruption than the male.

Because reproduction involves energy expenditure, it is sensible that the physiological control mechanisms are linked to those involved with appetite and nutrition [3]. Food is used as a source of energy for a variety of essential and non-
Energy balance and ovulation

Approximately 1-5% of women suffer from ‘weight-related amenorrhoea’ [5]. Because many girls with delayed puberty are relatively thin during adolescence it has been suggested that a certain critical body weight (47kg) or body fat content is required for onset of cyclical ovarian activity [6,7]. However, although ovarian activity and fat content are correlated they are not causally linked. It is relatively easy to dissociate fatness and reproductive function. Thus, for example, menstrual cycles return in some female athletes when energy expenditure is reduced such as after an injury long before there is any change in body weight or an increase in body fat [8].

Reproductive function, like appetite, is responsive to short-term changes in metabolic fuel oxidation. For example, many breeds of sheep are capable of altering their ovulation rate and hence the number of lambs they carry depending on body condition (Martin et al., 2004). Feeding underweight sheep high-calorie supplement of lupins or clover hastens the onset of the breeding season (‘flushing’) and increases the ovulation rate. A similar effect can be produced by administration of a glucogenic ‘drench’ [9].

The mechanisms involved in this adjustment of reproductive function involve the availability of calories. When Syrian hamsters are administered 2 de-oxy-d-glucose (DG), which limits glucose oxidation, ovulatory cycles are interrupted rapidly (Schneider and Wade, 1990). It is likely that this involves both central and peripheral mechanisms. In sheep and rats infusion of DG directly into the lateral ventricles depressed LH secretion [10,11]. Subsequent experimentation has helped define the pathway by which calorie deprivation leads to short-term inhibition of reproductive function. It appears that in the rat the metabolic signals are detected by chemo receptors in an area of the hind brain area (postrema (PA)). The signals involved in this are not entirely clear but probably include leptin and insulin/glucose [12,13].

Epinephrine, nor-epinephrine and neuropeptide Y (NPY) neurones connect to the forebrain to influence GnRH secretion in the hypothalamus [14]. When the animal is replete, the system is free running. The ‘brake’ is only applied during times of negative energy balance and involves NPY neurons [14,15]. Nutrition and reproduction [3], NE, nor-epinephrine; NPY, neuropeptide Y; PA, postrema.

Recent observations in women with ‘hypothalamic amenorrhoea’ have suggested that these experimental studies are relevant to clinical disorders. Women with anovulation associated with strenuous exercise or who are underweight, have low levels of leptin, LH and estradiol [16]. The frequency of gonadotropin pulses is too low to sustain development of antral follicles to the point of ovulation. When leptin was injected to restore levels to normal, there was an immediate increase in the frequency of LH pulses within 2 weeks, followed by growth of large ovarian follicles. Ovulatory cycles were restored in three out of eight women. Whether leptin acts directly on the hypothalamus or increases the availability of oxidizable metabolic substrates or both is unknown. It is likely that leptin plays a significant role in mediating this event although it should be noted that when nutritionally starved animals are refed the frequency of LH pulses increases long before there is an increase in circulating leptin [17].

Energy balance and implantation

Nutrition not only influences ovulation and fertilization but also implantation and early fetal development. Paradoxically overfeeding of sheep in the first few weeks of pregnancy results in an increase in embryonic mortality associated with low levels of progesterone [18]. The level of nutrition during pregnancy has a profound effect on fetal development and subsequent susceptibility in adulthood to disease. When ewes were underfed during mid pregnancy there was an increase in the incidence of pre-term birth [19]. The concept of fetal programming in utero which was originally derived from epidemiological studies in man has been confirmed in a number of experimental studies in animals [20,21]. Thus there is little doubt that nutrition plays an important role during pregnancy as well as in determining the timing and quality of reproductive activity.

Eating disorders

Under nutrition implies inadequate food intake or faulty assimilation due to low-caloric intake or limited nutritional diversity. In developed countries it is most commonly found in women with eating disorders.

Although records of under nutrition from developing countries are scarce, the experience from the Dutch famine in 1944-1945 is relevant to modern countries with a high prevalence of malnutrition. In the Western Netherlands, average daily intake fell from 1500 to less than 700 kilocalories from October 1944 to January 1945 and the birth rate fell 9 months after October 1944. Future reproductive life was affected among women with eating disorders. Women with anovulation or severe anorexia who are underweight, have low levels of leptin, LH and estradiol [16]. The frequency of gonadotropin pulses is too low to sustain development of antral follicles to the point of ovulation. When leptin was injected to restore levels to normal, there was an immediate increase in the frequency of LH pulses within 2 weeks, followed by growth of large ovarian follicles. Ovulatory cycles were restored in three out of eight women. Whether leptin acts directly on the hypothalamus or increases the availability of oxidizable metabolic substrates or both is unknown. It is likely that leptin plays a significant role in mediating this event although it should be noted that when nutritionally starved animals are refed the frequency of LH pulses increases long before there is an increase in circulating leptin [17].
Under nutrition due to eating disorders may affect ovulation and fertility, alter the response to conventional treatment and assisted reproduction technology for infertility and have effects on pregnancy and the newborn.

The relevant eating disorders are bulimia nervosa (excessive eating and compensatory activities such as vomiting or laxative abuse) and anorexia nervosa (low body mass index (BMI) and fear of weight gain). Both commonly onset in adolescence and occur in 3% of young women [23].

