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Requirements of the nutrition during weaning food

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Abstract
Current Weaning recommendations are based on nutritional need, physiologic maturation, and the behavioural and development aspects of infant feeding. Inadequate energy and protein intake and deficiencies of iron, zinc, and vitamin A and vitamin D are the most commonly observed nutrient deficiencies during infancy and weaning recommendations have focused on their prevention. Although breast milk is adequate to meet the energy and nutrient requirements of an infant up to four to six months of age, thereafter it is insufficient to sustain normal growth and needs to be supplemented with other foods, such as weaning foods. However, the capacity of a weaning diet to meet the protein and energy requirements of infants depends on its nutritional quality as well as its dietary bulk. The high-volume/high-viscosity character of many commercially available weaning foods is a major constraint in providing children with enough calorie density. An attempt was made to formulate low-cost, nutritive but bulk-reduced weaning foods using sorghum malt, green gram malt, and sesame flour. The formulations thus prepared were evaluated for functional properties such as particle size, water absorption, dispensability hot-paste and cold-paste viscosities, colour, and nutritive value with respect to calories, vitamin C, minerals, and available lysine. A weaning food containing 60% sorghum malt, 30% green gram malt, and 10% sesame flour was found to have satisfactory functional characteristics and nutritive value and is recommended.

Keywords: Children, weaning practices, breast feeding, supplementary feeding, food, nutritional, low-cost

Introduction
The mother's milk is the best gift nature has provided. It is complete nourishment for babies. At the time of breast feeding, the child can be close to the mother while having feed. Exclusive breastfeeding means feeding the infant, only mother's milk and no other liquid or solid food except any medicine and vitamin/mineral as supplement. The World Health Organization recommends the practice of exclusive breastfeeding of infants for the first 6 months after birth and to continue breastfeeding with supplementary diet up to two years or more. Initiation of breastfeeding within one hour of birth, practicing exclusive breastfeeding for 6 months is the simplest, healthiest and least expensive feeding method that fulfils the infant's needs for nutrition and growth and it also reduces child morbidity and mortality. For child survival mother's milk is one of the most important determinants besides breast feeding helps in inter birth spacing and prevention of childhood infections. Breast milk provides nutritive and immunological protection in infants to ensure health and survival. It is known to prevent adult-onset disease like coronary artery disease, diabetes and hypertension. (Mishra *et al.*, 2014) [1].
During in the first six months of a child's life, only mother's milk (exclusive breast feeding) can reduce under-five mortality by 13% in developing countries as estimated by the United Nations Children's Fund (UNICEF). Malnutrition causes 35 % of disease burden on children under the age of five. In fact, the best practices in the areas of breastfeeding and complementary feeding are important degree with the ability to save the lives of 1.5 million children under the age of five every year. Globally less than 40% of infants under the age of six months are exclusively breastfed although breastfeeding is a common practice in India, but there are influences of some cultural beliefs resulting in unsafe practices like prelacteal feeds (e.g., ghee, honey) and discarding colostrum etc. which affects the new-born's health. Besides cultural beliefs, several factors like maternal employment outside home, gender equity, lack of knowledge on breast feeding, social pressures and illness among the lactating mothers, easy availability of infant milk formulae and aggressive marketing by the commercial preparations

Having an impact on lactating mother's psyche. Though the ideal time to educate the women about the merits of breast feeding, is pre-pregnancy or during antenatal period, few receive counselling during pregnancy and most of them after failed lactation. An appropriate diet is critical in the growth and development of children especially in the first two years of life. Malnutrition during the first two years of life results in an irreversible impairment in attaining full potential of physical growth, brain development, and health status of children. The rate of malnutrition is very high in infants and young children from six months of age onwards, when breast milk alone is no longer sufficient to meet a child's nutritional needs, foods other than breast milk are introduced gradually into the baby's diet, first to complement breast feeding and progressively to replace it and get the child used to adult diet. This study aimed to find out the different supplementary weaning practices adopted and find out the nutritional status of the infants aged (6 months – 2 years). (ICMR 2017).

Weaning foods

Weaning food Breast milk is the best food for new-borns and the most suitable food. Although most Indian babies are breastfed during the first 6 to 8 months of life, not everyone has a healthy mother who can provide adequate nutrition, which in turn increases the demand for weaning food. Breast milk is the best food for new-borns and the most suitable food. Although most Indian babies breastfeed during the first 6 to 8 months of life, not everyone has a healthy mother who can provide adequate nutrition, which in turn increases the demand for weaning food. The semisolid food given to the child at this stage is usually defined as weaning food it is prepared by processing ingredients to improve digestibility and nutritional quality. It is classified as a ready-to-eat food. Its preparation is simple, convenient, easy and fast. Weaning food supplements with high protein content, high digestibility and high energy density must be prepared from readily available low-cost raw materials. This weaning food can be used to meet the needs of growing children, thereby reducing malnutrition in developing countries. Processing techniques used for formulating complementary foods, roasting, soaking, fermentation and sprouting these techniques enhance the bioavailability of micronutrients by decreasing the antinutritional factors and improving overall digestibility and absorption of nutrients also reduce the high bulk of complementary food with reducing the viscosity. (Satter *et al*, 2013) [21].

