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Review Article

DIGIT SUCKING AS AN ETIOLOGICAL FACTOR FOR SKELETAL DISCREPANCIES: A REVIEW

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ABSTRACT

Digit sucking or thumb sucking habits are most commonly seen in younger children. These habits continued in their latter part of life and results in minor or major dental and skeletal discrepancies. The affected patients go through the psychological stress because of social factors and pain due to intervention to correct the dental and skeletal problems. There is also a cost burden on the parents. This review highlights the digit sucking as an etiological factor in occurrence of skeletal problems and how common these problems that occur in adults. The review also tries to address the significant treatment required to correct the problem and recommendations made by organisations for parents and dentists in handling digit sucking cases.

Keywords: Digit sucking, Thumbsucking, Class II malocclusion, Class III malocclusion.

INTRODUCTION

Objectives:

- 1- The objective of this review is to address digit sucking as an etiological factor in the jaw having significant effect on skeletal discrepancies.
- 2- To review how common is it to get skeletal discrepancies in adults due to digit sucking habit.
- 3- To discuss the significant treatment required to correct the skeletal discrepancies caused by digit sucking

Digit Sucking

This habit is considered as a normal feature of a young child's development and it is thought to provide the child a sense of security and comfort¹. It is a natural reflex that may begin from in-utero and extends after birth till the period of 23% and 46% between 1-4years old, 13% in 6year old, 6% of 7-11years old². Other research studies has higher prevalence rates with 55% of 6years old and 16% of 11years old². This reflex of sucking disappears at the age of 4 months and thumb sucking normally stops at the age of 5years of age^{3,4}. In general, the prevalence of thumb sucking or finger sucking in children is between 61% and 90%⁶⁻⁷. The risk of developing a malocclusion like dental malocclusion, speech difficulties increases at 4 years of age³⁻⁵. It is more common in girls and high socio-economic status group^{1,6}.

Classification:

Cook 1958

- 1- Alpha group: only buccal wall group
- 2- Beta group: strong buccal wall contraction and negative wall pressure
- 3- Gamma group: alternative negative and positive pressure O'Brien 1996
- 1- Nutritive Sucking habit: Ex: Breast feeding, bottle feeding
- 2- Non-nutritive sucking habit (NNS): Ex: Thumb sucking, finger sucking and pacifier sucking.

Etiological factor

- 1- Psychoanalytical theory: Sigmond freud (1905)
According to this theory, the Non-nutritive sucking habit develops due to inherent biologic drive for sucking⁶.
- 2- Oral Drive theory : Sears and wise (1982)
This occurs due to prolongation of nursing strengthen the oral drive in the child.
- 3- Benjamins theory (1962)
According to this theory, the thumb sucking is due to the rooting reflex where infants head and tongue move towards an object toughing the cheeks.
- 4- Oral gratification theory: Sheldon (1932)
If the child is not satisfied with the sucking during the feeding period, it will remain as a symptom of emotional conflict/disturbance in the form of digit sucking.
- 5- Learning theory
This theory is most favoured and states that sucking is an innate cravings in infants and non-nutritive habit is an excess sucking urge with breast feeding or bottle feeding⁶.

Skeletal Problems in childhood/primary dentition due to thumb sucking

Digit sucking habit has a normal adaptive capacity in children up to the age of 4 years and 2/3 of such habits are self-limiting by the age of 4-5 years with no long term dental problems. Digit sucking beyond the preschool age, lead to the development of malocclusion such as anterior open bite, maxillary constriction and posterior cross bite⁽⁸⁾. The dental problems start appearing by the age of 5 years and can lead to various types of malocclusion including open bite, cross bite, increased overjet, crowding and increased probability of developing class II malocclusion⁹⁻²¹.

The pressures by soft tissue on the hard tissues have similar effects, if digit sucking is continued 6h/day results in development of increased overjet, class II primary canine and molar relationships and develop open bite and posterior crossbites¹⁰. The skeletal abnormalities like constricted maxillary arch and wider mandibular arch results in posterior crossbite²⁻¹⁴.

