Michael E.K. Moffatt, MD, FRCP(C)

Nutritional Problems of Native Canadian Mothers and Children

SUMMARY

Nutritional deficiencies are still all too common in Native Canadian women and children. Protein-calorie malnutrition is rare, although the 1972 Nutrition Canada Survey found low intakes of these nutrients in many pregnant Native women, especially among the Inuit, who still have a high (8%) incidence of low-birth-weight infants. Clinically, we still see a great deal of iron deficiency and, although it is less common, of vitamin D-deficiency rickets in infants and toddlers. Breastfeeding rates are 50% or less at six months, and prolonged use of the nursing bottle contributes to iron deficiency and dental caries. Fluoride is not present in the water supply of most Native communities and must be given to combat dental caries, which is rampant in some areas. In adolescents we begin to see signs of overnutrition, with noticeable obesity that is highly prevalent in adults. The ultimate solution to these problems is improved economic circumstances and education. In the meantime, however, physicians treating Native patients must become familiar with the local circumstances. (*Can Fam Physician* 1988; 35:377–382.)

Key words: Native health, nutrition, malnutrition

RÉSUMÉ

Les carences alimentaires sont encore beaucoup trop fréquentes chez les femmes et les enfants autochtones du Canada. La carence en protéines est rare, bien qu'en 1972, une enquête effectuée par Nutrition Canada a constaté un déficit alimentaire de ces nutriments chez de nombreuses Autochtones enceintes, principalement chez les Inuits dont l'incidence de nouveau-nés de faible poids était de 8%. En clinique, les anémies ferriprives sont fréquentes et, à un degré moindre, les rachitismes par carence en vitamine D chez les nourrissons et les enfants en bas âge. Six mois après la naissance, l'alimentation au sein ne dépasse pas 50% et l'usage prolongé de la bouteille contribue à la carence en fer et aux caries dentaires. La majorité des communautés autochtones n'ont pas de système de fluoration de l'eau et il faut donc ajouter du fluor en prévention des caries dentaires dont l'incidence est particulièrement élevée dans certaines régions. Chez les adolescents, nous commençons à voir des signes de suralimentation alors que, chez les adultes, il existe une forte prévalence d'obésité. La solution ultime de ces problèmes passe par l'amélioration des conditions économiques et de l'éducation. Dans l'attente de ces conditions favorables, les médecins qui traitent des Autochtones doivent se familiariser avec les circonstances locales.

Dr. Moffatt is a pediatrician in the Departments of Pediatrics and Child Health, and Community Health Sciences at the University of Manitoba. He is also Director of the J.A. Hildes Northern Medical Unit, which provides general practitioner and specialist services to 22 Native communities in Manitoba and the Keewatin district of the N.W.T. He chairs the Canadian Pediatric Society's Committee on Indian and Inuit Health. Requests for reprints to: Dr. Michael E.K. Moffatt, Director, J.A. Hildes Northern Medical Unit, The University of Manitoba, 61 Emily St., Winnipeg, Man. R2E 1Y9

SIGNIFICANT nutritional problems still exist in the Native Indian and Inuit population of Canada, and these problems sometimes go unrecognized by clinicians. Protein-calorie malnutrition is now rare, but this paper will address some of the more subtle nutritional deficiencies in mothers and children.

The past four decades have seen major changes in the way that Canada's Native people live. Traditional activities have decreased in importance, and the gathering and processing of traditional foods are no longer major activities in many Native communities, especially south of the 60th parallel. People spend more time in communities rather than out on the land, and most practise a "cash economy", purchasing the bulk of their food in stores. There has also been a trend to urban migration from many Native communities. With increasing education and work skills, some Native people have successfully adapted to the urban environment. However, particularly in Prairie cities, a large population of unskilled

Native people has sprung up. These people subsist in the core area of the cities and are subject to nutritional problems similar to those of Native people living on reserves.

Clearly there is tremendous variation in the level of nutritional problems among communities and among groups of people living in the same community. Overall the socioeconomic status of Native people has improved in the past decade. Some communities are actually well to do and have high employment rates. Unfortunately most do not. Physicians treating Native patients must have first-hand knowledge of the community and cultural backgrounds of their patients in order to know whether nutritional deficiencies are to be expected.

Nutrition of Women in the Childbearing Years

The Nutrition Canada Survey[1] carried out between 1970 and 1972 provides the most comprehensive background information on Indian and Inuit nutrition. This project was originally conceived to survey a stratified random sample of Native people across Canada, but a very high nonparticipation rate made the findings less conclusive than they might have been. It seems likely that the bias was in the direction of underestimating nutritional problems. Unfortunately, there has been a dearth of research since 1972. Undoubtedly nutrition has improved in many regions, but the same problems that existed almost two decades ago still exist.

