

Nutrition & Malocclusion

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Abstract

Food is the basic requirement for all organisms to survive. It is essential not only from growth and development point of view but also for producing energy to carry out various body functions. Nutrition in simple terms can be defined as a science of nourishing the body properly or analysis of the effect of food on the living organisms. The role of malnutrition in the development of malocclusion has many aspects which range from defective development of the human orofacial skeleton, palatal malformations due to prenatal deficiencies, vitamin deficiency affecting growth of dentition, increased rate of root resorption and the nature of the development of the jaws depending upon the consistency of food intake. This article tries to highlight the role of nutrition in the development of malocclusion which is one of the most important factor in the etiology of malocclusion.

How to cite this article: Jain S, Sinha A, Jain S, Singh DP. Nutrition & Malocclusion. HTAJOC.2018;11(2):35-36

Introduction

Food is the basic requirement for all organisms to survive. It is essential not only from growth and development point of view but also for producing energy to carry out various body functions. Nutrition in simple terms can be defined as a science of nourishing the body properly or analysis of the effect of food on the living organisms. Yudkin^[1] defined it as the relationship between man and his food and implies the psychological and social as well as the physiological and biochemical aspect. Others called it as the science devoted to the determination of requirements of the body for food constituents both qualitatively and quantitatively and to the selection of food in kinds and in quantity to meet these requirements.

Council of food and nutrition of the American Medical Association defines nutrition as- "The science of food, the nutrients and other substances therein, their action, interaction and balance in relation to health and diseases and the processes by which the organism ingest, digest, absorbs, transports, utilizes and excretes food nutritional factors in The Development Of The Human Orofacial Skeleton

It has been shown in animal studies that even short periods of malnutrition have resulted in an increase in anterior open bites, a reduction in dimension of dental arches with inadequate spaces for teeth, insufficient dental eruption.^[3]

The absence of natural diastema between the front deciduous teeth, and shorter roots and interosseous rotation of permanent teeth. Malnutrition has also been associated with shorter mandibles in AP direction, marked reduction in ascending ramus, condylar region, dentoalveolar inclinations in the incisor region and striking reductions in the diameter of third permanent molar.

Radiologic, histologic and histochemical studies have demonstrated such abnormalities in osseous tissues as the reduction of cortex, the enlargement of medullary spaces of diploe, weakening of osteoblastic and osteoclastic activities.

Malformations and Prenatal Deficiencies

Dietary intake of the expectant mother is directly related to the condition of the infant at birth.

a) Cleft lip and palate: Warkany^[4] showed riboflavin deficiency may act as one of the predisposing factor in the development of cleft palate. Evans, Nelson^[5] showed acute folic acid deficiency results in more chances of developing a cleft palate.

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Vitamin A excess can also cause clefts during development of palatal vault, various macromolecular substances like glycoproteins, enzymes and mucopolysaccharides and their precursors, substrates and cofactors are necessary.

Dietary deficiency of these substances are one of the etiologic influences in formation of cleft lip and palate. It has been seen that damage to orofacial osseous structure may be caused when a human fetus is deprived of proper nutrition by interference with the placental transfer of needed nutrients or during infections.

Such embryopathies include trisomies such as Down's syndrome, in which there are orofacial malformations, palatal dysplasias and low insertion of ears. Recent medical studies have indicated that mothers of children with Down syndrome have an imbalance in folate metabolism that may be explained, in part, by a common genetic variation in an enzyme involved in the folic acid pathway.

Future studies are anticipated to see if maternal folic acid supplementation will reduce occurrences of Down syndrome. If this proves to be true, then Down syndrome, like spina bifida, will become yet another disorder found to be influenced by a combination of both genes and environment, rather than just genes alone.

Vitamins in relation to Growth and Dentition

Undesirable modifications of the craniofacial osseous structures have been associated with the ingestion of too much or too little of certain vitamins.

Vitamin A

Deficiency of Vit. A: Causes disturbances in differentiation and positional growth of the developing teeth.

- Defective calcification.
- Retardation of eruption.
- Disturbances of periodontal tissues

Hypervitaminosis A causes:

- growth retardation
- marked softening of skull due to decreased Ca deposition

Vit A as a Teratogen

It is shown to slow the migration of neural crest cells maintained in vitro by inhibiting their interactions with extracellular matrix products.

Defects analogous to Treacher Collin Syndrome or Hemifacial microsomia can be produced by varying dose of Vit. A between 50,000-100,000 I.U

When pregnant rats are fed high doses of vitamin A during 8-10 days of gestation, facial malformations (including cleft palate) result but the limbs develop normally. When they are fed the vitamin during day 11 or 12 limb malformations result and facial disturbances are minimal. This is due to the defective migration of neural crest cells due to increased vitamin A.

Vitamin B-Complex (Folic Acid)

Defects of neural tube closure result in various malformations or the spontaneous

abortion of the foetus. Failure of closure of the cranial neural pore results in malformations, such as anencephaly; failure of caudal pore closure results in spina bifida. Neural tube closure is complete very early in pregnancy when most mothers have barely realized they are pregnant.

The supplementation of folic acid currently recommended to protect against neural tube defects is 0.4 mg per day, twice the current average daily intake for women of 0.2 mg (McNulty, 1995), there being a wide variation in dietary intake.

