1. The prenatal and immediate postpartum periods

A mother's nutritional status during pregnancy has important implications for both her own health and her ability to produce and breast-feed a healthy infant. Knowledge about adequate maternal nutrition during pregnancy is incomplete, however, and there is still considerable debate about the level of extra energy needed by a pregnant woman. A woman's usual nutritional requirements increase during pregnancy to meet her needs and those of the growing fetus. Additional energy is needed because of increased basal metabolism, the greater cost of physical activity, and the normal accumulation of fat as the energy reserve. The protein, vitamin and mineral requirements of the mother also increase during pregnancy, but the precise amounts for the last two are still a matter for discussion. A woman's weight increments during pregnancy vary between privileged and underprivileged communities. In addition to calcium, phosphorus and iron, a mother provides considerable amounts of protein and fat for fetal growth. Placental metabolism and placental blood flow, which are interrelated, are the most critical factors for fetal development.

The nutritional requirements of healthy newborns vary widely according to their weight, gestational age, rate of growth, as well as environmental factors. However, recommendations for some components may be derived from the average composition of early human milk and the amounts consumed by healthy, mature newborns who are following a normal postpartum clinical course. The water requirements of infants are related to their caloric consumption, activity, rate of growth, and the ambient temperature. A postnatal weight loss of 5–8% of body weight is usual during the first few days of life in mature newborn infants; in contrast, infants who experienced intrauterine malnutrition lose little or no weight at all.

The dynamic process of mother–newborn interaction from the first hours of life is intimately related to successful early breast-feeding. If this process is delayed, however, it may take longer and may be more difficult to achieve. Close mother–infant contact immediately after birth also helps infants to adapt to their new unsterile environment. Because drugs can interfere with bonding and breast-feeding, such substances should be given only when necessary and their effects should be evaluated. In general, young infants, especially newborns, have very irregular feeding intervals. It is advisable for numerous reasons to feed them whenever they indicate a need.

Introduction

The dual focus of this chapter—meeting the nutritional needs of the fetus at minimal cost to the mother and ensuring immediate and appropriate postpartum mother–child interaction—may appear disparate at first glance. However, as will become clear, these aspects are intimately related, critical as they are to promoting maternal and child health. The first influences pregnancy outcome, even as it protects the mother's nutritional status, while the second is paramount for the successful initiation and establishment of breast-feeding. In the 12-month period covered by this and the following chapters, both themes represent key first steps for the newborn infant on the road to a healthy productive life.

Nutritional aspects

The energy cost of pregnancy

A mother's nutritional status during pregnancy has important implications for both her own health and her ability to produce and breast-feed a healthy infant. Knowledge about what is adequate maternal nutrition during pregnancy is incomplete, and there is still considerable debate over the level of energy intake needed by a pregnant woman (*1*). For example, not enough is known about the metabolic alterations that occur, or their timing during pregnancy, or about when the mother builds up energy and nutrient stores for the growing fetus, and when her uterus, breasts, and blood and other bodily fluids are undergoing changes. Nor is it sufficiently clear how a pregnant woman, by regulating her physical activity, compensates for increased energy requirements and the rise in her basal metabolic rate. One has only to compare current dietary intake recommendations in many industrialized countries with the situation for most women in developing countries (*2*) to appreciate how incomplete the research on this subject is.

Results of recent longitudinal studies, which use more direct methods, are beginning to be published, however. For example, an integrated study conducted in the Gambia, Netherlands, Philippines, Scotland and Thailand showed that the energy costs of pregnancy were not met by anything like an equivalent energy intake. On this basis, the investigators concluded that both the 1981 Joint FAO/

WHO/UNU Expert Consultation's recommendation that women increase their food intake to supply an extra 1.0 MJ (240 kcal)/day (*3*) and the 1987 recommendation for women in Scotland of 1.2 MJ (285 kcal)/day (*4*) were not realistic for healthy populations living in industrialized countries.

