Sriwijaya Journal of Dentistry

Sriwijaya Journal of Dentistry (SJD)
Volume 5 Issue 1 2024 :27-38
https://sjd-fk.ejournal.unsri.ac.id/index.php/sjd/index

The Relationship Between Malnutrition And Malocclusion: Literature Review

Wahyuni Dyah Parmasari[1*]

[1]Department of Dental and Oral Medicine, Medical Faculty of Wijaya Kusuma University, Surabaya, Indonesia
[*]Correspondence author email: wd.parmasari@uwks.ac.id

Abstract

Introduction: Nutrition is a crucial factor in the body's growth and development process, particularly for the jawbones and teeth. A lack of proper nutrition can lead to slow growth of the maxilla and mandible, resulting in an imbalance in the relationship between the upper and lower jaw arches. This disharmony can cause malocclusion. The objective of this study was to review the most recent cross-sectional studies from the last 10 years that report on the relationship between malnutrition and malocclusion. **Purpose:** To find out more information on the influence of malnutrition on the occurrence in malocclusion. **Methods:** The literature survey was carried out using the Google Scholar, Sciencedirect and PubMed databases. Data search utilized the Boolean Search method. **Results:** The initial search yielded 58 citations which were then selected and duplicates were removed. There were 10 articles found. **Conclusion**: The studies cited in this literature review indicate that not all journals suggest a significant difference between malnutrition and malocclusion.

Keywords: Body_Mass_Index; BMI; Malnutrition; Malocclusion

Introduction

Malocclusion has a significant impact on individuals and society at large in terms of quality of life, appearance, and functional and social limitations.[1] This oral health problem ranked third after caries and periodontal diseases. Malocclusion examinations need to be conducted during the prepubertal stage because increasing severity can cause emotional problems and undermine a child's confidence.[2] Malnutrition is a multifactorial condition that includes two opposite but equally serious problems: macro nutrient and micro nutrient deficiencies, and over nutrition due to excessive intake of essential nutrients. Malnutrition is associated with a reduction in the length of the basis cranial and the height of the mandibular jaw. Long-term malnutrition results in inhibition of the bone growth process, seen from slower growth rates, poorer quality bone density and faster cessation of growth centers such as sutures[3].

Currently, Indonesia is facing a double nutrition problem, with issues of both under nutrition and over nutrition. Health research results (Riskesdas) 2013 mention that the nutritional status of adolescents aged 13-15 years is as follows: 3.3% are very thin, 7.8% are thin, 78.1% are normal, 8.3% are obese, and 2.5% are very obese. The latest data from the

2022 SSGI (Survei Status Gizi Indonesia) survey indicated an increase in overweight rates compared to underweight. This can be attributed to lifestyle habits such as excessive intake of sweet foods and lack of physical activity.[4].

Malnutrition results in variations in lower facial height and maxillary width.[5] Additionally, reduced width and length of the dental arches of the upper jaw and mandible were found among malnourished subjects compared to well-nourished subjects. This is reflected in the arch becoming shortened, inhibiting tooth eruption and causing crowding of teeth.[5]

In this study, subjects' oral health and general health relationships were examined. Among environmental factors, research shows the role of nutritional status. Among the assessment tools for nutritional status, Body Mass Index (BMI) is widely used and accepted. Nevertheless, WHO recommends BMI and height-for-age index as appropriate indicators for evaluating the nutritional status of adolescents.[6] Crowding of anterior teeth in adolescents is influenced not only by nutritional status but also by other factors such as dental history, bad habits, crowded deciduous teeth, heredity, and the socioeconomic status of parents.[7] This study aimed to review the latest cross-sectional studies from the past decade that examine the relationship between malnutrition and malocclusion, in order to gain a deeper understanding of how malnutrition influences the occurrence of malocclusion.

