

Meta-Analysis of Prevalence of Bad Oral Habits and Relationship with Prevalence of Malocclusion

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Abstract

The core objective of this particular research paper is to systematize current existing studies done on the prevalence of bad oral habits and the relationship that this has with the prevalence of malocclusion. As a quantitative form of literature review, this meta-analysis makes an evaluation of the past research on the prevalence of oral habits as well as the prevalence of malocclusion. Besides, this analysis explores the findings of previous studies done so as to identify how the prevalence of malocclusion relates to the prevalence of bad oral habits. Although this particular research is going to unify past studies done on the prevalence of these two conditions, the primary emphasis will be to explore the significant risk factors for the development of malocclusion, the different types of bad oral habits and finally the certain age groups that are at risks of suffering malocclusion.

Keywords: Malocclusion; Prevalence of Malocclusion; Oral Habits; Meta-Analysis

Introduction

By definition, Malocclusion is a condition in which there is a difference, or rather a departure from the normal relation of the teeth in the same or the opposing dental arch [1]. While existing literature suggests a particular association between malocclusion and bad oral habits, bad oral habits are not necessarily dependent on the levels of oral hygiene. Instead, bad oral habits are inclusive of digit sucking, mouth breathing, and tongue thrust swallowing, especially in young children. Also, different scholars contend that malocclusion is common in children and hence, a vast range of research indicates that its prevalence in various age groups is approximated to range from 20 - 90%. Usually, a majority of the epidemiological studies done on the different characteristics of occlusion are concerned with permanent dentition. This being the case, there seems to be a broad agreement in the types of researches done on the prevalence of malocclusion. A majority of the studies indicated that as a dental condition, malocclusion is prevalent in children from as early as three years. For this reason, the condition is most common among pre-school children, with its most common type being anterior open bite (AOB), Class II malocclusions, excessive overjet and finally the posterior crossbite (CB) [2].

From a general perspective, oral habits, which are defined as the repetitive and stereotypic functions of the masticatory system, are said to differ both qualitatively and quantitatively, from the physiological roles of the masticator system. The reason why this is so is that these oral habits, whether good or bad, are often done subconsciously. While malocclusions among young children are said to be caused by the acting together of both the environmental factors and the inherited factors, oral habits merit the greatest effects. For this reason,

oral habits are believed to be among the most obvious examples of malocclusion's environmental etiology [3]. Besides, the prevalence of malocclusions is said to differ depending on the external factors leading to it. For instance, cases of malocclusion happen to be more common than others and are supposed to persist during occlusion development. In this regard, different bad oral habits which range from non-nutritive sucking habits, breastfeeding to bottle feeding, among others, happen to cause the difference in prevalence of these conditions. Besides, there is sufficient evidence that the non-nutritive sucking habits which persist beyond the age of three are implicated in the development of the anterior open bite (AOB).

How the Prevalence of Bad Oral Habits Relates to the Prevalence of Malocclusion

According to numerous studies, malocclusion is deemed as the growth and development deviation, particularly of the muscles and jaw bones and is prevalent during early childhood and adolescence [4]. Despite the fact that the etiology of malocclusion primarily has components in the environmental and genetic paradigm, different studies suggest that Malocclusion is most often related to bad or rather, harmful oral habits common in early childhood. A habit, by definition, is a particular practice that is acquired through the frequent repetition of some act, which at first, happens from a keen sense of mind, and then given time, evolves into happening unconsciously. A 2014 longitudinal study that sought to identify the types of habits leading to the development of malocclusion in childhood suggested that bad oral habits such as finger-sucking and pacifier sucking are deemed to be the most common harmful practices especially for children ranging from the age of 0 to 3 years [1]. According to this particular study, the relationship between the prevalence of malocclusion development and these bad oral habits is primarily attributed to the fact that the ages between zero and three years are the ones in which, the process of development and world discovery, are common. A broad range of epidemiological studies such as (24) (13) (16) has increasingly reported the harmful consequences of bad oral habits, especially in early childhood. According to these studies, although some of these oral habits are common in a majority of children in this age group, their prevalence renders them as substantial risk factors malocclusion, especially in deciduous teeth. Similarly, different scholars cite mouth breathing, especially during sleep, as another typical bad oral habit that has a significant relation to the prevalence of malocclusion.