In the Philippines, the findings seemed to suggest that pregnancy outcome can be successful despite a marginal energy intake (*5*), while the Gambian women studied appeared to be the beneficiaries of a remarkable physiological adjustment. By becoming pregnant the latter group saved so much energy in basal metabolism that they ended with a positive energy balance over the whole of pregnancy of about 46 MJ (11 000 kcal) (*5*).

The overall conclusion from these studies—that the total energy cost of pregnancy is about 250 MJ (60 000 kcal)—suggests that the recommendation in the FAO/WHO/UNU report was a full 25% too high. Even more striking is the fact that the extra 250 MJ of energy was not usually consumed in the diet (*5*). In another inquiry using the same protocol designed for the integrated study, the total energy cost of pregnancy for 57 healthy Dutch women was calculated to be 285 MJ (68 000 kcal) (*6*).

Because of steady advances in knowledge, including data from the five-country integrated study just cited, the recommendations of successive international expert groups differ in often important respects. Just as the intake-level recommended by the 1981 Consultation was lower than that of the 1971 Committee, it appears certain that future recommendations will be different again as the results of current studies become known. The information presented here is therefore part of a still-evolving picture of the real energy cost of pregnancy.

Nutritional requirements during pregnancy

A woman's normal nutritional requirements increase during pregnancy to meet the needs of the growing fetus and of the maternal tissues associated with pregnancy. Additional energy is also needed to meet the increased basal metabolism, the greater cost of physical activity, and the normal accumulation of fat as the energy reserve. The total additional energy needed for a normal pregnancy has been estimated to be about 335 MJ (80 000 kcal) over the nine-month period (*3*) but, as just discussed, this figure is now considered unrealistic. How much of this extra energy needs to be supplied by the diet is not clear and varies according to specific circumstances. As stated earlier, there are a number of metabolic adaptations whereby pregnant women can use dietary energy more efficiently. The amount of physical activity during pregnancy will also have a significant influence on energy needs; some women reduce their physical activity while others continue to do hard physical labour. The nutritional status at the outset of pregnancy is also an important factor; obese women will not need to accumulate extra fat while thin women will.

A proper dietary balance is necessary to ensure sufficient energy intake for adequate growth of the fetus without drawing on the mother's own tissues to maintain her pregnancy. It has been shown, for example, that well-nourished women who eat a varied, balanced diet, and maintain a low level of physical activity, can have a normal pregnancy, gain adequate weight and produce healthy babies without any significant change in their pre-pregnancy dietary intake (*3*). On the other hand, chronically malnourished women with marginally adequate or frankly insufficient diets, who, in addition, continue to engage in heavy physical labour, usually gain very little weight during pregnancy, produce low-birth-weight infants and experience a deterioration in their own nutritional status. Two classic studies, one conducted in Colombia (*64*) and the other in Guatemala (*65*), demonstrated the significant positive impact on birth weight, stillbirths, and neonatal and perinatal mortality of food supplementation of pregnant mothers at risk of malnutrition.

It was previously thought that the increased energy need was greater towards the end of pregnancy when fetal growth is significant. However, it has been found that, under normal circumstances, fat begins to accumulate from the outset of pregnancy in order to meet later needs for extra energy, particularly during lactation. It is thus recommended that the extra energy required during pregnancy should be distributed throughout the whole period. The FAO/WHO/UNU Consultation on Energy and Protein Requirements (*3*) recommended, under normal conditions, the addition of 1200 kJ (285 kcal)/day during pregnancy. If women are well nourished and reduce their physical activity during pregnancy, this extra allowance can be reduced to 200 kcal (840 kJ) per day. While these may prove to be overestimates of what is necessary for good pregnancy outcomes, it is clearly advisable, if at all possible, to increase the energy allowance for undernourished women in order to ensure significant fat deposits or at least to avoid further deterioration in their own nutritional status. Weight gain during pregnancy is a good indicator for regulating energy intake.

