



## Thumb Sucking: A Review Article

<sup>1</sup>Dr. Keyura Parakh, <sup>2</sup>Dr. Aditi Bali, <sup>3</sup>Dr. Diksha Jain,

<sup>1</sup>Associate Professor,

Department of Pedodontics and Preventive Dentistry,

Chhattisgarh Dental College and Research Institute, Rajnandgaon, Chhattisgarh.

**\*Corresponding Author:**

**Dr. Keyura Parakh**

Department of Pedodontics and Preventive Dentistry, Chhattisgarh Dental College and Research Institute,  
Sundra, Rajnandgaon, Chhattisgarh

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

### Abstract

Boucher defined habit as the tendency towards an act that has become a repeated performance, relatively fixed, consistent, and easy to perform by an individual. Repetitive behaviors are common in infantile period and most of them are started and finished spontaneously.

**Keywords:** NIL

### Introduction

Oral habits could be divided into 2 main groups:

- 1. Acquired oral habits:** behaviors which are learned and could be stopped easily and when the child grows up, he or she can give up the habit and start another one.
- 2. Compulsive oral habits:** behaviors which are fixed in child. When emotional pressures are intolerable for the child, he/she can feel safety with this habit, and preventing the child from these habits make him/her anxious and worried.

One of the most common repetitive behaviors in infantile period is hand sucking. It naturally develops in 89% of infants in the 2<sup>nd</sup>-month and in 100% of them in the 1<sup>st</sup>-year of age. It is the first coordinated muscular activity of the infant, and it is also considered as a natural reflex. There are essentially two forms of sucking:

**Nutritive form** - which provides essential nutrients. Example - breastfeeding and bottle-feeding.

**Non-nutritive form** - which ensures a feeling of warmth and sense of security like sucking on objects

or body parts that do not provide nutrition. Example – pacifier sucking and thumb/finger sucking.

The non-nutritive sucking habit can be considered as first step in the development of child's self-regulation and the ability to control emotions. It is also associated with pleasure.

Thumb sucking is a form of non-nutritive sucking. Gellin defined digit sucking as the placement of thumb or one or more fingers into the mouth. It occurs as early as in the 29th week of gestation. It is seen commonly in infants and peaks at 18 to 21 months of age. The digit in question is placed against the palate and the adjacent digits are curled over the bridge of the nose or come together to form a fist. It can be described as chronic if it occurs in two or more environments (home and school) after the age of 5-years.

There is a direct relationship between the level of education in parents, the child nutrition, and the sucking habit. If the child chooses this habit in the first year of life, the parents should move away the thumb smoothly and attract the child's attention to other things such as toys. After the second years of age, thumb sucking will decrease and will be appear

just in child's bed or when he/she is tired<sup>1</sup>. Some of children who do not stop this habit, will give it up when their permanent teeth erupt, but there is a tendency for continuing the sucking habit even until adult life.

### Causes

Sucking habits emerge very early in life, and they have even been observed in utero. Theories relating to the cause of digit sucking date back to before the fourteenth century, and the etiology are still not clear. According to Bishara and Larsson<sup>13</sup> there are several theories including Freud's psychoanalytic theory, learning theory, reduction in breast-feeding theory, and sensory deprivation theory.

**Psychoanalytic theory (Freud 1905)** - He defined digit sucking as an autoerotic behavior and pleasure-seeking act, postulating that such behavior was a sign of underlying psychopathology and emotional developmental problems. Freud also related infantile digit sucking to the need to derive pleasure, independent of the need for nutrition. He proposed that, if the sucking needs of the infant were not met during the oral phase of development, the sucking habit would extend into the next developmental phase. Psychoanalysts have defined this as the fixation of a habit.

**Learning theory (Palermo 1956)** - This theory advocates that nonnutritive sucking stems from an adaptive response. The infant experiences a reduction in anxiety and a sense of satisfaction through prolonged digit sucking. This theory assumes no underlying psychologic cause to prolonged nonnutritive sucking habit.