It is evident that there exist an association between duration of thumb sucking and occurrence of occlusal characteristics in the primary dentition. A study by Warren JJ¹⁰ concluded firstly, that the patient with minimal non-nutritive sucking habits with longer duration of breast feeding showed similar dental arch parameters and occlusal characteristics with shorter duration/no breast-feeding. Secondly, the malocclusions were different for pacifier and digit behaviour, for example pacifiers had increased posterior crossbite while with digit habits were associated with increased overjet, greater maxillary arch depths and smaller maxillary arch widths. Thirdly, the occlusal traits were well persisted even after cessation of pacifier or digit habits. And lastly, discontinuing the non-nutritive sucking habit may not be necessary in preventing habit related malocclusions at the end of the primary dentition stage. Several studies like for example Ogaard et al²² stated that the use of pacifier for 2 years longer use was sufficient to have decrease maxillary arch width and 3 years longer use was associated with increased mandibular arch width.

A cephalometric analysis explains that thumb sucking habits affects the vertical and anteroposterior dentofacial characteristics. There will be maxillary prognathism, relative prognathism, maxillary incisor angulation, interincisal angle, maxillary length and maxillary plane angulation. There will be no significant mandibular prognathism or length, neither maxillary mandibular plane angle, cranial base measurements nor any measurement of facial height.

The digit sucking individuals will have a larger variation of lower incisor angulation than non-digit sucking individuals, although no significant difference in the mean value for this variable was detected²⁴.

Another study by Erik Larsson in 1985¹ tried to rule out the theories about the aetiology and development of prolonged sucking habits. He studied the sucking habits among 9 year old children from two communities in Sweden and compared these results with 14 year old data. He found that finger suckers have greater problems compared to dummy suckers. A question is answered regarding whether increased prevalence in dummy sucking habits leads to decrease in the number of

finger suckers and several studies supported this question that there is more number of dummy sucking habits than finger sucking habit.

Karen Duncan et al²¹ conducted a Avon longitudinal study and tried to determine the effects of sucking habits on the development of primary dentition. Questionnaire data on non-nutritive sucking habits were collected among the children at 15 months, 24 months and 36 months of age. Later, dental examinations were performed on same children at 31 months, 43 months and 61 months of age. They found that the dummy sucking habits had profound effects on the developing dentition, especially on the upper labial segment alignment at 43 months, development of anterior open bites at 61 months and posterior cross bites in 43 months and 61 months. There was no association found between digit sucking habit and lower labial segment alignment at any age.

T. Azanar et al²³ analysed variation in dental arch width in relation to oral habits between the age group of 3 to 6 years of age in 1297 children. The author concluded that dummy habits lead to the decrease in maxillary arch widths, particularly in the region of the canines. The finger sucking habit, with increasing habit duration, was associated with an increase in mandibular intermolar distances.

Skeletal discrepancies in mixed dentition due to digit sucking

The anterior open bite and posterior crossbite has been significantly seen in the mixed dentition period. This malocclusions occurred due to prolonged digit sucking habit. The prolonged pacifier habits were associated with anterior open bite and bilateral class II malocclusion and prolonged digit habits were associated with anterior open bite¹⁹.

Skeletal discrepancies in Adult dentition due to digit sucking

There are not much studies mentioned regarding the prevalence of skeletal discrepancies in adult dentition due to digit sucking. The abnormality that occurs in adult is due to the impairment that is carried from early, mixed to adult dentition/skeleton. A recent study tried to look at the distribution of malocclusion among thumb suckers seeking orthodontic treatment in North India of age 12-30 years in 410 patients. They found that nearly 13.9% had a significant history of thumbsucking and affected by class II div I malocclusion²⁵.

Significant treatment required to correct skeletal discrepancies

Since the nutritive and non-nutritive habits have significant effects on dental and skeletal structures, the correction of these to improve the aesthetics involves the high financial burden on the parents. It depends on the time when the intervention is carried out. If the intervention is early, then the cost of the treatment will be less. There are different approaches to treat these malocclusions occurred due to thumb sucking habits. Rewards, reminder therapy, and appliance therapy have been described for the management of nutritive and non-nutritive sucking habits. Basically, initial intervention at early age is done by reminder therapy which includes the use of gloves, thumb-guards, mittens, and tastings applied to fingers. These may not have that significant financial burden. When other modes of treatment have failed, appliance therapy, such

as palatal cribs or Bluegrass appliances, may be necessary to prevent the placement of the digit in its sucking position. In major dental and skeletal problems, a combination of fixed orthodontic and orthognathic surgeries is carried out. These tools are very effective, expensive, time consuming, relapse and are associated with few adverse effects. So, there is an issue for both, patient in terms of undergoing treatment and financial burden to parents.