Nutrition Canada found evidence that pregnant Indian and Inuit women frequently had total caloric intakes in the borderline range, with 18% ingesting <20 kcal/kg/day. The degree of caloric deprivation was greatest in Inuit women and was often considered severe enough to retard fetal growth. The 1973 Perinatal and Infant Mortality and Morbidity Study of the N.W.T.[2] found that Inuit mothers had an 11% rate of low-birth-weight (LBW) infants. By 1983[3] this rate had fallen to 8%, but still exceeded the national rate of 5.8% (Statistics Canada, 1982) and the Indian rate of 4.5%. Although nutrition is not the only factor involved in the continued high rates of LBW among Inuit women, it likely has some effect. Why Indian women, who also had low caloric intakes, according to Nutrition Canada, have few LBW infants has not been conclusively determined. One theory suggests that the difference might relate, at least in part, to high rates of gestational diabetes among Indian women that have so far not been seen among the Inuit.

Nutrition Canada also found inadequate intake and serum levels of vitamin C in 30%–50% of Native women in their childbearing years. In the traditional Native diet, vitamin C was supplied primarily by dried and smoked fish and meat, supplemented by berries in season. This food is no longer available in large quantities, and the major source of vitamin C are imported fruits and vegetables, which are variable in quantity and quality. Nevertheless, clinical scurvy is extremely rare, although I have seen two cases in children in the past decade.

Iron deficiency is the most common nutritional problem of pregnant women. Nutrition Canada found that one-third of Native women had poor iron stores as compared with only 19% of the national sample. When these data were re-analysed several years later,[4] the Native figure was revised to about two-thirds. Since iron is stored in large quantities by the fetus during the third trimester of prenatal development, inadequate iron intake can lead, theoretically, to poor fetal iron stores, although whether this happens except in extreme cases is debated.[5] The transport of iron across the placenta appears to be very efficient.

Expectant mothers' intake of vitamin D and calcium is another concern. Nutrition Canada found that 36.6% of pregnant women had a calcium intake of <500 mg/day, an amount that is considered inadequate. A further 34.6% had intakes in the borderline range of 500 mg–700 mg/day. Fifty-five per cent of pregnant Native women had dietary vitamin D intakes of <150 IU/day, and only 14.1% had intakes greater than the recommended daily allowance (RDA) of 400 IU/day. Poor dietary intake of vitamin D can be compensated for by sunlight exposure of the skin, but in Northern communities the long hours of darkness in the winter and the "dress code" of traditional culture along with the prevalence of insects in the summer limit the amount of exposure possible. It therefore seems certain that many infants, especially those born in the late winter and early spring, begin life with low stores of vitamin D.

The Nutrition Canada Survey also documented inadequate intakes of vitamin A and folate in pregnant Native women, although clinical correlates are rarely seen.

Clinical recommendations

Physicians providing prenatal care to Native women must be aware of the socioeconomic status of these clients and the prevalent nutritional problems in their community. Dietary counselling is frequently unavailable, but it should be used where possible. Physician teamwork with local public health nurses and social workers can provide a clearer picture of the dietary constraints under which a client lives and can sometimes help to secure additional financial aid. The routine use of standard prenatal vitamin and mineral supplements fortified with iron (preferably ferrous sulphate 320 mg) is recommended. These supplements must be provided cautiously, however, in areas where suicide by overdose is common. In recent years prenatal vitamins with iron have been used to make suicide attempts by adolescents and young women in some Native communities. Where there is a risk, I recommend prescribing only one week's supply and making frequent follow-up checks.

Nutritional Status of Infants and Young Children

The major nutritional issues in Native infant feeding and accompanying clinical recommendations are as follows.

Breast- versus formula-feeding

Several studies have shown that breastfeeding has a protective effect against infectious diseases and episodes of hospitalization for Native children in various regions of the country.[2,6,7] The weight of evidence suggests that breastfeeding is the optimal method of nourishing all children. Unfortunately, bottle feeding became widespread in Native communities during the 1950s, largely as a result of the influence of health professionals and other outsiders who, accepting the prevailing wisdom of the time, believed that formula was equivalent to human milk. It has

proved much easier to influence breastfeeding negatively than positively.

Native communities do exist where traditional values prevailed and breastfeeding rates never dropped. Examples include most of the Inuit communities and some Indian bands such as the Island Lake Band in Manitoba. By contrast, breastfeeding almost disappeared in many Indian communities in the 1960s.