**Oral drive theory (Sears and Wise 19820)** – thumb sucking is because of prolongation of nursing, which strengthens the oral drive and to satisfy that, child starts with thumb sucking.

**Reduction in breast-feeding theory** - if a sucking need is left unsatisfied during breastfeeding, the infant uses the digits as a substitute. There exists a relationship between breastfeeding, bottle-feeding and digit sucking, and sucking habits to satisfy the sucking reflex.

**Sensory deprivation theory** - children develop sucking habits to relieve mental stress and to assist in sleeping, by isolating themselves from the

environment. Digit sucking may induce sensory deprivation, because repetitive and monotonous stimulation of the oral senses may lead to reduction of sensory receptors in the mouth. These receptors stop firing and, as a result, the brain cortex is deprived of normal sensory input. This deprivation leads (in turn) to the impairment of perception, learning ability and muscular motor control. For example, in children with Class II Division 1 malocclusions associated with digit sucking, the motor function of the mandible is impaired because of sensory deprivation and so is held in a retruded position, exacerbating the Class II Division 1 malocclusion. It becomes increasingly difficult for the brain to develop the normal anatomy of the mouth when motor control, perception and awareness are altered.

### Contributing Factors

**Gender differences** – girls are more likely than boys to suck their thumbs'. In contrast to this, few authors reported no significance difference between sexes in the distribution of digit-dummy suckers''.

**Age** – most of the children begin with a non-nutritive sucking habit during the first 3 months of life.

The prevalence of thumb sucking in the children of 3-5 years age group seems to decrease with age<sup>9</sup>. At age 4, 8.2% of the samples were reported to have persistent sucking habits, which is less than one-fifth of that reported by Modeer et al. for the same age group.

**Breast feeding versus bottle feeding** – infants who are breastfed for a reasonably long period of time are less likely to become digit-suckers than babies who have no breastfeeding experience'. The prevalence of digit-dummy sucking habits was the least among children who were breastfed for a period of 6 months or longer<sup>27</sup>. In contrast, the prevalence of digit- and dummy-sucking habits was higher among children who had been breastfed for a short period (less than 6 months) than children with no breastfeeding experience. This could be due to early cessation of breastfeeding causing greater frustration to the child than experiencing no breastfeeding at all<sup>24</sup>.

**Siblings** – Farsi et al<sup>24</sup> showed no relationship between birth rank and prevalence of the habit, which agrees with the result of Larsson and Jarveheden.

**Parents' education** – the higher the level of parents' education the greater was the probability that the child was a dummy sucker<sup>24</sup>. These observations are in contradiction to Larsson E who found dummy-sucking to be more prevalent among children of parents with little or no education. Wolf and Lozoff found a higher percentage of the mothers of thumb-suckers to have had some college education than did the mothers of non-thumb-suckers.

**Socio-economic status** – family income doesn't predict digit sucking habit<sup>24</sup> which supports the findings of Paunio et al<sup>23</sup>. Other researchers reported that digit-sucking children came from higher socioeconomic groups, whereas others reported a significant greater prevalence of dummy users among children of low socio-economic status'.

### Epidemiology

Knowledge of the prevalence of digit sucking may increase awareness and aid health professionals in becoming attuned to identifying the habit in early life. This would be helpful in reducing the proportion or severity of malocclusions associated with digit sucking. Yassaei et al reported the prevalence rate of oral habits in primary school and high school girls to be 30% and 87.9% respectively. Williams et al found 34.1% of children with one of the various oral habits in his study. Internationally, prevalence estimation for digit sucking habit in early life varies. According to Larsson the prevalence of the habit is 90%. Sarkar et al reported that non-nutritional sucking habit was predominantly seen in cities, and bottle feeding was found to be the main cause of this habit. In 3-6 years old children the prevalence of the habit was more in boys than girls.

Warren et al found that for over 20% of the children, a non-nutritive sucking habit was prolonged to 36 months of age or older. Factors associated with prolonged sucking habits included older maternal age, higher maternal education level, and having no older siblings.