Protein intake is also critical during pregnancy. The extra protein needed for a woman who gains 12.5 kg during pregnancy and who produces a 3.3 kg infant has been estimated to be an average of about 3.3 g/day throughout pregnancy (*3*). The amount is low at the beginning and increases as pregnancy progresses; it needs to be corrected, however, according to the efficiency with which dietary protein is converted into tissue protein. The 1981 FAO/WHO/UNU consultation recommended 6 g of extra protein/day throughout pregnancy if the protein comes from a varied diet containing foods of animal origin, which permit a margin of safety to cover individual variations.

Unlike energy, dietary protein surpluses do not accumulate. Women in well-to-do societies on usual diets frequently consume more protein than is actually required. Under these circumstances, the extra needs of pregnancy are met with no significant changes in dietary intake. However, for chronically undernourished women, for whom not only the total amount of dietary protein but also its biological value is frequently low, corrections during pregnancy are important. The addition of even small amounts of protein of high biological value (e.g., most proteins of animal origin) can enhance utilization of total dietary proteins and therefore significantly improve nutritional status. In order to prevent any protein imbalance in populations consuming varied diets, including proteins, but where the total energy intake is low, additional energy needs for pregnancy should be provided by an increase in the overall diet and not simply by the addition of starches or fats.

Vitamin and mineral requirements also increase during pregnancy, but the precise amount is still a matter for discussion. With balanced diets which satisfy the normal requirements of adult women for these nutrients, the extra intake needed to compensate for increased energy requirements during pregnancy should also, under normal conditions, cover the needed extra allowance of vitamins and minerals. An exception might be iron, in which women are frequently deficient even when they are otherwise well nourished (7). Significant amounts of additional iron are needed during pregnancy—about 1000 mg in all (*8*); however, this need is not equally distributed over the duration of pregnancy, the iron requirements of the fetus being most important during the second and third trimesters (*8*). Requirements during this period cannot be satisfied by dietary iron alone, even if it is of high bioavailability. Unless stores of about 500 mg exist before pregnancy, administration of iron supplements may be indicated if impairment of the expected increase in haemoglobin mass in the mother is to be avoided (*8*). It is still preferable, to the extent possible, to increase iron intake from dietary sources, as medicinal iron supplements have been reported to cause marked decreases in serum zinc levels (see chapter 2). Factors known to stimulate absorption of non-haem iron are the presence in the diet of meat, poultry, seafood and various organic acids, particularly ascorbic acid. On the other hand, a large number of substances, for example, polyphenols including tannins, phytates, certain forms of protein, and some forms of dietary fibre impair the absorption of non-haem iron (*8*).

When a diet is already deficient, even marginally, in some minerals or vitamins, the situation can become critical during pregnancy. For example, iodine-deficient populations suffer a variety of consequences that include goitre, low birth weight (see chapter 5), reduced mental function, and widespread lethargy. Irreversible forms of severe mental and neurological impairment, commonly known as cretinism, are observed in marked deficiency states (*9*). Similarly, in areas where there is a deficiency of vitamin A or thiamine, pregnant women and their infants are at risk.

Weight increments during pregnancy

Weight increments during pregnancy vary between privileged and underprivileged communities; the average weight gain, by the time of pregnancy, for mothers in the former group are given in Table 1.1.

Table 1.1: **Average weight gain during pregnancy in industrialized countries**[a]

Time of pregnancy (weeks)	Weight gain (kg)
1–12	0
13–20	2.4
21–24	1.5
25–28	1.9
29–32	2.0
33–36	2.0
37–40	1.2
Total:	10–12

[a] Reference *10*.

A considerable proportion of weight gained during pregnancy is composed of protein and fat. Pregnant women in underprivileged communities normally have a much lower weight increment during pregnancy than women who are materially well off; if they do not have an adequate energy intake, they are more likely to lose fat and are at greater risk of giving birth to infants with low birth weight (*2*) (see chapter 5). It may be assumed that a reduction of fat deposits during pregnancy points to severe dietary deficiencies; however, an increase in fatty tissue, which is usual in affluent communities, may not be essential for a normal pregnancy outcome. The fat deposited during pregnancy is of great value, however, in compensating for the high energy requirements during lactation. If these reserves are not available, a mother's own tissues may be used to the detriment of her nutritional status.