Milder eating disorders (not otherwise specified) occur in a further 3-5% of women [24]. Anorexia nervosa (1% of young women) is defined as body weight less than 85% of expected weight or BMI less than 17.5 kg/m2, coupled with intense fear of weight gain and an inaccurate perception of body image. Bulimia nervosa (1~5% of young women) involves recurrent binge eating, compensated by recurrent purging, excessive exercise or fasting, excessive concern about body weight or shape and the absence of anorexia nervosa [20]. Full recovery with bulimia nervosa is more likely (74%) than with anorexia nervosa (33%), but to achieve these recovery rates required a median of 90 months of follow-up with treatment and relapses occurred in about one third of full recoveries [25].

Effects on fertility

Menstrual periods often cease after a 10-15% decrease in normal body weight. In theory the mechanisms include altered regulation of gonadotropin-releasing hormone secretion and changes in the dopaminergic and opioid systems. Amenorrhea occurs in 15-30% of women with anorexia nervosa [26,27]. Amenorrhea is also a component of the female athletic triad, along with osteoporosis and milder versions of the eating disorders [28]. Oligoamenorrhea may occur with bulimia nervosa even in women with BMI in the normal range. The amenorrhea persisted in 30% of patients who had regained their normal weight during recovery from anorexia nervosa with amenorrhea [29].

With respect to fertility, anorexia nervosa or bulimia nervosa was present in 5 (8%) of 66 consecutive infertility clinic patients; non-specified eating disorders were found in a further six (9%) [24]. Seven of the 11 women with eating disorders were among the 12 of 66 with oligoanovulation; thus, in this small group, eating disorders were present in about 60% of women with oligoanovulation. Although women with anovulation are unlikely to conceive, fertility may be normal in later years among women who achieve normal weight after recovery from eating disorders [28,30]. Women with a history of anorexia nervosa and community controls had similar rates of pregnancy, mean number of pregnancies per woman and age at first pregnancy [31]. After 11.5 years of follow-up in 173 women with bulimia nervosa, 75% had been pregnant at least once and only 2% reported that they were unable to conceive [32].

Effects on treatment for infertility

Under nutrition is not a reliable predictor of conception among infertile women. In 244 cycles of GnRH treatment for oligoamenorrhea in 48 women, pregnancy rates were not affected by patients' weight or weight loss [33]. With assisted reproduction (ART) treatment, BMI was <20 kg/m2 in 22% of 398 French women: the delivery rates per started cycle were 21% in underweight women and 15% in those with BMI 20-25 kg/m2 [34]. Among 2860 Norwegian women having ART, BMI was <18.5 kg/m2 in 3%; the live birth rates per started cycle were 21%, both in underweight women and in those with BMI 18.5-25 kg/m2 [35].

Effects on pregnancy

Women with a history of being anorexic may have more abortions: 27% in a cohort of 66 anorexics versus 13% in a control group [31]. In contrast, a larger follow-up study of 246 women with either anorexia or bulimia reported that 54 women had 82 pregnancies of which 46 (56%) were live births, 25 (31%) were therapeutic abortions and only 11 (13%) were spontaneous abortions [36].

During pregnancy, women with eating disorders have higher rates of hyperemesis gravidarum, anaemia, impaired weight gain and compromised intrauterine fetal growth [23,37]. Premature delivery is more likely in underweight women. A case control study found that BMI <20 kg/m2 was associated with a four-fold higher likelihood of pre-term labour (OR=3.96, 95% CI=2.61-7.09) after adjusting for other known factors [38]. Rates of cesarean delivery, post-natal complications and post-partum depression are higher among mothers with anorexia nervosa [31,39]. Under nutrition is associated with low birth weight (3233 g compared with 3516 g for normal controls) [37].

Factors associated with premature delivery [38]. OR, odds ratio; CI, confidence interval; body mass index Kg/m2 (standing at work >2h/day, stress score: arbitrary scale.

Among women with eating disorders, postponement of conception until remission is recommended because of the impact of low nutrition, but all pregnant women with past or current eating disorders should be viewed as being at high risk and should be monitored closely both during and after pregnancy to ensure optimal maternal and fetal outcomes [35].

Conclusion

While deprivation and under nutrition are major causes of disease and death in developing countries, eating disorders is more likely to interfere with reproduction in developed countries. Because preservation of female energy expenditure for reproduction is essential, appetite and the reproductive axis are closely linked to nutritional status. As a safeguard against untimely reproduction due to under nutrition, ovarian activity is suppressed in women with eating disorders and

How to cite this article: Bayramova AN. Eating Disorders and Reproduction in Women. J Gynecol Women's Health 2017; 5(3): 555663. DOI: 10.19080/JGWH.2017.05.555663.
exercise amenorrhoea through pathways in the hindbrain. It is the balance between energy consumption and utilization that is crucial more than the body fat mass, thus recovery of ovulation may occur after a small percentage gain in weight [36-121].

The combined prevalence of bulimia nervosa and anorexia nervosa is approximately 5% among women of reproductive age, and the likelihood of cure is higher with bulimia nervosa. Both disorders suppress ovulation in severely affected women and account for up to 60% of women with anovulatory infertility. Pregnancy among underweight women increases the risk of premature labour.

References


56. Fossvik BN. BMJ Statist.