The cost for treatment is also determined for UK and Scotland, because it is the NHS in UK and Scotland has to provide the expenses for the treatment. A multi-centre study in 2006 approximated a cost to €6075.25. It is considered to be same for other countries which provide national health services through its established private practices and hospitals. Fixed orthodontic treatment in India would cost more than INR 18,000 to 20,000. However surgical correction after the growth has arrested would cost approximately around INR 45,000 to 50,000.

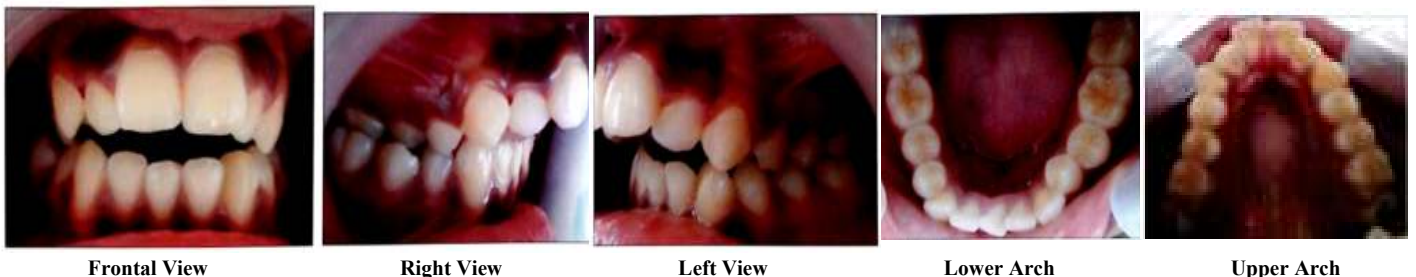
Most orthodontist provides services through the private practice around the world and some by the established government and private hospitals. In countries like UK, have orthodontic services through NHS hospitals. The load of cost have to be determined if the hospital is providing the care. One of the studies by Borrie F et al (2013) tried to determine the size of cost by looking at the load of expenses to NHS Tayside in UK for providing intervention treatment for stopping of thumb sucking habit. The author emphasized that patient/parent should realize the benefits in terms of less time off school; work and prevention of malocclusion; then a potential “burden” of a fixed habit breaker may become less. The author also suggested that the general dental practitioners should be made aware of all possibilities available alternative to the fixed habit breaker and for this to happen; it needs training of dentists to change current practice²⁴.

In USA, they looked at the patient care and the best use of resources and came up with a conceptual model which is strategized in providing early interceptive and preventive treatment rather or in addition to compressive care in patient’s permanent dentition. They stressed that, the dental professionals should try to identify solution to needs of low income families that have low access to orthodontic services and determine the relative cost-effectiveness by comparing from various perspectives²⁴.

One of the recommendations by the researchers is that, instead of providing complex treatment to fewer patients, better to provide basic level of interceptive orthodontic to many

INTRAORAL PHOTOGRAPHS

Pre-treatment:



patients. It is agreed that interceptive orthodontics might not produce the finished results but it reduced the treatment need from ‘medically necessary’ to ‘elective’²⁴.

One study has reported the possibility in reducing the burden of malocclusion in developing countries especially for low income families by interceptive orthodontics. It was hypothesized that orthodontists can more readily provide shorter, simpler interceptive and preventive treatments to low-income families compared with the alternative of more expensive and longer comprehensive treatments. Cost-effectiveness analyses are necessary to demonstrate the economic value of this strategy compared with comprehensive treatment in the permanent dentition. No studies have compared mixed dentition interceptive treatment alone vs comprehensive permanent dentition treatment alone. This finding lends support to the idea that a comprehensive strategy designed to increase access to interceptive orthodontic services might be more cost-effective overall than the competing one of focusing primarily on comprehensive treatment in the permanent dentition for the most difficult malocclusions²⁶.