Nutrient transfers during pregnancy

Nutrient transfers from mother to fetus are shown in Table 1.2. By the end of pregnancy the fetus has drawn about 30 g of calcium, 17 g of phosphorus and 300 mg of iron. At the same time, sizable amounts of minerals, which had been used in uterus and breast development, become available for meeting maternal nutritional needs.

Table 1.2: **Substances transferred to the fetus and placenta during pregnancy**[a]

	Newborn (g)	Placenta and amniotic fluid (g)
Total weight	3500	1450
Water	2530	1350
Protein	410	40
Fat	480	4
Sodium	5.7	3.9
Potassium	6.4	1.1
Chloride	6.0	3.1
Calcium	29.0	0.2
Phosphorus	16.9	0.6
Magnesium	0.8	0.06
Iron	0.3	0.01

[a] Reference *11*.

Changes in maternal metabolism that promote adequate fetal growth

In addition to calcium, phosphorus and iron, a mother provides considerable amounts of protein and fat to promote adequate fetal growth. Since the transfer of most of these substances occurs most actively towards the third trimester, supplies of them have to be made available in time. This implies a biphasic cycle of the mother's intermediary metabolism, which is steered by endocrine influences during pregnancy (*12*). The energy balance of maternal tissues is assumed to be positive during the first half of pregnancy, which has been suggested by an apparent reduction in 3-methylhistidine excretion in the first part of pregnancy (*13*). This anabolic phase, with increased protein synthesis and an increase in fat tissue, is followed by catabolic processes characterized by a rapid formation of fetal tissues and depletion of maternal stores, which is not covered by the mother's usual nutrient intake (*14,15*). This process continues during lactation. The fetus, which has some of the characteristics of a parasite inside the maternal organism, is well protected by maternal nutrient stores. The stores compensate for seasonal variations in dietary intake and are activated through hormonal changes during pregnancy. The fetus is also protected by the active transport capacities of the placenta, which is able to mobilize nutrients, vitamins and minerals against concentration gradients in favour of the fetus (*16*).

The placenta

Placental function and fetal growth

Appropriate growth and development of the fetus is dependent on the functioning of the placenta. There are four areas of major importance (*17*): substrate and hormone concentrations in maternal circulation; uteroplacental blood flow; placental transfer mechanisms; and placental metabolism.

Substrate and hormone concentrations. Glucose is the main fuel for fetal metabolism (*18*), and its placental uptake is dependent on maternal blood glucose concentration (*19*). This does not apply to amino acids (*20*), but there is some correlation as regards free fatty acids (FFA). Placental hormones are able to regulate metabolic processes by modulating maternal substrate concentrations through changing the action of insulin on maternal tissues or regulating the mobilization of maternal plasma FFA (*21*). It is thus possible to direct glucose to the fetus in later pregnancy by lowering the insulin sensitivity in maternal tissue.

Uteroplacental blood flow. Near term, the uteroplacental blood flow ranges from 500 to 700 ml/minute (*22*). Little is known about earlier phases of pregnancy. Augmentation of uterine vessels, increase in maternal cardiac output, and increase of uterine vascular resistance are the basis for transfer of oxygen and amino acids to the fetus (*23*). Placental glucose uptake is severely reduced only when the blood flow is similarly restricted (*24*); maternal hypotension is thus considered a threat for fetal growth (*25*).

Placental transfer mechanisms. There are three main transfer mechanisms across the placenta (*16*): passive diffusion, dependent on blood flow; carrier-mediated facilitated diffusion; and active transport against concentration gradients, which is an energy-consuming process.

Glucose is transported by facilitated diffusion (*26*). Amino acids apparently are moved by active transport because their concentration in fetal blood is higher; there is selective transport for the neutral amino acids, whereas others (glutamic and aspartic acid) are not taken up (*26*). There is a gradient-dependent transport for FFA, although FFA in fetal and maternal blood are related. The process of maturation of the placenta, with marked reduction in the diameter of placental membranes in the course of pregnancy, may enhance diffusion and transport mechanisms.

