World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Comparison of jaw arch size in stunting patients at Asemrowo Public Health Center

Ida Bagus Narmada [1,*], Dyva Amalia Noor Pratama [2] and Nafasya Putri Brillianti [2]

[1] *Department of Orthodontics, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia.*
[2] *Undergraduate Students, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia.*

World Journal of Advanced Research and Reviews, 2024, 21(01), 1305–1309

Publication history: Received on 01 December 2023; revised on 10 January 2024; accepted on 13 January 2024

Article DOI: https://doi.org/10.30574/wjarr.2024.21.1.0167

Abstract

Background: The etiology of malocclusion is multifactorial, it can occur due to intrinsic, extrinsic factors or a combination of both. Malnutrition, which is one of the extrinsic factors of malocclusion, is a frequent case in Indonesia. An example of a malnutrition case that commonly occurs in Indonesia is stunting in children's growth and development, which can trigger malocclusions such as crowded teeth and bone crowding.

Purpose: To identify the size of the dental arches in stunting sufferers at the Asemrowo public health center.

Methods: In the study model of stunting patients, the length and width of the jaw arch were measured. The results of the measurements are then analyzed and compared with the data from the measurements of healthy children to see whether there are significant differences.

Results: In terms of maxillary arch length, the 7 year age group yields p = 0.179. In terms of maxillary arch width, the 7 year age group yields p = 0.282. In terms of mandibular arch length, the 7 year age group yields p = 0.398. In terms of maxillary arch width, the 7 year age group yields p = 0.398. In terms of maxillary arch length, the 8 year age group yields p = 0.438. In terms of maxillary arch width, the 8 year age group yields p = 0.082. In terms of mandibular arch length, the 8 year age group yields p = 0.302. In terms of mandibular arch width, the 8 year age group yields p = 0.190.

Conclusion: There is no significant difference between the length and width of the jaw arch in all age groups (p > 0.05).

Keywords: Jaw arch size; Etiology of malocclusion; Mixed dentition; Stunting; Malnutrition

1. Introduction

Malocclusion is the most common dental problem with a prevalence of 20-100% from various surveys and research that have been conducted. One of them, according to data from the World Health Organization (WHO). In the last five years in Indonesia, the results of Basic Health Research (Riskesdas) show that 57.6% of the Indonesian population experienced dental and oral problems and only around 10.2% received medical services, 80% of whom experienced malocclusion [1, 2]. Malocclusion is defined as one of the dentofacial abnormalities associated with abnormal occlusion and craniofacial relationships [3]. These disorders can affect the function, aesthetics and harmony of the face.

The etiology of malocclusion is multifactorial, it can occur due to genetic, environmental factors or a combination of both [3]. Abnormalities of the teeth (dental), jaw bones (skeletal), combination of teeth and jaw (dentoskeletal), and masticatory muscles (muscular) known as soft tissue are one of the etiologies of malocclusion [4]. Apart from abnormal tooth relationships, the balance of the surrounding muscles is also one of the factors affecting malocclusion. The muscles of the face and neck exert a constant influence on the teeth and their supporting structures. Active power and

* Corresponding author: Ida Bagus Narmada

The passive nature of the muscles plays a role in the integrity of the tooth relationship and the dental arch. According to Singh (2007), the etiology of malocclusion is divided into extrinsic and intrinsic factors. Extrinsic factors include hereditary, congenital, malnutrition, bad habits, trauma and accidents. Meanwhile, intrinsic factors include deciduous tooth caries, deformities, size or number of teeth, premature loss, prolonged retention and so on ankylosis[5, 6].

Malnutrition is one of the extrinsic factors of malocclusion and is a frequent case in Indonesia. One of the cases of malnutrition that commonly occurs in Indonesia is stunting. According to data from the 2022 Indonesian Nutritional Status Survey (SSGI), the prevalence of stunting in Indonesia has decreased by 21.6% from 26.92% in 2020. Babies born with stunting will experience decreased cognitive and motoric development and the risk of physical and mental disability [5]. In addition, stunting can affect the development of tooth structure, tooth eruption and increased caries [7, 8].

Stunting is a short or very short body condition based on height for age that is less than -2 standard deviations (SD) from the WHO growth curve, caused by inadequate nutritional intake and/or chronic infections that occur in the first 1000 days [9]. Based on global prevalence, it was 22.9% or 154.8 million children under five and became 22.2% or 150.8 million children under five in 2017. This condition is concentrated in poor countries 35.2% and developing countries 22.4%, spread across Asia 56% and Africa 39%. According to data from the Indonesian Nutrition Status Study (SSGI), the Indonesian Ministry of Health (Kemenkes) states that in 2022 there will be 923 toddlers in the city of Surabaya, one of which is at the Asemrowo health center, numbering 14 toddlers [2, 10].