The prevalence of oral habits in Delhi school going children was 25.5% in 2003 as reported by Kharbanda et al. Thumb sucking was relatively less common habit and seen in only 0.7% of children. It was more significant in girls (1.0%) when compared with boys (0.4%).

According to Bishara and Larsson (2007) the prevalence rate of thumb sucking habit is 34%. Shetty et al. (2013) reported 1.7% of children (6-11 years) with thumb sucking or finger sucking habit in Rajnandgaon city of Chhattisgarh state.

Garde et al. (2014) reported that the prevalence of thumb sucking habit in 6-12 years old school going children was 8.7% and it was more common among female children.

### Classification

1. Thumb sucking can be of two types as follows:
  - **Active sucking:** In this type, there is a heavy force by the muscles during the sucking and if this habit continues for a long period, the position of permanent teeth and the shape of mandible will be affected<sup>10</sup>.
  - **Passive sucking:** In this type, the child puts his/her finger in mouth, but because there is no force on teeth and mandible this habit is not associated with skeletal changes.
2. Thumb sucking can also be classified as:
  - **Normal Thumb Sucking** – is generally seen during first and second year of life and it does not generate any malocclusion.
  - **Abnormal Thumb Sucking** – if thumb sucking persists beyond preschool life, it is said to be abnormal. This causes deleterious effects on dento-facial structures. It can further be subdivided into two types as:
    - Psychological – this type of habit is deep rooted due to emotional factors and is associated with insecurities and neglect.
    - Habitual – it does not have any psychological bearing.
3. Cook (1958) explained 3 patterns of thumb sucking:
  - **α Group:** pushed palate in a vertical direction and displayed only little buccal wall contractions.
  - **β Group:** registered strong buccal wall contractions and a negative pressure in the oral cavity show posterior cross bite.

- **Y Group:** reported alternate positive and negative pressure; it has least effect on anterior occlusion.
4. Subtelny (1973) has graded thumb sucking into four types:
- **Type A:** seen in 50% of children. Whole digit is placed in the mouth with the thumb pad pressing the palate, and at the same time maxillary and mandibular anteriors contact.
  - **Type B:** seen in 13-24% of children. Here the thumb doesn't touch the palatal vault and the maxillary and mandibular anterior contact is maintained.
  - **Type C:** seen in 18% children. The thumb is fully placed into the mouth contacting the hard palate, but there is no contact with the mandibular incisors.
  - **Type D:** seen in almost 6% of children where in very little portion of the thumb is placed in the mouth.

#### Detrimental Effects

In 1870s, Camble and Jander reported for the first time that long-term finger sucking has harmful effects on dentition<sup>43</sup>. Cook in 1958<sup>44</sup> analyzed intraoral pressures involved during thumb or finger sucking in a selected sample of 25 children. He found that there exists a relationship between the type of pressure developed and the malocclusion observed, whereas Baril and Moyers in 1960 reported that no relationship between the pressure applied by the thumb and the neuromuscular behavior exist. The callus often seen on fingers of sucking subjects does not seem to be caused by mandibular elevation but by the pressure of the digit against the teeth.

The side effects of finger sucking are:

1. Anterior open bite<sup>43</sup>,
2. Increased overjet<sup>49</sup>
3. Labial inclination upper incisors and lingual inclination of lower incisors
4. Constriction of maxillary arch and posterior cross bite<sup>43</sup>
5. Compensatory tongue thrust<sup>43,51</sup>
6. Deep palate<sup>50</sup>
7. Speech defect<sup>51</sup>

8. Finger defects (Eczema of the finger due to alternate dryness and moisture that occurs and even angulations of the finger).

Farsi et al<sup>24</sup> showed a strong correlation between persistent sucking habits and distal molar and canine relationship, open bite, and protrusion. These findings coincide with those of Larsson E. They also found that children with a previous sucking habit did not show any significant difference in the prevalence of malocclusion compared with the no-habit group, except for anterior open bite, as it was more prevalent among the former group.