Placental metabolism

The placenta, especially the trophoblast, is a very active metabolic tissue (*17*). Only 30–40% of glucose taken up by the placenta is transferred to the fetus, the rest being retained in the placental tissues (*17*), which are well equipped with insulin receptors (*27*). Moreover, lactate production represents about 40% of placental glucose utilization, lactate not being excreted into the human fetal circulation. Less is known about lipid metabolism of the placenta; the maternal hypertriglyceridaemia of late pregnancy may thus enhance an increased FFA uptake by the fetus (*28*). Amino-acid concentrations in the placenta exceed maternal and fetal values (*29*), a considerable proportion of which is returned to the maternal circulation as ammonia. Protein synthesis within the placenta essentially concerns hormone synthesis, especially of insulin receptors (*27*). The physiological role of placental insulin receptors has not been entirely clarified.

Placental metabolism and placental blood flow, which are interrelated, are the most critical factors for fetal development. The placenta is apparently able to adjust maternal metabolism to meet the needs of fetal growth through hormone synthesis.

The newborn

Nutritional requirements

Nutritional requirements of healthy newborns vary widely according to weight, gestational age, rate of growth and environmental factors. If one looks at breast-milk intake, the great variability of volume and composition during the immediate postpartum period does not lend itself to making recommendations based solely on breast-milk flow (*30*). However, recommendations for a few components may be derived from what is currently known about the average composition of early human milk, and the amounts consumed by healthy, mature newborns who are following a normal postpartum clinical course.

Where minor and trace elements in breast milk are concerned, the WHO study (*31*) on these elements that was conducted in Guatemala, Hungary, Nigeria, Philippines, Sweden and Zaire concluded that environmental conditions appear to play a major role in determining the concentration of most of them. However, for some of the elements (calcium, chlorine, magnesium, phosphorus, potassium and sodium) there appeared to be little difference between groups and countries, and concentrations were not significantly influenced by maternal nutritional status.

The ranges of concentrations found under usual conditions, i.e., after excluding study areas where exceptionally low or high values were observed, may be useful in determining the desirable concentration of trace elements in breast-milk substitutes. The study also concluded, however, that it may be opportune to reconsider the recommendation of a WHO Expert Committee in 1973 (*32*) that infant formula should contain all the minor and essential trace elements, at least as much as is present in human milk. The emphasis at the time was on meeting minimum nutritional requirements. Today there is concern that infant formula contains levels of some trace elements far exceeding the normal nutritional requirements of infants during the first months of life. Breast-milk composition and maternal dietary needs for lactation are discussed further in chapter 2.

The water requirements of infants are related to caloric consumption, ambient temperature, activity, and rate of growth. Specific gravity of urine is influenced by the way the infant is fed. Breast-fed infants have a low solute load and therefore a low urine specific gravity, while the opposite is true for infants fed on breast-milk substitutes. Average water requirements for a healthy infant under normal environmental conditions are given in Table 1.3, while Table 1.4 shows the dependency of the water requirement in relation to the specific gravity of urine.

Table 1.3: **Average water requirements for infants**[a]

Age	Weight (kg)	Water (ml/kg)
3 days	3.0	80–100
10 days	3.2	125–150
3 months	5.4	140–160

[a] Reference *33*.

Table 1.4: **Average water requirements of a 3-kg infant**[a]

Urine specific gravity	Volume		
	ml	ml/100 kcal	ml/kg
1.005	650	217	220
1.015	339	113	116
1.020	300	100	100
1.030	264	88	91

[a] Reference *33*.