As a result of considerable public health effort aimed at promotion of breastfeeding, both the number of fully or partially breastfed babies and the duration of the period of breastfeeding improved between 1962 and 1983.[3] This improvement is shown graphically in Figure One. There is reason to believe, however, that again the National Database may have overestimated good nutritional habits because of a selection bias. Even if we assume that these figures are correct, there is still considerable room for encouraging breastfeeding. There are regions with low breastfeeding rates and individual communities from which breastfeeding has practically disappeared. The Canadian Pediatric Society[8] has gone on record as recommending that hospitals which serve Native maternity patients be especially active in promoting breastfeeding and eliminating factors that might discourage it, such as supplementation, lack of rooming-in, and distribution of free samples of formula to mothers on discharge. Physicians should be cautious, too, about discontinuing breastfeeding because of physiologic jaundice unless bilirubin levels are approaching exchange-transfusion levels.

When formula feeding is chosen, economic constraints enter into the equation for Native people in remote areas, where there is a tradition of using evaporated milk both for infant formula and household uses. One tin of concentrated humanized infant formula (e.g., Enfalac, Similac, SMA) may cost as much as $4 in the most remote Native communities and nearly always costs at least twice as much as evaporated milk. For low-income families the cost of humanized formula is prohibitive. Moreover there has never been a randomized controlled clinical trial that compared evaporated and humanized milk formulas. The only comparison was undertaken in 1959, by Marsh and colleagues,[9] in a study that non-randomly compared iron-fortified milk formula with a standard (non-iron fortified) prepared formula and an evaporated milk formula. Results showed that there were essentially no differences between the last two types with respect to infant weight gain, hemoglobin, and gastrointestinal problems over a nine-month follow-up period. Readers could, however, extrapolate from the published graph a suggestion that serum-iron levels fell slightly more quickly in the group of infants fed evaporated milk formula, perhaps leading to earlier subclinical iron deficiency. Had the study continued past nine months, it is possible that higher levels of anemia would have appeared in the group fed evaporated milk, but this possibility is highly speculative.

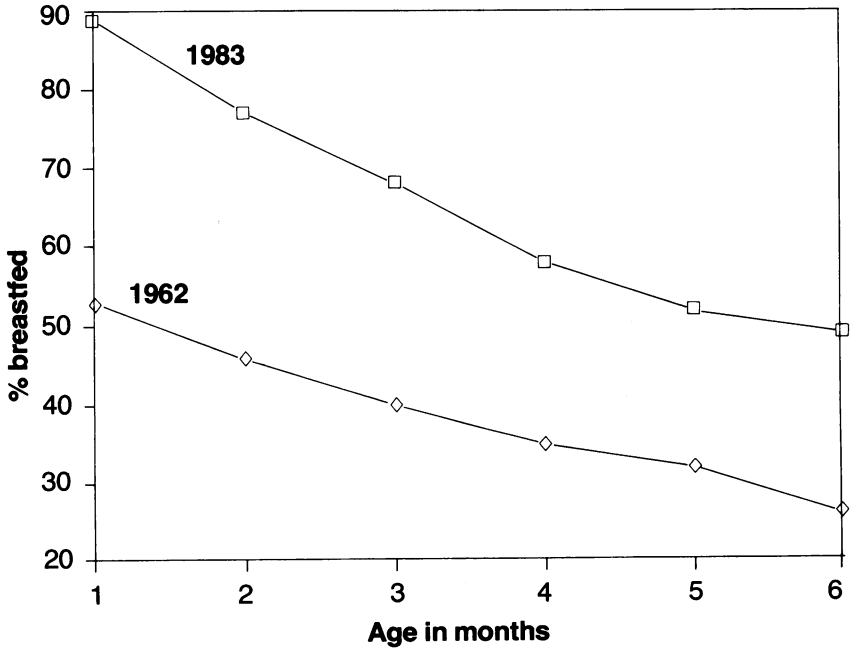
Theoretical advantages of prepared infant formulas include a lower protein content, a lower solute load, more complete vitamin supplementation, and a fat content more closely resembling that of human milk. However, because of the lack of evidence that evaporated milk is inferior to human milk and the aforementioned economic considerations, the Canadian Pediatric Society Committee on Indian and Inuit Health has been unwilling to make a blanket recommendation that all bottle-fed Native infants should be fed humanized formulas. Experience has also shown that when formula is provided free of charge, the breastfeeding rates fall. Thus, until the economic situation of Native people improves substantially or some method of subsidization is achieved to provide humanized formulas for infants in remote areas, it is likely that evaporated milk will continue to be used for infant feeding.