A CASE:

A 14 year old patient with a chief complaint of forwardly placed teeth. She had a history of digit sucking habit nearly for 10 years. Intra-orally she has class I molar relationship bilaterally with an overjet of 11mm and open bite of 5mm. She had a constricted maxillary arch leading to posterior unilateral crossbite on right side. Extra-orally she had a mesoprosopic facial form, mesomorphic body type with a convex profile with incompetent lips. Cephalometric analysis showed class I skeletal relationship with a vertical growth pattern.

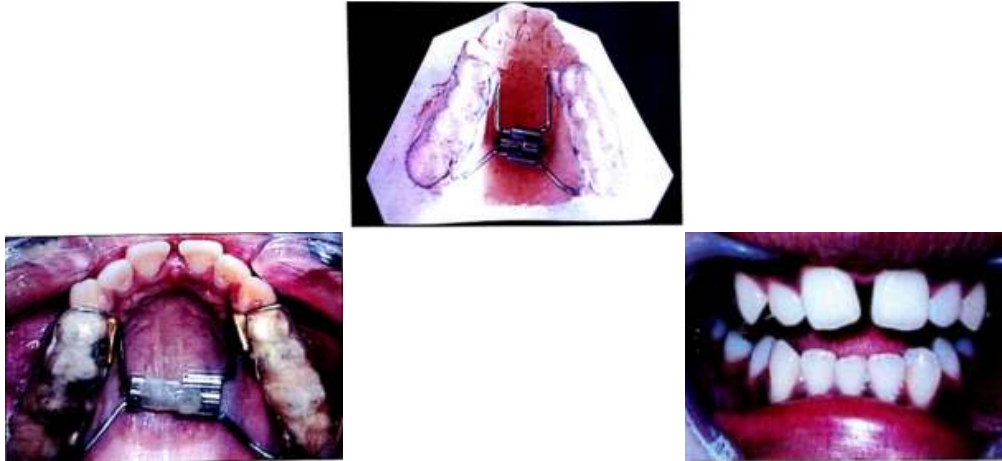
Treatment strategy:

First objective was to correct the transverse maxillary discrepancy followed by achieving class I molar relation bilaterally. Later, overjet, overbite and aligning and levelling of both the arches will be achieved. Lastly to attain pleasing profile and smile.

Treatment Plan:

- Surgically assisted rapid palatal expansion
- Non-extraction therapy
- Fixed Mechano-therapy using 022’ MBT Brackets
- Leveling and aligning
- Fixed Appliance Therapy using MPA
- Finishing and Detailing

INTRAORAL PHOTOGRAPHS



**POSTOPERATIVE PHOTOGRAPHS
INTRAORAL PHOTOGRAPHS**



Frontal View



Right view

Left View



Lower Arch

Upper Arch

Retention Plan:

Fixed retainer in both upper and lower arches.

Treatment Duration:

Treatment initiated on: 09/08/2011

Appliance removed on: 15/04/2013

Active treatment duration: 20 months

Results achieved:

Posterior crossbite on right side corrected.

Alignment of upper and lower arches done.

Class III molar relationship on right side and class I molar relationship on left side achieved.

Ideal overjet and overbite achieved.

Critical appraisal:

Patients' chief complaint was addressed. Pleasing smile achieved. Posterior crossbite resolved. Due to congenitally missing lower central incisor, canine relationship is not achieved on right side. Maxillary midline shifted to right side.

CONCLUSION

In conclusion, there are severe skeletal discrepancies in early and later stages of life arising due to nutritive and non-nutritive habits prolonged over a period of time. The intervention of these skeletal discrepancies involves significant cost burden on parents and psychological effect on

the patients. Hence, parents have to be educated by general dental practitioner about the condition and possible non-intervention techniques to overcome these habits at earliest stages. The patients who have already been affected should be treated based on the current guidelines, recommendations and better cost-effective way of managing these discrepancies and habits.

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