These figures are divided up as follows: 30 ml as skin loss, 50 ml through the respiratory tract, and 50–70 ml/100 kcal for excretion of non-concentrated urine. Infants fed only breast milk require no additional water, even in very hot climates (*34*), unless another, high-osmotic food is given, unless they lose excessive volumes of water due to diarrhoea, or unless they become severely overheated. In such cases, a small quantity of water given by cup or spoon will ease the infants irritability due to thirst. However, giving water regularly may decrease the frequency and intensity of breast-feeding, or inappropriately condition the infant's oral behaviour, with a consequent negative impact on breast-milk production and removal. Moreover, water may be contaminated in some environments or the feeding bottles may be a source of infection (*35*). In addition, water will dilute the protective effects and nutritional value of breast milk, and is associated with higher levels of neonatal jaundice (*36*).

Neonatal weight loss

A postnatal weight loss of 5–8% of body weight is usual during the first few days of life in mature newborn infants. Postnatal weight loss is the result of a fall of intracellular fluid after birth, particularly from the skin, and is influenced by feeding practice, humidity, ambient temperature and, to some degree, loss of meconium. In contrast, infants who experienced intrauterine malnutrition, i.e., who are small for gestational age, lose little or no weight at all. There is a shift to the extracellular compartment, which stabilizes after the third day, when intracellular water content begins to rise to its previous level. Infants mobilize and excrete water and electrolytes in the fasting state. Since plasma osmolarity remains stable, there may be a shift of sodium from intracellular to extracellular space (*37*). The provision of water during this phase accelerates losses (*38*). It is known from animal experiments that low fluid intake leads to retention of cell water, while high intake speeds its release (*39*). This is particularly critical in the case of premature infants who tend to retain considerable amounts of intracellular water when fluid intake is restricted. See chapter 5.

Other postpartum concerns

Importance of immediate contact between mother and infant after birth. The importance of the immediate postpartum period for healthy child development has been clarified through scientific investigation since the 1960s. This research began on the assumption that this is an "imprinting" period, a critical and sensitive early phase concerned with sudden and lasting attachment between the infant and the mother. The phenomenon was first observed in animals (*40,41*), and it was further postulated that this reaction existed for human mothers and their infants (*42–45*). The father can also contribute to this early bonding period; although his direct influence is usually limited, it is nevertheless significant given the impact his reaction can have on the mother (*46*).

The immediate initiation and evolution of the parent–newborn interaction is structured by a mother's life experience and her conscious and unconscious attitudes. In the dynamic process which begins at birth, neonates are by no means as passive as their limited development may suggest (*47*). Most of the many interactions between a mother and her infant in the first hours of life are closely related to successful early breast-feeding. Immediate contact may be provided initially and most effectively by placing the infant on the mother's abdomen, even before the umbilical cord has been clamped (*48*). Another way is to place the infant at the mother's side, facing the mother. Both facilitate the touching and eye-to-eye contact that play such an important role in a mother's own sense of satisfaction (*49*).

The immediate postnatal period is obviously not the only moment when attachment can develop; if the process is delayed, however, it may take longer and be more difficult to achieve. The classic studies have shown that immediate contact between mother and infant after birth positively influences attachment behaviour where fondling, kissing, looking in the face, and talking to the infant are concerned; later, with regard to frequency of picking up, increased proximity, and greater soothing in stress situations; and still later, as concerns effectiveness of speech contact (*43,45*). Notwithstanding the scepticism recently shown about the long-term effects of early contact (*50,51*), there is no doubt about its positive influence on the successful initiation and establishment of lactation (see chapter 2). However, it is important in this regard to distinguish between early contact without suckling and early contact that includes unrestricted suckling.

In addition to contributing to early attachment, close mother–infant contact immediately after birth also helps infants to adapt to their new unsterile environment by favouring colonization of their skin and gastrointestinal tract with their mothers' micro-organisms. These tend to be non-pathogenic, and mothers' milk supplies antibodies specific for them. Infants are thus simultaneously exposed to, and protected against, the organisms for which active immunity will be developed only later in life.