Methods

The literature survey was carried out using *the Google Scholar, Sciencedirect* and *PubMed databases*. Data search uses the Boolean Search method. The keywords used to search for journals were “malocclusion”, “malnutrition”, “obesity”, “Body Mass Index (BMI)”, “Jaw disharmony” AND “maksilla”, “mandibula”, “anterior crowding”. In Bahasa, the keywords used to search for journals were “malnutrition cause malocclusion”, “obesity”, “Body Mass Index (BMI)”, “disharmony of jaw” AND “maksila”, “mandibula”, “crowding anterior”. The inclusion criteria were: 1) research articles in English and Bahasa Indonesia; 2) original articles, full text; 3) journal search range 01 January 2024-01 January 2014; 4) study areas including malnutrition cause malocclusion, BMI, jaw disharmony; 5) cross-sectional study and research study. Exclusion criteria were: 1) literature review / systematic review / rapid review articles other than English and Bahasa Indonesia; 2) textbooks, theses, literature that cannot be

accessed in full text; 3) journals with publication years outside the time range; 4) the study areas not related to the discussion; 5) subjected to animals.

Results

The initial search yielded 58 citations, from which duplicates were removed. Ten articles meeting the inclusion criteria and relating to malnutrition and malocclusion were found. Table 1 describes the studies included in this review. A summary was created for each publication, according to (a) author and year of publication, (b) title of journal in which it was published, (c) sample size (N), (d) Body Mass Index (BMI)/ Berat Massa Tubuh (BMT), (e) malocclusion, (f) variables measured, and (g) research results.

Table 1. Summary of Articles Examining the Relationship Between Malnutrition and Malocclusion

Author and year	Title of journal	N	BMI/BMT	Malocclusion	Variables measured	Research results
Khan et. Al, 2014	Is there is any relationship between malocclusion and nutritional pattern of children?	627 school children (276 male, 349 female)	Normal : 79,9% Overweight : 10,0% Underweight : 10,1%	No : 77.5% Yes : 79.9%	0,03	In this study it was confirmed that the health status was poor and Malnutrition can result in poor oral health and malocclusion
Anand et. Al 2021	Analyzing the role of malnourishment in malocclusion: a cross-sectional study	220 subjects, male and female, 12-15 years of age.	Underweight Healthy Overweight	Angle's Class I malocclusion with spacing : 44,,54% malocclusion Angle's Class II division 1 : 23,63 % malocclusion Angle's Class II division	-	This study found that the subject variable crowding had a statistically significant relationship with malnutrition BMI <18.5. Another factor is found to be associated with malocclusion but not

				2 : 17,27 % malocclusion Angle's Class III : 6,3 %		statistically significant.
Anand, Grag & Singh, 2022	Effect of Socioeconomic, nutritional status, diet and oral habits on the prevalence of different types of malocclusion in school children	765 students, low soscio-economic status (LSS) : 369 and high soscio-economic status (HSS) : 368. The age group of 13-15 years.	Under weight : 190 (50,0%) Normal : 149 (39,2%) Overweight : 32 (8,4%) Obese : 9 (2,4%)	Class I : 336 (43,9%) Class II : 229 (29,9%) Class III : 4 (0,05%)	0,874	Nutritional status is determined using BMI, which can be used to estimate health weight based on height. Teenagers who are underweight have malocclusion compared to those who are normal BMI.
Narang et. Al, 2023	Nutritional Status and Malocclusion Parameters among 5–15-Year-Old School-going Children of Bathinda, Punjab, India	500 subjects, 5-15 years old school going children	**Association of body mass index with crowding (Present)** Underweight : 61 Normal : 104 Overweight : 8 Obese : 4 **Association of body mass index with**	**Crowding** Present : 177 (35,4%) Absent : 323 (64,6%) **Crowding**	0,013 0,014	Conclusion This research concludes a significant relationship between tooth crowding, Lower facial Height (FH), and nutritional status. Relationship between BMI and facial shape. In this study it was found