Extruded weaning foods are made from a combination of cereals and legumes to produce the correct protein and energy content for growing children. The extruded product may also be fortified with minerals and vitamins. The process produces highly soluble, fully gelatinised flakes or pellets that can be ground to a powder and rehydrated with hot water to form a porridge that is fed to children. The high temperatures used in the extruder ensure that pathogens are destroyed and the products are microbiologically safe. The low water activity ensures a shelf-life in excess of 12 months when packed in moisture proof and airtight packaging. Other weaning foods include ready-to-eat 'rusk' products that resemble aerated biscuits and are designed to dissolve slowly in saliva when eaten by children. The process is particularly suitable for production of both commercial weaning foods and those designed as emergency or aid foods in developing countries. Development of these foods is described for example by (Milan-Carrillo *et al.,* 2007).

Weaning food is eaten

Weaning from breastfeeding is the process of switching a baby's diet from breast milk to other foods and drinks. In developing countries, child malnutrition is common because infants at this stage of development need higher energy and protein to meet their increasing metabolic needs. Traditional weaning in simple words involves pureeing and mashing foods to make it a little easier for babies to swallow the solids. It begins with offering the child with different tasting foods using a spoon. The food initially is mashed or pureed enough for the child to be able to gulp it easy, transitioning from milk to solids. Actually, Nutrition in early life is the main determinant of healthy growth throughout childhood and health in adulthood. (Vishakha Singh 2018)

Requirements of nutrients in weaning foods

The chief carbohydrate in milk, lactose, helps in the absorption of calcium and phosphorus and in maintaining normal intestinal micro flora. Other carbohydrates commonly added to infant feeding mixtures are sucrose, malt-dextrin mixture, invert sugar syrups, and dextrose (Swaminathan 1975). The amount of increase in fasting blood sugar after the ingestion of different carbohydrates is in the following order starting with the highest: glucose, dextri-maltose, honey, sucrose, fructose, and lactose. Sucrose is common added because it has advantage of being digested and absorbed more rapidly than lactose, although less rapidly than glucose and maltose, honey, sucrose, fructose and lactose. Sucrose is commonly added because it has the advantage of being digested and absorbed more rapidly than lactose, although less rapidly than glucose and maltose. Because it is too sweet, a mixture of dextrin-maltose and sucrose could be used. The United Nations proteins advisory group suggests an upper limit of 5% crude fiber in supplementary foods. The protein content in milk cereal blends of follow up formulas and weaning foods as recommended by the Codex Commission should be 3.0 to 5.5 g/100kcal (John willey and sons 1975) [17].

Linoleic acid is a dietary essential, and its deficiency in infants may cause drying and flaking of the skin, poor growth, and lowered resistance to infections (Krause MV Mahan 1984) [18]. The minimum requirement for linoleic acid is 4.5% of the calories consumed. The desirability of adding vegetable oils rich in polyunsaturated fatty acids (PUFAs) to increase the linoleate content of infant formulas is well established. PUFAs play a nutritional role in the development of the central nervous system during infancy. With an increase in the level of unsaturated fatty acids in the formulations, the products become more susceptible to oxidative deterioration. The higher ambient temperatures in tropical countries bear a special significance with respect to oxidative changes in PUFA-rich products. Methyl siloxane is therefore used as an antioxidant. The oxidative stability of vegetable oils is on the order of those of milk fat and coconut oil, which are greater than that of palm oil, which is greater than that of groundnut oil, which is greater than that of safflower oil. Dried skim milk increases the oxidative stability of groundnut oil, decreases that of palm oil, and has no effect on that of coconut and safflower oil (Thompksin DK Mathur 1986) [19].