According to a 2016 study by Jamilian, *et al.* bad oral habits such as finger sucking have high chances of interfering with the positions of the teeth and above all else, interfere with the regular pattern of skeletal growth and hence changing the pattern of craniofacial growth which is known to cause malocclusion [17]. Regarding the relationship between these bad habits and the prevalence of malocclusion, different bad habits have their own impact concerning the prevalence of malocclusion. For instance, pacifier sucking, and different weaning methods such as baby bottle sucking accompanied with a severe oral habit such as finger sucking, most often cause conditions such as premaxilla, the protrusion of the upper incisors, anterior open bite and posterior cross bite, atypical swallowing, among many others. With all these conditions being common characteristics of malocclusion, various researchers point out a relationship between bad habits and the prevalence of malocclusion [5]. Precisely, the prevalence of the posterior crossbite is caused by the bad oral habit that leads to the habit of low positioning of the tongue during sucking, with the lack of thrust of the tongue on the palate. According to this particular study, the relationship between these particular bad oral habits and the prevalence of malocclusion occurs due to the fact that, the lack of thrust in the tongue primarily causes an increased activity of the muscles of the cheeks. This, in turn, leads to the alteration of the muscle pressure on the upper arch, which results to the prevalence of malocclusion in the end. This being said, the studies used in this particular meta-analysis suggest that it is always appropriate to verify the existence of the kind of association that exists between malocclusion and bad oral habits. However, result findings in a majority of the studies suggest that children, especially those between the age of 0 and 7, that are found to have these bad oral habits have characteristics of malocclusion that are worse than those of the general population [7].

Methods and Procedures

The search strategy of this particular meta-analysis designed. This included performing a search based on the electronic health literature that are based on the study of both the prevalence of malocclusion and the prevalence of bad oral habits. In a similar regard, hand searching of major orthodontic journals alongside limited literature searching was also included in the selected search strategy. Precisely,

the hand search used in this particular study was limited to various academic journals such as; *The European Journal of Orthodontics*, *Journal of dental research*, *Angle Orthodontist* and finally *The American Journal of Dental Orthodontics and Dentofacial Orthopaedics*. With respect to the relationship between the prevalence of the bad oral habits and the prevalence of malocclusion, some of the methods such as archival research were extensively used so as to make an analysis of the various case studies as well as content analysis [8]. For instance, a vast range of existing literature and studies were used to identify the relevant studies that are independent of language. In this regard, different electronic database searches were used as the primary search strategies and were essentially conducted with medical subject headings, major keywords, and keyword combinations. Besides, the electronic search criteria use as a research method in this meta-analysis included malocclusions, bad oral habits and orthodontist search terms, among many others.

In this particular meta-analysis, the studies used in the methodology section sampled the prevalence of malocclusions in different age groups as well as the various oral habits that relate to the prevalence of the malocclusion conditions. According to a Brazilian Oral Research studying “Breastfeeding, bottle feeding and the risk of malocclusion in both the permanent mixed dentitions,” it was concluded that there is a significant relation between the prevalence of bad oral habits and that of malocclusion [9]. Finally, two very independent reviewers were used to screen the results of the searches. This being the case, through the use of titles, the first screening of references was performed. The second reviewer screening, on the other hand, was performed using abstracts. Owing to the fact that this particular meta-analysis also explores the relationship between the prevalence of different bad oral habits and the prevalence malocclusions, in the second screening, there were situations whereby the reviewers disagreed. Precisely, it happened that the reviewers disagreed regarding the relationships existing between the prevalence of the two. This being the case, different reasons were identified and extensively discussed, until a consensus was reached.

Empirical Findings and Results

Based on the four epidemiological studies done on occlusion traits and the prevalence of malocclusion, individual results suggested that there is a significant relationship between the prevalence of bad oral habits and malocclusion’s prevalence. A certain research which studied the prevalence of malocclusion and the prevalence of bad oral habits among children between ages 5 - 7 years found out that a substantial percentage of children in this particular age group presented with one or more attributes of malocclusion and another significant percentage of bad oral habits. This is to say that, different malocclusion characteristics such as vertical malrelation of the incisors, as well as abnormal teeth spacing, were some of the most predominant features of malocclusion. Nonetheless, certain studies such as the 2014 study done by Kristina, *et al.* showed that children with the digit sucking bad oral habit are usually at a higher risk of suffering the anterior open bite and the posterior cross bite malocclusions. Precisely, an infantile type of swallowing such as baby bottle feeding during weaning substantially demonstrated a strong association with the anterior open bite type of malocclusion.