			Facial Height (FH) (Present) Underweight : 21 Normal : 53 Overweight : 11 Obese : 3 **Association of body mass index with Anterior Crossbite (Present)** Underweight : 5 Normal : 4 Overweight : 0 Obese : 0 **Association of body mass index with posterior Crossbite (Present)** Underweight : 4 Normal : 1 Overweight : 0 Obese : 0	Present : 88 (17,6%) Absent : 412 (82,4%) **Crowding** Present : 88 (17,6%) Absent : 412 (82,4%) **Crowding** Present : 5 (1,0%) Absent : 495 (99,0%)	0,46 0,17	that the bone size was larger in children with overweight, provide tentative evidence that obesity accelerates the timing of facial growth.
Jasim, Garman & Nahidh, 2016	The Association between Malocclusion	600 children between 9 to 11	**Frequency distribution of the sample**			There is a significant relationship between

	and Nutritional Status among 9-11 Years Old Children	years (312 males, 288 female)	**according to the genders and nutritional status** Normal : 348 (58%) Overweight : 238 (39,7%) Underweight : 14 (2,33%) **Association between BMI and anterior crossbite.** Normal : Overweight : Underweight : **Association between BMI and dental crowding.** Normal : Overweight : Underweight :	**Chi square** Male : 2,305 Female: 1,246 **Chi square** Male : 2,305 Female: 1,246	0,129 0,536	crowding, high face, bad habits and Nutritional status is influenced by local factors such as caries. Furthermore, policy actions are aimed at reducing obesity and unhealthy oral habits are strongly encouraged to reduce malocclusion and obesity related treatments burden.
Spahi, Taha & Razeghi, 2023	Relationship between Growth Hormone Level and Growth Parameters among Primary School Students with Malocclusion in	Total sample size was 400 students, aged 10-11 years old	Underweight : 153 (38,25%) Normal : 184 (46,00%) Overweight : 46 (11,50%) Obese: 17 (4,25%)	Molar Rotation: 2,135 Overjet: 6,135 Overbite: 7,754 Posterior crossbite: 0,946	0,545 0,105 0,051 0,820	This study shows basal metabolic rate an inverse relationship between GH levels among children. Class I malocclusion is higher

	Center of the Middle city of Iraq					from class II in all BMI categories. The increase in overjet and overbite is mostly higher in comparison normal in the BMI category. The posterior crossbite was found to be higher at normal BMI, while obesity is the lowest. All these results showed no significance relationship between overbite and BMI.
Dermawan, Fitrianan & Alioes, 2016	The Relationship Between Nutritional Status To Mandibula Anterior Alignment Teeth Based On Little's Irregularity Index In Students SMPN 5 Padang	60 elementary school students, 12-14 years old	Normal : 41,7% Underweight : 25,0% Overweight : 45,0%	Non crowding : 25% Crowding mild: 45% Crowding medium-severe: 30%	0,03	The nutritional status of 5 students is varies from normal, thin and fat. Almost half of the students of 5 have normal nutritional status, one-third of whom are obese and The other small part is a quarter Students are malnourished.
Fatimah & Wahyuni, 2023	The Relationship between	30 subject,	**Nutritional Status**	**Crowding** Yes : 73,3% No : 26,7%	0,00	Results of research conducted on children aged 5-12

	Stunting and Crowded Teeth in Children Ages 5-12 Years in Gedong Tataan District, Regency Pesawaran	5-12 years old	Poor nutrition : 13,3% Undernutrition : 43,3% Normal : 43,3% **Stunting status** Yes: 56,7% No : 43,3%			in one of the elementary schools in the sub-district Gedong Tataan, Pesawaran Regency in 2023 concluded that There were 4 children (13.3%) who were malnourished and 13 children (43.3%) were malnourished less. The percentage of children who are stunted is 17 children (56.7%). Array distribution The teeth of children who experienced the most malocclusion were crowded teeth as many as 22 children (73,3%).
Sembiring, Sjahruddin & Yusra, 2020	Correlation between Body Mass Index with Anterior Crowding and Enamel Hypoplasia of Sundanese	157 children	**Correlation of body mass index with anterior crowding** Underweight : 4,769 Normal : 3,82	**Anterior crowding frequency distribution based on age groups** Age 9 : 15 Age 10 : 61 Age 11 : 54	0,024	Malocclusion is an oral health problem ranked third after caries and periodontal diseases. Malocclusion examination