Effects of anaesthesia or drugs on the infant postpartum. In view of the significance of early mother–infant contact for successful breast-feeding, it is important to understand that drugs administered during labour may interfere with this process (*52*). Eye-opening by the infant after delivery may be delayed, thus affecting interaction between mother and child. Even very small doses of drugs can have serious consequences for an infant's neurobehaviour pattern and therefore on the quality of the early mother–neonate relationship (*53*). Drugs given to the mother may negatively influence feeding ability and nutrient intake in newborn infants for many days after delivery owing to the dependence of the fetus on maternal detoxification, and on the infant's drug excretion, which is slowed because of immaturity of the liver (*54*). The effects of obstetrical analgesia or anaesthesia on neonatal feeding behaviour have been reviewed elsewhere (*55*).

In pregnancy and during birth, most drugs pass easily from mother to fetus through the placental barrier. Analgesics, tranquillizers and other drugs affecting the central nervous system pass rapidly because the blood–brain interchange has the same characteristics as the placental barrier. Changes in the reactions of newborn infants under the influence of various drugs have been observed as regards sleep and wakefulness, attentiveness to visual stimuli, oral behaviour in response to auditory and tactile stimuli, application of various neurobehavioural scales, ability to breast-feed well 24 hours after birth, and EEG patterns. Drugs that have been tested included pethidine (*56,57*) tranquillizers, barbiturates (*53,58*), and morphine derivatives (*57*); all affect the neonate's physiological state. Various investigations have also shown that even spinal anaesthetics given to the mother change the infant's neurobehavioural status (*55*), although this may be partly due to premedications.

Because drugs can interfere with both attachment and breast-feeding, drugs should be given only when necessary and their effects should be evaluated. The application of antibiotic, or possibly silver nitrate, eye drops to prevent conjunctivitis in the infant is reported to delay immediate eye-to-eye contact (*59*). Where these drugs are still considered necessary their administration can be postponed for a time to allow eye-to-eye contact immediately after birth (*60*). See also chapter 3 for a discussion of drug therapy during lactation, and Annex 1.

The newborn infant's feeding

As will be discussed more fully in chapter 2, it is one of the more striking neurological capabilities of the newborn infant to be able to breast-feed vigorously within the first two hours after birth, even at gestational ages when bottle-feeding is difficult. In general young infants, especially newborns, have very irregular feeding intervals. They may feed at unevenly spaced intervals from 6 to 12, or as many as 18, times in a 24-hour period. Mothers may need reassurance that this early phase of very frequent feeding is likely to settle into more predictable routines as lactation is established. Indeed, lactation will be more speedily established if the mother and baby are encouraged to feed as often and as long as the infant wishes to do so. Correct positioning of the infant is important to prevent nipple trauma.

It is advisable for numerous reasons (*61,62*) to feed young infants whenever they indicate a need. Mothers can usually rely on their infants, who regulate their appetite well, to know when they have had enough to drink. To an experienced observer, the infant's clinical state and behavioural patterns before and after a feed will also indicate satiety or hunger. Mothers may need to be cautioned not to interpret an infant's possible unsettled behaviour as due to milk insufficiency (see chapter 3); there are many other possible causes. It is not advisable to weigh an infant before and after every feed. Daily weighing will usually be adequate during the first few days of life to monitor milk intake where this is thought to be necessary. Weekly weighing will be sufficient in the first weeks after birth to detect any possible nutritional problem early enough for appropriate action to be taken (*63*). Where relevant, catch-up growth can be extremely rapid during this period, even for infants who have failed to thrive for some weeks before a corrective intervention is begun.

Résumé

La période prénatale et les post-partum immédiat

Le statut nutritionnel de la mère durant la grossesse influe directement sur son état de santé et sur ses possibilités de donner naissance à un enfant sain qu'elle pourra allaiter. On ignore encore exactement la valeur des besoins énergétiques supplémentaires à couvrir pour une femme enceinte. On connaît mal les modifications métaboliques qui surviennent et le moment où elles se situent. De quelle manière la future mère en règlant son activité physique compense-t-elle l'augmentation de son métabolisme de base et ses besoins caloriques accrus?