Several authors reported a significantly greater prevalence of posterior crossbite among dummy or finger-suckers compared with non-suckers<sup>25</sup>, whereas Adair et al. found no clinically significant difference in the transverse occlusal relationship between dummy-suckers and non-suckers. Similar finding was reported by Farsi et al<sup>24</sup>.

Modeer et al.<sup>25</sup> found posterior crossbite to be positively related to the intensity of the sucking habit, which was 6-15 hours in most of their sample. The long daily use of the dummy also has been reported by Larsson et al<sup>36</sup>.

Ravn JJ reported a difference between suckers and non-suckers in the canine relationship without significant differences in the sagittal molar relationship.

The severity of changes in dentition due to finger sucking is related to the duration and times of habit. A short duration period may be of no or little effect. In some children the sucking habit is just a passive insertion of the finger in the mouth, with no apparent buccinators activity, so that the children who suck vigorously but intermittently may not displace the incisors much or at all, whereas others who produce 6 hours or more of pressure, particularly those who sleep with a thumb or finger between the teeth all night, can cause a significant malocclusion<sup>58</sup>.

During active phase of permanent tooth eruption, there is a high risk for dental arches deviation<sup>1</sup>. In children who do the sucking habit for 6 hours or more, especially during night or sleep, severe abnormalities in dentoalveolar system<sup>43</sup> and minor skeletal effects will develop.

#### Diagnosis

History taking is important to determine the psychological component involved. Questions regarding the frequency, intensity and duration of the habit should be asked. Feeding pattern and parental care of the child should be noted.

The digits are exceptionally clean, chapped and has short fingernails (dishpan thumb). Fibrous roughened callus may be present on superior aspect of the finger. Upper lip may be short and hypotonic whereas lower lip is mostly hyperactive. Mandibular retrusion and maxillary protrusion should be checked.

Examination of oral cavity for correct size and position of the tongue at rest should be done. Tongue action during swallowing should also be examined.

### Prevention

1. Motive based approach.
2. Child engagement in various activities.
3. Prevent psychological disturbance by giving proper care, affection, equal attention to all siblings.
4. Feeding practices should also be in such a way that baby satisfies both hunger and its sucking urge. In case of bottle feeding the habit can be prevented by use of physiological nipple and keeping more of vacuum in bottle.

### Management

Dental changes due to finger sucking do not need any treatment if the habit stopped before 5 years of age and as soon as giving up the habit, dental changes will be corrected spontaneously<sup>51,60</sup>. The longer the habit continues, the more likely it is that there will be permanent effects on the developing dentition and the more difficult resulting treatment may become.

At the time of permanent anterior teeth eruption and if the child is motivated to stop the sucking habit, it is the time to start the treatment as follows<sup>60</sup>:

**Interview:** direct interview with child if he/she is mature enough to understand<sup>1,60</sup>.

**Encouragement:** this can give the child more pride and self-confidence<sup>1</sup>. Dunlop hypothesis - Patient is made to sit in front of mirror and asked to suck his thumb this will make him realize how awkward he looks and want to stop sucking his thumb.

**Reward system:** rewarding the child for not exercising the habit<sup>1</sup>. Reward charts are a popular

means of supporting this approach, with stickers recording every day completed without the thumb or fingers being sucked.

**Digital reminder therapy:** are used for preventing or interrupting the process of thumb sucking habit<sup>1,60</sup>. It includes chemical means (bitter flavored preparations or distasteful preparations) or mechanical means (adhesive tapes) that are applied to the finger or thumb. These preparations are effective only if the habit is new".

1. Long sleeve night gown – It prevents the child from practicing thumb sucking because it interferes with contact of the thumb and oral cavity.
2. Thumb guard - An appliance that is worn when the child is tempted to suck. Once the guard is worn, they cannot generate vacuum and so sucking is not much satisfying.