A particular cause for concern is the result of a recent survey[10] conducted by a medical student at the University of Manitoba, showing that more than half the mothers using evaporated milk were mixing it incorrectly. Physicians must know what advice to give patients, and this knowledge is no longer taught in medical schools. Table One is taken from a useful publication entitled "Feeding Babies"[11] that is full of this and other practical tips. This booklet is distributed to parents and health-care professionals by the Department of National Health and Welfare.

Prolonged use of nursing bottle and consequent problems

Native children often continue to use the nursing bottle until they are two or three years old. Unfortunately, it is not uncommon to see a baby

Figure 1
Indian Breastfeeding rates, 1962 in contrast to 1983



Source: See Reference 3.

who has been successfully breastfed being weaned to the bottle and continuing bottle feeding to this age. The bottle becomes the line of least resistance and the easiest method of pacifying an irritable child. A wide variety of fluids are used in the bottle, including solutions made from fruit crystals and highly sugared tea. This practice has two major detrimental effects. First, it suppresses the child's appetite for more nutritional foods, and secondly it contributes to the problem of nursing-bottle caries. Allowing a child to fall asleep with the bottle increases the risk of dental caries, as the suction created allows sugary liquids to coat the posterior surfaces of the upper incisors for hours at a time. Another theoretical objection to allowing a child to take the bottle to bed is a possible increase in the risk of otitis media, a disorder that is highly prevalent in some Native communities. Two decades ago Wittenborg and Neuhauser[12] demonstrated radiologically that when the bottle is taken in the supine position, milk enters the middle-ear cavity. However, a relationship between clinical otitis and supine feeding remains unproven.

From a clinical point of view, mothers should be encouraged to stop giving the bottle to their babies when the latter are about 12 months old and to replace the bottle with milk from a cup, starting when the babies are about nine to 10 months old. A balanced diet of solid foods given on a regular basis is important to the baby's welfare, and this need is often poorly understood.

Iron deficiency

The incidence of iron deficiency in infants and toddlers is extraordinarily high in some Native communities. The sampling bias in the Nutrition Canada Survey combined with the use of an unusual method of grouping the infants by age, probably resulted in a significant underestimate of the peak rates of iron deficiency that occur in babies between six and 18 months old. The Survey did not take blood from children under one year, and it grouped the results recorded for children one to four years of age. Nevertheless, 40% of the Native children in this age group had abnormal serum ferritin values. Using different criteria, Coodin and colleagues[13] in 1972, found anemia in 20% of preschool children in Cross Lake, Manitoba. As recently as 1985, we have demonstrated that 33% of children aged six to 24 months, living in Norway House, Manitoba, have hemoglobin values of <110 gm/L and mean corpuscular volume (MCV) values of <73, while a further third of the children had a low MCV with normal hemoglobin, a condition suggesting subclinical iron deficiency.[14] Cross Lake and Norway House are two fairly similar Cree communities 80 km apart, with large populations (3000–3500), high unemployment rates, and limited breastfeeding practices. Evaporated milk is the infant food of choice. It is safe to say that in spite of a fairly intensive (by Northern standards) level of medical services, little progress has been made in the past 15 years in reducing iron deficiency, at least in these two communities, and there are many others that are very similar.

The factors that contribute to iron deficiency certainly include prematurity and low birth weight. Breastfeeding protects against iron deficiency because of the high bioavailability of iron in breastmilk. Evaporated milk may constitute a risk factor, but there is no *a priori* reason why it should cause anemia if the introduction of solid foods is carried out appropriately. Iron-fortified cereal should be introduced into the diet of infants between four and six months and used regularly. We have found that solids are often introduced early but are not given on a consistent basis as the child grows older. Excessive feedings of evaporated milk satisfy the baby's caloric needs. Our current recommendation is to start all LBW babies on prophylactic ferrous sulphate drops 2 mg elemental iron per kg body weight within the first two

Table 1
How to Mix Evaporated Milk Formula

	Infant's Age	
Formula	**0-6 mos**	**7-12 mos**
Evaporated whole milk	200 ml	300 ml
Cooled boiled water	400 ml	300 ml
Sucrose or dextrose	30 ml (2 tbsp.)	–
Total volume	600 ml	600 ml

Figure 2
Nursing Bottle Caries in a Pre-School Child

Note the decay of the upper incisors and canines.

weeks of life. We measure the hemoglobin of all formula-fed babies at six months of age and liberally use ferrous sulphate drops as indicated. If dispensed one bottle (50 mL) at a time, ferrous sulphate carries very little risk of poisoning for the baby or for other family members. Close follow-up and public health tracking is essential for the family of any infant who has shown evidence of iron deficiency. There is a theoretical risk that iron deficiency may affect infant behaviour. The literature on this subject has been reviewed by Lozoff.[15] While this relationship must be considered unproved, it would have very serious implications.