	Children in Bandung		Overweight; 3,5	Age 12 : 15		needs to be conducted during the prepubertal stage so that, if any malocclusions are found, early treatment can be initiated. If malocclusion is neglected, an increasing severity of malocclusion can cause emotional problems and undermine a child's confidence. Susilowati's study of 157 children obtained prevalence rates of anterior dental malocclusion of 26.75% for crowding, 9.55% for protrusion, and 6.37% for diastema.
Lubis & Tiong, 2021	Relationship Between Nutritional Status and Mandibular Length in Subjects	100 children aged 10-16 years old	**Nutrition status** Lower than normal : 50% Normal : 50%	**Mandibular length (mm)** Lower than normal : 94,52 ± 5,89 Normal : 104,44 ± 4,85	0,001	Mandibular length in subjects with normal nutritional status was significantly longer than in subjects with low nutritional status.

	Aged 10–16 Years					The role of nutritional status In mandibular growth, nutritional status is important to consider in treatment planning.

Discussions

In the journal stated by Khan et al. (2015), No relationship was established between being underweight, having low height, and malocclusion in permanent dentition. This may indicate that malnutrition alters the growth pattern of the skeletal bones, including those of the face and oral cavity.[8] Malnutrition may be linked to dental crowding, which occurs when teeth misalign due to insufficient space for them to erupt in alignment with the alveolar crest. There is a connection between nutritional status and reduced space for tooth eruption (crowding) in permanent teeth. The correlation between low height for age was only observed in adolescents with a long history of mouth breathing. No association was found between being underweight and dental crowding. Thus, it is concluded that malnutrition is related to the crowding of permanent teeth in mouth breathers.[9] There is statistically significant relationship between anterior and posterior crossbite and the nutritional status of school children. This is important because nutritional factors impact the width of the maxillary and mandibular arches, with the causes of crossbite involving a combination of dental, skeletal, and neuromuscular functional components.[10]

There is no statistically significant relationship between anterior and posterior crossbite and the nutritional status of school children. This is relevant because nutritional factors will influence the width of the maxillary and mandibular arches because the etiology of crossbite includes various combinations of dental, skeletal and neuromuscular functional components[10].

According to Jasim et al., in the child population in Iraq, statistical analyses revealed no association between anterior and posterior crossbite and the nutritional status of children in both genders. Since the etiology of crossbite can include any combination of dental, skeletal, and neuromuscular functional components, the posterior cross-bite could be associated with a reduction in maxillary arch width due to adverse oral habits. Mouth breathing plays a significant role in increasing anterior facial height (AFH) concomitant with downward and

backward mandibular rotation, posterior teeth supra-eruption, and the development of an anterior open bite, which can be associated with adaptive tongue thrust.[1] The effects of malnutrition on the growth and development of facial bones and skeletal muscles are significant. Protein deficiency can manifest as disrupted jaw growth, causing crowding of teeth. The research also found that students with normal nutritional status had crowded teeth due to other influencing factors, such as education, socio-economic status, bad oral habits, physical activity, genetic factors, and various other factors.[4]

Another conclusion from the research of Fatimah & Wahyuni is that nutritional imbalances can occur from childhood to adolescence. If this continues for a long time, chronic malnutrition will occur, disrupting the growth and development process. Delayed eruption of permanent teeth is one form of chronic malnutrition. Being underweight can influence delays in the eruption of permanent teeth, causing them to erupt in the wrong place and resulting in tooth crowding and caries in adjacent teeth.[7]