Stunting during a child's growth and development period triggers malocclusion, such as crowded teeth and impaired bone growth [11]. Common malocclusions include Class II malocclusion, anterior open bite, excessive overjet and posterior cross-bite [12]. Previous studies show that nutritional status affects the growth and development of children's teeth and jaws. Based on this, further research is needed to examine the classification of malocclusion in individuals who experience stunting [12, 13].

2. Material and methods

2.1. Material

The materials used in this research included stationery, bowl, rubber bases, handscoons, calipers, stock tray, spatula, mask, mineral water, alginate and type 2 gypsum.

2.2. Methods

The type of research is analytical-observational with a cohort research design, where there are two groups (children diagnosed with stunting and healthy children) who observe the length and width of the jaw arch. The population of this study is data on the history of stunting patients at the Asemrowo health center in 2022-2023 and the sample was selected using a purposive sampling technique. The sampling criteria for the study model were children aged mixed dentition (6-12 years), diagnosed with stunting, had good growth and development and had never had orthodontic treatment. The research takes place from May to November 2023.

Research procedures included printing study models on patients according to inclusion criteria, collecting models, and measuring arch length and width in stunted and healthy children. The length of the maxillary and mandibular arches was measured by making the most anterior and most central points of the central incisors as anterior benchmarks. Then an imaginary line was drawn connecting the most distal surfaces of the most posterior right and left molar teeth. The midpoint of the imaginary line as a posterior benchmark. Next, draw a line connecting the anterior benchmark and posterior benchmark for measurement.

Arch width measurements were made by making a point at the top of the mesiobuccal cusp of the right and left permanent first molars on the upper and lower jaw. Then, the distance between the two peak points of the mesiobuccal cusp of the right and left permanent first molars was measured using a caliper. All these steps were repeated on models of children diagnosed with stunting and healthy children. The data results were then processed using SPSS v.26 with the Repeated Measure ANOVA test to test the difference between the arch sizes of children diagnosed with stunting and healthy children.

3. Results and discussion

The research results were obtained by analyzing study models from stunted child patients and healthy children. In the study model of patients with stunted children and healthy children, the arch length was measured anteroposteriorly from the incisal point anteriorly to the midpoint of the imaginary line connecting the distobuccal cusps of the right and left second molar teeth posteriorly. Jaw width is measured by calculating the intermolar width. The measurement results are then compared and observed to see whether there are differences between stunted children and healthy children.

Table 1 T-test result

Parameter	Stunting Group	Healthy Group	*p-value*
7 years group			
Maxillary Arch Length	34.60 ± 3.26	36.61 ± 2.79	0.179
Maxillary Arch Width	48.33 ± 1.87	49.29 ± 1.81	0.282
Mandibular Arch Length	32.53 ± 3.25	33.70 ± 2.38	0.398
Mandibular Arch Width	45.84 ± 0.99	46.18 ± 0.16	0.679
8 years group			
Maxillary Arch Length	36.13 ± 2.82	37.43 ± 2.19	0.438
Maxillary Arch Width	48.92 ± 1,16	50.48 ± 1,29	0.082
Mandibular Arch Length	33.83 ± 2.14	35.27 ± 2.02	0.302
Mandibular Arch Width	46.30 ± 1.03	48.10 ± 0.91	0.190

Based on the results of the t-test data in the table above, the following results show there is no significant difference in every group (p>0,05). The results of the study show that there are differences in size for each individual between stunted children and healthy children in the same age group, but there is no significant difference because the difference is not that big. If the means between the two age groups are compared without using statistical analysis, they will show differences, even though they are very small. There are differences in the two age groups, it is possible that there are subjects who do and do not experience accelerated growth [14].

This research is also in line with previous research conducted by Sitinjak *et al* (2019) which states that the size of the jaw arch can change as the number of permanent teeth increases. Changes in the size of the jaw arch can also be influenced by the phase of tooth replacement, changes in the alveolar bone as the bone that supports the teeth, which undergo significant changes according to the process of loss and eruption [15]. Lack of nutritional intake in stunted children can have an impact on delayed tooth eruption. The initial stages of tooth growth are influenced by several factors, namely protein, Ca, P, F, vitamins and minerals. Intake of calcium, phosphorus, vitamin C and vitamin D is very important, if the body lacks these substances then the growth and development of teeth can be hampered and make tooth eruption time slower [15, 16].