Iron is one of the most important mineral requirements of infants. The amount of iron storage at birth depends on the adequacy of the mother's diet, the length of gestation, and the amount of blood received by the baby. The infant born at term of a healthy, wellfed mother will maintain a good

haemoglobin level at least up to six months of age. If the infant receives some iron-containing foods daily after the fourth month of life, probably no other supplements will be necessary. It is thought to have an inhibitory action on epilepsy and has been used to reduce seizures. Its inhibitory action can also help counteract anxiety and stress, especially when it is combined with histidine and glycine. Supplementation of weaning foods with taurine improves fat absorption and leads to increased growth in terms of both weight gain and bone growth. The biologic functions of taurine are bile acid conjugation, reduction of platelet aggregation, enhancement of cardiac contractility, enhancement of growth, and enhancement of insulin activity. As regards its influence on the heart, taurine acts as an antiarrhythmic agent, an osmotic agent, and a hypotensive agent (Hays KC, Young VR 1988) [3]. Weaning foods with improved nutritive value can be prepared by using cereal-legume blends, fermented and germinated cereals, and legumes. Weaning foods could be improved by using flours that complement each other in such a way that the pattern of amino acids created by this combination is similar to that recommended for infants (Lutter KC, 2000) [8].

Development of weaning foods

Malting of cereals and legumes

The process of malting has many technological and nutritional advantages for weaning food preparation. Finger millet or ragi (Eleusine coracana) and green gram (Phaseolus radiatus) possess some special characteristics with regard to their malting qualities and suitability for preparation of weaning foods. Malting of ragi does not pose problems such as mold growth as is observed with jowar (Sorghum vulgare) or bajra (Pennisetum typhoideum). Ragi malt has an acceptable taste and desirable aroma, and it keeps well. Ragi contains high levels of calcium, and its protein is rich in methionine. At the household level, the practice followed is generally to germinate cleaned ragi for one to three days, and the sprouted grains are then dried, toasted, and powdered to obtain the malt flour. The malt flour is cooked in the form of porridge and fed to the child. This method of preparation of malt flour has a few drawbacks: steeping ragi for less than 10 hours is insufficient to hydrate the grains fully, as required for proper germination; wrapping the soaked grains tightly prevents proper germination or sprouting, because it affects aeration and rootlet development; grinding of roasted germinated grains with the roots and shoots increases the fiber content of the food, and the food tastes bitter; and sieving through a fine sieve results in a very low yield (Malleshi NG 1988).

Chapati/roti-based weaning food

It is better to polish the grains and use the debranned or polished flours for preparation of weaning foods so that the fiber content of the final product is low. Flour from toasted or popped split green gram dal flour alone or a mixture of green gram and Bengal gram flours may be used as legume ingredients. Cereal flours blended with toasted green gram flour in the ratio of 70:30 or 70% cereal flour mixed with 20% toasted green gram dal flour and 10% popped split chickpea dal flour should be used for making roti. Popped chickpea flour improves the palatability of the food. Fresh roti, which contain 25% to 35% moisture, can be soaked in milk to soften them or mashed to give to the child immediately after preparation. Chapatis dried hygienically in the sun or on a baking pan can be powdered, packed, and stored in tins for use. When the powdered meal is added to milk or water and cooked, a paste is obtained. The addition of milk powder to the dry food enhances its taste and nutritive value (Malleshi NG 1988).

Vermicelli-based weaning foods

Generally, vermicelli is prepared from wheat rice, jowar, maize, or millet flours. Vermicelli can be prepared from a blend of polished cereal and legume flours to give a very nutritious product. Dough prepared from the mixture of flours should be steamed and extruded through a perforated die of a hand-operated press. The strands are called vermicelli. Alternatively, the dough may be extruded and the strands steamed or cooked. For storage, the strands can be dried with hot air. The dried vermicelli should be powdered and stored. The food mixes well with water or milk and becomes a soft mass. Jowar and rice are more suitable ingredients (Malleshi NG 1988).

Sattu

Sattu is a mix of Bengal gram, wheat and jaggery (crude brown sugar). the Bengal gram and wheat are usually combined in a 1:3 proportion. Jaggery is added as required. For Food Mix, wheat and Bengal gram are roasted and powdered separately, then mixed and stored. To prepare sattu as porridge, the required amount of jaggery dissolved in 220 to 240ml of warm water and 30 to 50gm sattu mix is added and mixed well. Sattu of improved nutritional quality Bengal gram dal, green gram dal, wheat, soyabeans and groundnuts has been attempted (Rohini D, Boralkar MA 1999).

Conclusion

Current weaning recommendations are based upon nutritional need, physiologic maturation, and the behavioural and developmental aspects of infant feeding. Inadequate energy and protein Intake and deficiencies of Iron, zinc, vitamin A, and vitamin 0 are the most commonly observed nutrient deficiencies during Infancy and weaning recommendations have focused on their prevention. Weaning foods with good protein quality and energy density can be prepared by processing a variety of raw materials.

There appears to be no awareness on the part of the mother regarding the infants, quantitative food needs during the second half of infancy. Milk and weaning foods are likely to be contaminated, thereby resulting In Increased. Diarrheal morbidity and hence impaired growth. However traditional foods and 31 preparation methods do exist which could be explored as a means of providing Pakistani infants with safe foods of high energy and nutrient density.

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