Vitamin-D deficiency rickets

In the late 1960s vitamin D was added to most milk and dairy products sold in Canada, and vitamin D-deficiency rickets virtually disappeared. However, as Haworth and colleagues[16] recently reported, there has been a steady stream of cases in Manitoba over the past 15 years, and they have almost all occurred in Native children. Anecdotal reports suggest that sporadic cases also occur in Native children in the northern parts of the Western provinces and in the N.W.T. In Manitoba a particularly heavy concentration of cases occurs in the Island Lake area, near the Ontario border. In this tribal area with its 5000 population, 12 new cases were recognized last year. The babies affected usually present after 12 months of age with tibial bowing, rachitic rosaries, and sometimes seizures and tetany. Although we do not fully understand all the risk factors operative, we suspect that low sunlight exposure and prolonged breastfeeding may contribute. Intake of dairy products by adults is minimal, and expectant mothers do not always comply in the matter of taking prenatal vitamin supplements. Thus a baby born in early spring may have very low vitamin D stores at birth and, if breastfed, may fairly rapidly become vitamin D deficient if supplements are not given. Getting this message across to the community without giving people the impression that breastfeeding is harmful may prove to be a real challenge. Recently the Canadian Pediatric Society Committee on Indian and Inuit Health issued a statement[17] recommending that Native infants who are breastfed should have supplements of at least 400 IU vitamin D daily, year round, and that this amount may be increased to 800 IU in winter. The statement also recommends that children over the age of two years who do not drink milk in reasonable quantities be given 400 IU vitamin D throughout the winter months.

Fluoride and dental caries

Most Northern communities have water supplies low in natural fluoride, and artificial fluoridation is too expensive for small communities to undertake. Thus most Native children are not receiving fluoride, and this fact is often forgotten by the health-care providers who were trained in urban centres, where fluoridation is the norm. Dental caries is extremely common, and fluoride supplementation from birth is indicated. The recommended dose is 0.25 mg for the first two years of age. Standard vitamin and mineral preparations have been reformulated in recent years to contain this dose. Fluoride supplements in appropriate doses are recommended for all Native children, at least until they reach school age.

Nutritional Problems in Adolescents

Like their counterparts in the south, Native adolescents are prone to eating "junk foods" that are high in calories and refined carbohydrate and fat. Iron deficiency is seen particularly in girls. Obesity starts to become common, and the rates become very significant in early adulthood. This development is closely related to the new morbidity of Indian people, which includes diabetes, hypertension, and cardiovascular disease, disorders that were extremely rare four decades ago. In general, the Inuit people have not yet begun to suffer from these conditions.

Figure 3
Rickets in a Toddler

Note fraying and cupping of the distal ends of the radius and ulna.

Conclusions

During the past four decades most Native communities have made a transition from a diet high in country foods to one predominantly imported and purchased in stores. The traditional Native diet was surprisingly well balanced, although Native peoples were subject to periods of famine if the game sources failed. A steadily increasing amount of income support has made protein-calorie malnutrition a rarity, but other problems have become apparent. Artificial feeding of infants has contributed to iron deficiency and bottle caries. In more traditional communities, where breastfeeding is still common, the loss of certain country foods has probably left mothers deficient in vitamin D, and this circumstance may have led to a resurgence of rickets.

Obesity, which has become a major problem of Indian adults, also has its onset in childhood. Poverty is an important factor in the poor nutrition of mothers and children. Nutrition education at all levels would help to alleviate the situation, since we have shown that children receive adequate total amounts of calories. There is certainly a need for more research both of a descriptive and of a therapeutic nature.

Physicians treating Native patients must be aware of the risks relative to the community from which their parents come. They should also be aware that it is dangerous to generalize, and that there are many Native women and children who have little or no chance of developing nutritional problems. Physicians working in the North should be advocating the provision of more resources for nutritional counselling, preferably in the from of fully qualified Native people whose advice might be more culturally appropriate than that of non-Native strangers to the communities. The resolution of nutritional deficiencies, which are inappropriate in a country as rich as Canada, will require a general increase in knowledge and in purchasing power. To achieve both of these advances will take time. ■

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