Malnutrition includes two opposite but equally serious problems: reduced nutrition and excess nutrition due to excessive intake.[11] Malnutrition can cause problems with the structure of the mouth, inhibit tooth eruption, reduce radicular osteocementum, disrupt collagen fiber formation, cause odontoblast atrophy, and thicken the mandible.[2] This can interfere with the maturation and formation of the jaw, making it narrow and causing irregular tooth growth. Bone metabolism can change in those who are obese, leading to alterations in jaw growth and development, tooth eruption, accelerated tooth development, and decreased masticatory performance.[12] Bad habits are actions or behaviors repeated continuously that are neither beneficial nor detrimental to the individual. Bad habits from childhood that greatly affect malocclusion include improper feeding, finger biting, tongue, lip or nail biting, and mouth breathing.[7]

Conclusion

Some existing references did not find a significant relationship between malnutrition and malocclusion, while others did. This discrepancy can be attributed to several factors, including bad habits that influence the severity of malocclusion. Chronic malnutrition can result in the late eruption of permanent teeth, and being underweight can affect the timing of

this process. A delay in the eruption of permanent teeth can cause them to erupt in the wrong place, leading to tooth crowding.

References

1. Jasim ES, Garma NMH, Nahidh M. The Association between Malocclusion and Nutritional Status among 9-11 Years Old Children. Iraqi Orthod J. 2016;(August):13–9.
2. Sembiring L, Sjahruddin L, Yusra Y. Correlation between body mass index with anterior crowding and enamel hypoplasia of sundanese children in Bandung. Sci Dent J. 2020;4(2):59.
3. Spahi HA, Taha SS, Razeghi S. Relationship between Growth Hormone Level and Growth Parameters among Primary School Students with Malocclusion in Center of the Middle city of Iraq. 2023;7:418–26.
4. Arief Dermawan CH, Fitriana A, Alioes Y. Hubungan Status Gizi Terhadap Kesejajaran Gigi Anterior Mandibula Berdasarkan Pengukuran Little'S Irregularity Index Pada Siswa Smpn 5 Padang. Cakradonya Dent J. 2018;9(1):50–4.
5. Anand T, Garg AK, Singh S. Effect of socioeconomic, nutritional status, diet, and oral habits on the prevalence of different types of malocclusion in school-children. Acta Biomed. 2022;93(3).
6. Aguilera-Galaviz LA, Hernández-Vázquez B, Frausto-Esparza S, Díaz-Rosas CY, Gaitán-Fonseca C. Nutritional and oral health conditions in high school students. Odovtos - Int J Dent Sci. 2019;21(2):83–93.
7. Fatimah RN, Wahyuni S. Hubungan Stunting Terjadap Gigi Berjejal pada Anak Usia 5-12 Tahun di Kecamatan Gedong Tataan Kabupaten Pesawaran. J Kesehat Tambusai. 2023;4(4):5088–9.
8. Khan SH, Hasan MN, Anjum S, Rafique T. Is there is any relationship between malocclusion and nutritional pattern of children. Updat Dent Coll J. 2015;4(2):9–13.
9. Poojar B, Ommurugan B, Adiga S, Thomas H, Sori RK, Poojar B, et al. Methodology Used in the Study. Asian J Pharm Clin Res. 2017;7(10):1–5.
10. Article O. Nutritional Status and Malocclusion Parameters among 5 – 15 - Year - Old School - going Children of Bathinda , Punjab , India. 2023;15–8.
11. Anisa M, Wibowo D, Hamdani R. Hubungan Status Gizi Terhadap Maloklusi (Literature Review). Dentin. 2022;6(1):41–6.
12. Lubis H, Tiong R. Relationship between nutritional status and mandibular length in subjects aged 10–16 years. Sci Dent J. 2021;5(3):144.