



BIOMECHANICS OF COMPLEMENTARY FEEDING- A REVIEW ARTICLE

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ABSTRACT:

An appropriate diet is critical in the growth and development of children. WHO recommends exclusive breastfeeding for infant and children up to the age of six months; timely initiation of feeding solid, semisolid foods from six months onwards. The transition from infant to mature swallowing proceeded after 6 months, aided by the maturation of neuromuscular elements. There is also a debate about the risk of early introduction of complementary food to the development of dental caries. In this article, we will summarize how the body adapts changes related to accepting non-milk products for the very first time as complementary food.

KEYWORDS:

COMPLEMENTARY FOOD, WEANING, SWALLOWING, INFANT NUTRITION.

INTRODUCTION

Complementary feeding refers to the time when breastfeeding is supported by liquids and semi-solid foods. It has nutritive as well as non-nutritive aspects. It is the process of giving an infant other foods and liquids along with breast milk or non-human milk. This food complements rather than replace breast milk. ⁽¹⁾ It is a process in which infants are gradually accustomed to an adult diet. Sometimes, it is also replaced by the term weaning food, supplementary food, or transitional food. It should be in ideal quantity, quality, and frequency to fulfil the daily energy demands for appropriate growth and development of the child. ⁽²⁾ A 6 to 12 months period is a critical time for the child's developmental trends of occlusal and swallowing methods. Biomechanics is the science of movement of the living body, in this article, we will discuss how an infant's body will prepare to accustom to changes related to introducing the complementary food. Muscle's kinematics are changed simultaneously with the

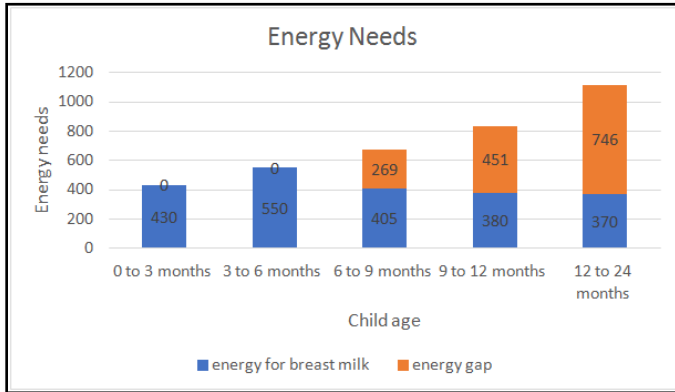
food texture. ⁽³⁾ Appropriate parental education is needed to avoid common mistakes which are usually transient but that sometimes can lead to lengthier situations that are more difficult to resolve.

THE NECESSITY TO START COMPLEMENTARY FEEDING

Breast milk is sufficient to promote the growth and development of an infant till 6 months of age. As the child grows breast milk alone falls short of providing the full nutritional requirements and optimal growth. The energy and nutrients gap appears after 6 months and it widens thereafter. Child's daily physical activity increases and simultaneously the amount of energy he/she needs also increase. Certain development and behaviour make the child ready for other food, he can hold a solid object, his chewing movement starts, and his tendency to push solids out decreases. A child develops neck/head control and hand-to-mouth coordination. Eruption of the teeth begins

at the age of 6 months and biting movement start. When it comes to digestive point of view, infant's GI system is not same as adult's GI system, the concentration of pancreatic Alpha Amylase which is needed to digest starch is 1.6% of the adult concentration at birth. (4)

The side-to-side movement of the tongue develops within 8-12 months. The introduction of complementary feeding at around 6 months is the ideal time or "sensitive period". If the introduction of complementary feeding is delayed, then the child may enter a "critical period" after which the infant may always be a poor chewer and may be poor in eating solids later. (2)



PHYSIOLOGY OF DEGLUTITION

There is basic three phases of deglutition. First is the oral phase in which suckling or mastication occurs followed by transportation of the bolus to the pharynx. The second is the pharyngeal phase which includes the transport of the bolus through the pharynx. The third phase is the esophageal phase in which transportation of the bolus into the stomach through the esophagus occurs.

In newborns or infants, all four phases are reflexive and involuntary. Only later in infancy, the oral phase becomes controlled voluntarily which is an essential achievement to allow infants to begin to masticate solid food. For biting and chewing to be safe and effective, there has to be an appropriate sensory registration of the food source as well as a coordinated motor response. (4)

AERODIGESTIVE COORDINATION

There have to be some important changes that need to occur in oropharyngeal function for the initiation of complementary feeding. Respiration and swallowing are correlated with each other. As the infant matures and throughout the feeding, the coordination between these two is an important factor in maintaining airway function. This coordination is different before and after the initiation of complementary feeding. If this coordination is disturbed aspiration pneumonia can happen. In healthy adults, swallowing normally occurs during a pause in expiration. There is greater variation in infants, which often swallow just before inhalation. (5) However, this does not rely upon how child acquire liquids, like in bottle or bowl. The infant's ability to digest and absorb protein, fats, and carbohydrates other than those in breast milk

increases rapidly

QUANTITY AND FREQUENCY OF COMPLEMENTARY FOOD

AGE	ENERGY REQUIREMENTS IN ADDITION TO MILK	CONSISTENCY	FREQUENCY	AMOUNT AT EACH MEAL
6 to 8 months	200Kcal/day	Liquid	2-3 times a day	2 to 3 tablespoons per meal
9 to 11 months	300Kcal/day	Chopped or mashed	3 to 4 times a day	Half cup of 250ml
12 to 24 months	550Kcal/day	Solid family food	3 to 4 times a day	1/4 th to a full cup of 250ml

RELATIONSHIP OF COMPLEMENTARY FEEDING AND CARIES

The development of dental caries may be related to carbohydrates in complementary food. (6) In Korean National Health survey 2019, Miyong Yon et al stated, delayed introduction of complementary feeding was associated with a risk of early childhood caries. (7) Rizqi fauzia et al in their study noted high defs score in posterior teeth in children in whom complementary feeding is initiated before 6 months. (6)

CONCLUSION

The introduction of solid foods in the diet requires specific guidelines in the field of dentistry, given the importance of establishing masticatory function by encouraging more consistent, fiber-rich, and dry foods. (8) Changes in food texture and food acquisition occur across the weaning process and influence muscle function and kinematics. Chewing, which starts as the first deciduous teeth erupt, requires solid, dry, and fiber-rich foods to allow the correct development of the Stomatognathic System. Infants should be fed in gradual manner of exposure of the complementary food. Simultaneous changes like neurodevelopment milestone and digestive changes should become mature enough for successful initiation of complementary feeding. (9) Inadequate food transition in the first year of life may cause changes in nutritional status and oral health by impairing Stomatognathic system development.

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