Norton and Geuin proposed a 3-Alarm system often effective in children between 3-7 years of age. First the offending digit is taped and when the child feels the tape in the mouth it serves as the first alarm. Then a bandage is tied on the elbow of the arm with the offending digit, a safety pin is placed lengthwise. When child flexes the elbow, the closed pin mildly jabs indicating a second alarm. At last, the bandage is tightened if the child persists serving as a third alarm<sup>62</sup>.

RURS elbow guard – is an innovative treatment of thumb sucking habit in Hurler's Syndrome was introduced by Dixit et al. in 2010.

**Appliance therapy:** For long-term habits or unwilling patient, the fixed intra oral appliance is the most effective inhibitor. After active phase of treatment, the appliance should remain in place for more than 3 to 6 months to minimize the relapse potential<sup>1</sup>.

1. Palatal crib – it serves dual purpose. In the anterior palate, a fence that resembles a "crib" is placed and acts to stop a child gaining a seal when he/she sucks the thumb. The bite will be corrected because of continued eruption of the anterior teeth in either or both the jaws.
2. Villa and Cisner reported that open bite decreased as incisor angulation, arch length and arch perimeter decreased with the use of palatal crib.

3. Hybrid habit correction appliance (HHCA) – it consists of a tongue bead, a palatal crib and a U-loop which is attached to the molar bands on either side. It can act as a device for retraining the associated musculature, a mechanical restrainer, and a reminder to discontinue the habit.
4. Rakes – it has several sharp spikes which hang down behind the upper central incisors and cause significant discomfort if the thumb is sucked.
5. Vestibular shield – it is a simple, removable appliance that has vestibular shields and a crib that are intended to aid in eliminating sucking habit.
6. Bluegrass appliance - It consists of a transpalatal arch with a hexagonal section of Teflon which sits on the palate behind the upper central incisors. Success rates of 93% have been reported and the habit has stopped in a mean of 12 weeks. It is an effective treatment option and had limited treatment complications for children with special care needs.
7. W-arch appliance – the soldered W-lingual arch or Porter appliance is an efficient appliance for the correction of posterior crossbite and simultaneously function as a reminder appliance for digit sucking habit.
8. Quad-helix – it is especially useful in children who have sucking habit and require maxillary expansion or the derotation of molars.

### Use Of Pacifier

The use of pacifier is common in most countries. Its use until 2-3 years of age, doesn't cause any permanent changes in dentition, but the use of pacifier after the age of 3 years causes harmful effects on developing dentition. The children who used pacifier have no desire to suck their fingers<sup>1</sup>.

The pacifier use pattern showed gradual increase among children until 12 to 23 months of age. After that, there was an abrupt increase in the habit rate, peaking at 36 to 47 months. From that age on, a decrease in the indexes in 72-to-83-month age group is seen.

It is suggested that pacifier should be replaced in children who have the habit of finger sucking, because the harmful effects of sucking pacifier are

less than finger<sup>51</sup>. In comparison between different pacifiers, despite the claims, it has been shown that there is no significant advantage for physiologic pacifiers over conventional ones.

Ollila et al. (1997) suggested that pacifier use may reduce oral sugar clearance, increase number of receptor sites for microbial adhesion and interfere with mucosa in a way that favors candida colonization. Simkiss et al recommend ventilation holes in pacifier flanges to avoid asphyxiation. And, minimum horizontal and vertical dimensions of 43 mm, as well as a grasp ring to facilitate removal.

Zardetto et al. (2002)<sup>72</sup> pointed out that more occlusal and oral myofunctional alterations are detected among children who have pacifier habits. Among the oral myofunctional alterations associated with pacifier use are lip incompetence, lip entrapment, decrease in muscular tonicity lips, narrow hard palate.

Degan et al., 2004<sup>71</sup> showed that the best results were achieved when professionals' explanations were given to the children to discontinue pacifiers.

### Conclusion

Sucking habits during dental development should be of interest to dental professionals because malocclusion can be ameliorated or prevented if the habits are managed early. Understanding the cause of persistent and deleterious sucking behaviors and the range of management approaches available can reduce the need for more invasive and rehabilitative approaches in later life.

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