Les résultats d'enquêtes longitudinales ré-

centes utilisant des méthodes directes, conduites en Gambie, Hollande, Philippines, Ecosse et Thaïlande montrent que les coûts énergétiques de la grossesse ne sont pas compensés par une consommation énergétique équivalente. Sur ces bases les chercheurs ont constaté que les conclusions de la consultation d'experts conjointe FAO/OMS/UNU de 1981 qui recommandaient un accroissement de la ration fournissant 1.0 MJ/j, et les recommandations pour l'Ecosse de 1.2 MJ/j, n'étaient pas réalistes pour des populations en bonne santé des pays industrialisés. Aux Philippines, certaines constatations suggèrent que le produit de la grossesse peut être tout à fait satisfaisant avec des apports énergétiques mineurs. De même des femmes en Gambie ont démontré des capacités remarquables d'adjustements physiologiques grâce à une adaptation à la grossesse de leur métabolisme de base. La conclusion de ces études est que l'on peut fixer le coût énergétique total de la grossesse à environ 250 MJ (60 000 kcal), soit un chiffre inférieur aux recommandations FAO/OMS/UNU. Ce qui est étonnant cependant c'est que le fait que les femmes enceintes aient besoin de 250 MJ supplémentaires ne se traduise pas nécessairement par une augmentation de 250 MJ apportés par leur régime alimentaire.

Sont ensuite successivement envisagés:

—*Le gain de poids pendant la grossesse.* Il existe une différence entre pays en développement et pays industrialisés. La variation porte principalement sur les réserves en graisses. Dans les pays en développement les femmes se situent bien souvent en dessous des 10 à 12 kg de gain de poids généralement acceptés.

—*Modifications du métabolisme maternel favorisant la croissance fœtale.* Les échanges les plus actifs en protéines, graisses, Ca, P et Fe se produisent durant le troisième trimestre de la grossesse; en conséquence la mère doit avoir constitué des réserves durant les deux premiers trimestres. L'équilibre énergétique maternel est positif durant la première moitié de la grossesse, du moins en ce qui concerne les protéines comme cela a été démontré par l'étude de l'excrétion de la méthylhistidine.

—*Les besoins nutritionnels durant la grossesse.* Les recommandations FAO/OMS/UNU fixaient à 3.3 g de protéines supplémentaires par jour la ration pour une femme qui aurait pris 12.5 kg pendant sa grossesse et donné le jour à un enfant de 3,3 kg. Ces apports valables pour les pays industrialisés où le pourcentage de protéines d'origine animale dans la ration est important sont loin d'être fournis aux femmes enceintes mal nourries de manière chronique dans le tiers-monde. Pour les vitamines et les minéraux, si les besoins sont accrus durant la grossesse, les valeurs exactes ne sont pas connues. Dans les conditions normales les besoins sont couverts à l'exception du fer dont la carence est la plus fréquente même dans des populations autrement bien nourries. Il faut aussi ajouter les problèmes liés à la carence en iode qui frappe des régions entières du globe.

— *Les effets de l'anesthésie et de l'utilisation de divers médicaments sur le nouveau-né.* L'importance fondamentale dès la naissance du contact mère-enfant sur la mise en route de l'allaitement maternel demande la plus grande prudence dans l'utilisation durant le travail de drogues qui pourraient gêner ce processus. Barbituriques, analgésiques, tranquillisants passent facilement la barrière placentaire et affectent le système nerveux central. De même le contact visuel mère-enfant ne devrait pas être retardé par les instillations de gouttes oculaires. Cette pratique abandonnée dans certains pays devrait tout au moins être retardée.

— *L'importance du contact mère-enfant immédiatement après la naissance.* L'importance de la période du post-partum pour le développement de l'enfant a été vérifiée. C'est une phase critique qui imprime une marque définitive aux liens psycho-affectifs qui unissent la mère à son enfant. Les interactions multiples qui s'établissent à ce stade sont déterminantes pour l'initiation de la lactation même si un certain septicisme se fait jour sur les effets à long terme de cette relation.

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