In a similar regard, the other research used in this particular meta-analysis was the “Longitudinal study of the bad habits leading to malocclusion development in childhood”. Being a study that focused on the study of mother-child pairs, regarding the breastfeeding as well as the weaning habits, this particular study found out that malocclusion is overly prevalent in children in the weaning age group due to the prevalence of bad oral habits which are in association with bottle feeding. Mainly, the researchers came up with the results of this study, which indicated that bottle feeding was the most prevalent habit leading to malocclusion, in children between the ages of 12, 18 and 30 months of age. With this study being one that focused on the study of children below the age of 3, bottle feeding, finger sucking, and bad oral habits related to breastfeeding were found to be the most prevalent habits leading to the prevalence of malocclusion [10]. In the same vein, for children above the age of 12 months, the pacifier sucking habit indicated a high association with malocclusion traits such as overjet an open bite. However, at 30 months, the prevalence of the pacifier bad oral habit reported a significant relation to the prevalence of the overbite malocclusion trait. In a nutshell, the at the ages of 12, 18 and 30, bad oral habits such as finger sucking and also bad habits related to breastfeeding indicated a substantial association with both the open bite condition and overjet. Nonetheless, conditions such as the posterior crossbite were known to occur later as the child grows and begins bottle feeding. Therefore, the prevalence of bottle feeding related bad oral habits had a significant relation to malocclusion types such as the posterior crossbite [11].

Besides, the Brazilian Oral Research that sought to study the prevalence of malocclusion and that of deleterious oral habits among kids in the adolescents' age also suggested a close relation between these bad oral habits and malocclusions prevalence [12]. This was indicated in the results of the study which differentiated the prevalence of malocclusion and its characteristics, according to gender and the social inclination of the adolescents' students, which was known to be the key contributor to bad oral habits. For instance, at the end of the study, the scholars found out that normal occlusion was higher among the girls among the boys in their adolescents' age [13]. In the study, a majority of the boys indicated a prevalence of either Class I or III MO. During the interpretation of these results, this particular study found out that those students, especially the boys, who indicated high malocclusion prevalence were commonly reported to have deleterious oral habits during their infancy. Some of these deleterious oral habits (DOH) were such as; pacifier sucking, finger sucking. These deleterious habits were, however, less prevalent as compared to others such as nail biting, object e.g. pencil biting, cheek or lip biting. This is to mean that, at the time of the study, some of the prevalent DOH that indicated a significant relation to the prevalence of malocclusion traits such as Class I and III MO, included, object biting, nail biting and also lip and cheek biting [14].

The final research that was analyzed in this particular meta-analysis was a 2013 longitudinal study that was done to investigate malocclusions in children between ages three and seven [15]. Particularly, this study was aimed at comparing the prevalence of malocclusion in children in this particular age group as well as understanding the relationship that this prevalence had with the prevalence of sucking habits [16]. The empirical results of this particular study were found using a sample that was tested for homogeneity through an analysis of participants with respect to both genders, sucking habits and even the types of malocclusions. This being said, the empirical results found in this particular study showed that at the age of 3 malocclusions was more prevalent in boys than in the girls. The reason why this was so, is that a significant percentage of the boys that were sampled in this particular study exemplified a prevalence of different bad oral sucking habits. Besides, the study associated this malocclusion prevalence in boys with the prevalence of nocturnal breathing disturbances [17]. However, with age, and specifically at the age of 7 different malocclusion types such as posterior crossbite became more prevalent in the girls as compared to the boys. Some of the bad oral habits that led to the prevalence of malocclusion in girls at the age of seven unlike their male counterparts were such as; nail biting habits, tongue thrust swallowing, as well as object biting habits [18].

Discussion and Conclusions

Discussions

According to the first study analyzed in this particular meta-analysis, certain bad oral habits were considered to have direct impacts on the prevalence of malocclusion, especially in young children. With reference to the accuracy of oral habits diagnostics, this study found out that, a significant 71.4% of the children that were assessed in the survey had at least some kind of unusual occlusal trait [19]. Nevertheless, there was a noticeable inconsistency of the results found at the end of the study [20]. According to the scholars, this discrepancy in the results was highly attributed to the different incidences of malocclusion in children of different age groups. Thus, with reference to the results of this particular study, digit sucking, which was considered a significant bad oral habit among the children population that was studied, was substantially related to occlusal development as well as a statistically significant association of AOB and posterior CB [6]. The results of this particular study can be said to be in agreement with other existing malocclusion studies done by different scholars. This is in the sense that, numerous studies [4,27,29] have linked a vast range of non-nutritive sucking habits to malocclusion.

In addition to the relationship between the prevalence of bad oral habits with the prevalence of malocclusion, it was evident that mouth breathing (termed as a bad oral habit) in one of the most prevalent conditions that have possible potential adverse effect on occlusion. These malocclusion traits are such as the molar Class III sagittal relationship [21]. Thus, in a nutshell, malocclusion prevalence is identified from a clinical standpoint. Although gender or even environmental factors are common factors leading to malocclusion, the identification of the prevalence of the condition needs to pay attention to clinical details. This being said, studies done from a clinical standpoint suggest that the prevalence of some bad oral habits such as digit sucking, may be overestimated to the extent of overlooking conditions such as mouth breathing. Therefore, with respect to the studies analyzed in this meta-analysis, there is a significant relation-

ship between sucking habits (considered as a type of bad oral habits) and the anterior open bite as well as the posterior crossbite (these two are considered as different malocclusion types) [22]. In a similar vein, different studies suggest that it is advisable to eliminate digit sucking right before tooth movement. The reason why this is crucial is that, when digit sucking becomes a habit, there is a possibility that it will disturb the correction of the sagittal discrepancy and also the growth modification [23].