In humans, drugs which interfere with folate metabolism, for example, phenytoin, are known to have teratogenic effects. These include oral clefts, growth retardation, limb defects, and other craniofacial deformities.^[6]

Vitamin C deficiency:

- Disturbed calcification of teeth.
- Retarded eruption.
- Thickened jawbones.
- Narrow maxilla and Short mandible
- (hypodimensional cranial bases).
- High vault palate.

Vitamin D deficiency:

Retarded dentition along with dysplasia as well as various maxillary problems caused by the exceptional malleability of the osseous tissue and increased susceptibility to muscular traction, facial sutures close with difficulty therefore open bite, transverse hypodimensions and misshapen palate are frequently observed.

Effect of metabolic disturbances:

Depending on the enzyme deficiencies involved, they can seriously impair the functions of suction and deglutition in infants. This can deprive orofacial bones of the positive mechanical stimuli that occur normally as a result of these functions and malocclusion can result.

Phenylketouria: among symptoms of phenylketonuria are hypertelorism and diastema between upper incisors

Diabetes: there is increased resistance to action of insulin in some diabetics due to presence of anti-insulin factor. (Vallance-Owen). Study showed the 15 of 22 mothers with cleft lip and palate had this factor.^[7]

Role of Nutrition in Root Resorption

Marshall et al.^[8] showed that greater degree of resorption is seen in patients with deficient diets though it is of multifactorial origin.

Beck^[9] stated that patients with calcium deficiency were more susceptible to root resorption than normal patients.

Effects of consistency of food

Throughout its various stages of growth mouth is affected by complex system of forces.

Diet that does not supply food of a sufficient hard consistency does not supply adequate stimulus for proper mastication resulting in a narrow maxillary arch- arch collapse syndrome.

According to anthropologic studies, the exertion of the masticatory function has been decreasing in people because of use of softer diets. It appears that these changes caused unfavourable changes in muscle tone and a tendency for skeletal and dental problems to develop. Some authors have proposed- decreased muscle tone can result in weakening of the temporomandibular articulation. So condyle has to bear greater forces leading to heavy bone deposition on its upper and rear portions. Hence the overall development of mandible follows a rotative movement downward and forward.

A dentist named Weston Price, traveled around the world in the early part of the 1900's. He compared the health problems and physical features of people on traditional native diets to people with similar genetic make-ups who had converted to Western diets that included processed foods and refined sugars.

Native Diets--Well developed faces, few dental cavities, normal height, straight teeth, well formed dental palates, well developed jaws, few birth defects and "hereditary" disorders.

Western Diets--Underdevelopment of the mid face, underdeveloped noses, long narrow faces, high rate of cavities, lengthening and narrowing of body (taller and thinner), crowded teeth, malformed dental palates - high arches cleft palates, micrognathia - underdeveloped jaws, wide variety of degenerative diseases and birth defects.

The effect of food consistency on the bone appositional pattern at the growth site in the palatal region of the maxillary complex in growing rats was examined. Sixty inbred male rats aged 14 days in the weaning period were divided into two groups. One group was fed a conventional solid diet in addition to milk, while the other received the same diet but in liquid form in addition to milk. They were weaned at 21 days of age. In rats fed a liquid diet, the amount of bone apposition on the occlusal surface of the palate was reduced in the region between the first molars, but was increased in the region between the third molars, indicating a more anteriorly directed growth rotation of the palate. The width and ossification rate of the synchondrosis of the midpalatal suture was smaller. Furthermore, lateral growth of the maxilla was inhibited considerably in the distal area.^[10]

Thirty 3-week-old male Wistar rats were grouped into a hard diet control group, a kneaded diet group, and a powdered-diet group. After 6 weeks of growth, all rats were killed under deep anesthesia. The effects of dietary physical consistency on the mandible were investigated with respect to morphology and bone mineral content using lateral cephalometric analysis and computed X-ray densitometry.

Gonion (Go), which is a measurement of depth to the X-axis, was significantly less in the powdered-diet group, while the kneaded-diet group showed no significant differences. The most posterior point of the coronoid process (Cr) and the most posterior point of condylar process (Cd), which are measures of height to the Y-axis, were less in the kneaded-diet group than in the control group. In the powdered-diet group, Cr, Cd, Go and Infradentale were significantly less than in the control group. On the other hand, the bone mineral content was significantly lower in the coronoid process and angle of mandible in only the powdered-diet group.^[11]

Conclusion

Food is the basic requirement for all organisms to survive. It is essential not only from growth and development point of view but also for producing energy to carry out various body functions. The role of malnutrition in the development of malocclusion has many aspects which range from defective development of the human orofacial skeleton, palatal malformations due to prenatal deficiencies, vitamin deficiency affecting growth of dentition, increased rate of root resorption and the nature of the development of the jaws depending upon the consistency of food intake. This article tries to bring to light the various parameters of nutrition in the development of malocclusion which is one of the most important aspect in the etiology of malocclusion.

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- Kerela State Dental Conference**
January 4-6, 2019
Colicut Trade Centre, Kozhikod
- Denasia, Rang Dsh Dental Conference**
January 11-12, 2019
Mahatma Gandhi Dental College, Jaipur
- Indian Dental Conference**
January 18-20, 2019
Indore, India
- Famdent Show**
February 16-17, 2019
Auto Cluster Exhibition Centre
Pimpri Chinchwad Pune
- AEEDC Dubai**
February 5-7, 2019
Dubai International Exhibition Centre
- 5th Global AAID Conference**
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Leela Ambience Convention Centre
- 38th IDS**
March 12-16, 2019
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