Based on the results and the discussions of the aforementioned studies, it was evident that malocclusion prevalence differed across different age groups due to the change in the bad oral habits associated with the said age groups. For instance, while malocclusion can be said to be overly prevalent in children between the ages of 1 and seven years, its prevalence was considered higher in children in children aged three than those of 7 years of age [24]. Besides, despite the relatively constant prevalence of different types of malocclusion between age 3 and seven years, different changes were observed at individual levels. This was not only because of the spontaneous correction of these conditions but due to extreme prevalence, of the malocclusion condition. For instance, there were those children whose malocclusion conditions worsened due to the development of malocclusions of a similar rate [25]. Additionally, specific malocclusion types such as anterior open bites had the greatest association with different types of sucking habits [26]. Precisely, the influence of sucking habits on occlusion and was most prevalent in kids aged three years. Conversely, although children who were seven years of age exemplified a prevalence of bad oral habits such as the sucking patterns, some of the malocclusion conditions that were prevalent amongst them were bot the anterior open bite and the posterior crossbite. Besides, although not as frequent as the sucking habits among children in this age group, persistent tongue thrust, which is deemed as a bad oral habit, can also be said to bring about the prevalence of the anterior open bite condition [27]. The relationship between the prevalence of various sucking habits and malocclusion conditions such as posterior crossbite is seen in the fact that sucking habits change the swallowing pattern of an individual. This, in essence, is known to be a crucial factor in the etiology for the development of posterior crossbite. This being the case, it said that, even if a child's sucking habit ceased a couple of years ago, the persistence of the abnormal tongue position or pressure mostly acts as the barrier to the correction of the malocclusion situation in the child. Therefore, based on this particular context, it is with no doubt that the most prevalent bad oral habits in the childhood fall under the sucking patterns. This being the case, anterior open bite and posterior crossbite, form the most common malocclusion conditions [28].

Conclusion

Based on the analyzed studies, it is evident that the negative influences of the bad oral habits relating to occlusion originate right from childhood. Precisely, right at a very tender age, say 0-3 months, at a time of primary dentition, bottle feeding and non-nutritive sucking habits have been said to have a significant relationship with malocclusions. According to different scholars, bottle-fed children are more prone to developing pacifier-sucking habits. This being the case, a majority of the scholars in the studies mentioned above contend that it is through some of the non-nutritive sucking habits, which are assumed in primary dentition, that a typical swallowing pattern is developed [22]. This, in turn, has an association with the thrusting of the tongue which is essentially related to the development of specific malocclusion types such as the posterior crossbite.

Similarly, one out of the four analyzed studies concluded that there is a substantial relationship between bad oral habits and malocclusion conditions such as open bite and increased overjet. In this particular study, no significant association was realized in bot anterior and posterior crossbite. The primary reason for this was that the biological damages which were caused by the prevalence of bad oral habits were dependent on different factors such as; the age of initiation, duration, and a person's biological and genetic factors, among many others. Numerous literature both recent and olden have, therefore, linked the pattern of vertical growth as well as non-nutritive sucking habits with a substantial maxillary deficit. According to the findings in numerous studies, it was concluded that in cases where the sucking habits in mixed dentition are associated with an increase in the vertical dimensions, then there is a significant association with the transversal maxillary deficit leading to the narrowing in diameter of the upper jaw. This, in essence, leads to the prevalence of posterior crossbite, a common malocclusion condition. In a nutshell, commonly among young children, the risk that is associated with bad habits

to develop a crossbite is significantly dependent on the genetic pattern of growth. In this regard, it is evident that not all individuals who exemplify bad oral habits have crossbite or are at risk of developing crossbite in the future.

In conclusion, the above discussed bad oral habits are considered as risk factors that mostly lead to malocclusion due to the fact that they change the physiological balance of growth, especially the mandibular system. Also, although mouth breathing is not considered a bad oral habit in most studies, like other bad oral habits such as sucking habits, tongue thrust, among others, is always significantly associated with all the occlusal problems. Thus, based on the conclusions derived from all the above-discussed studies, we can finally conclude that there is a very significant relationship between the development and prevalence of malocclusion with the prevalence of bad oral habits. However, the related bad habits would be expressed in those individuals who are more susceptible factors that are genetically caused and also different unfavorable growth patterns.

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