If during the dentition phase, nutritional intake is not met, it can cause delays in the bone maturity process. Nutrition is one of the factors that influences the growth of the jaw arch and influences changes in its dimensions. The presence of calcium in the human body can create optimal conditions for mineralization and growth of bones, including the jaw arch. Calcium in tissues is always being renewed. First, calcium is present in the superficial part of hydroxyapatite and in the fluid around its surface. Calcium in this area is quickly exchanged. Second, calcium is distributed in crystals of the mineral substance of bone tissue. This ion group is renewed more slowly [17]. Also, each individual tends to have different skeletal and jaw patterns, so that one individual will be different from another. This is in accordance with the statement of Townsend, Brown, Guagliando, and Leysel in Sylvia (1993), that there are variations in the jaw arch caused by growth hormone factors. Usually this growth hormone causes almost all men's skeletal size to be larger than women's [16, 17, 18].

Stunting factors can cause problems with the oral structure, delayed tooth eruption and bone loss, disruption of collagen fiber formation, and odontoblast atrophy, as well as thickening of the mandible [19]. However, nutritional factors are only one of several factors that may dominate, as previously mentioned, so from this study it cannot be said that there is a significant relationship between cases of stunting and the length and width of the jaw arch, which is an indicator of malocclusion [19, 20, 21].

4. Conclusion

There is no significant difference between the size of the jaw arch and the pattern of malocclusion in children with stunting and healthy children aged 7-8 years. Changes in arch size and malocclusion have a multifactorial and complex etiology. The occurrence of changes in the jaw arch is a normal thing that occurs in the mixed dentition phase.

Compliance with ethical standards

Disclosure of conflict interest

No conflict of interest to be disclosed.

References

[1] Dutra, Sônia Rodrigues, et al. "Impact of malocclusion on the quality of life of children aged 8 to 10 years." Dental press journal of orthodontics 23 (2018): 46-53.

[2] Hasil Utama Riset Kesehatan Dasar (RISKESDAS). Jakarta: Kementerian Kesehatan Republik Indonesia; 2018.

[3] Zou, Jing, et al. "Common dental diseases in children and malocclusion." International journal of oral science 10.1 (2018): 7.

[4] Proffit, William R., et al. Contemporary Orthodontics, 6e: South Asia Edition-E-Book. Elsevier India, 2019.

[5] Singh, Gurkeerat, ed. Textbook of orthodontics. JP Medical Ltd, 2015.

[6] Tarigan, Theresia, and Ismet Danial Nasution. "Alveolar arch shapes and its relation to complete denture retention." Journal of Syiah Kuala Dentistry Society 5.1 (2020): 30-36.

[7] Kasparaviciene, Kristina, et al. "The prevalence of malocclusion and oral habits among 5–7-year-old children." Medical science monitor: international medical journal of experimental and clinical research 20 (2014): 2036.

[8] Madhusudhan, K. S., & Pallavi, M. R. (2019). Malnutrition-a risk for oral health. International J Sci Res, 8, 71-77.

[9] WHO (2014b) Childhood stunting: Challenges and opportunities. Report of a Promoting Healthy Growth and Preventing Childhood Stunting colloquium (WHO/NMH/NHD/GRS/14.1). World Health Organization: Geneva.

[10] Sjarif, D. R., Yuliarti, K., Lestari, E. D., Sidiartha, I., Nasar, S. S., & Mexitalia, M. (2015). Recommendations for evidence-based feeding practices for infants and toddlers in Indonesia to prevent malnutrition.

[11] Anand, Kumar, et al. "Analyzing the role of malnourishment in malocclusion: A cross-sectional study." Journal of Pharmacy & Bioallied Sciences 13.Suppl 1 (2021): S452.

[12] Hassan, R., & Rahimah, A. K. (2007). Occlusion, malocclusion and method of measurements-an overview. Archives of orofacial sciences, 2, 3-9.

[13] Premkumar, Sridhar. Textbook of craniofacial growth. JP Medical Ltd, 2011.

[14] [14] Enikawati, M., H. Soenawan, and M. Suharsini. "Length of the maxilla and mandible in children aged 10-16 years (lateral cephalometric study). 1-13." Jakarta: FKG UI (2013).

[15] Thilander, Birgit. "Dentoalveolar development in subjects with normal occlusion. A longitudinal study between the ages of 5 and 31 years." The European Journal of Orthodontics 31.2 (2009): 109-120.

[16] Jasim, Esraa S., Noor MH Garma, and Mohammed Nahidh. "The association between malocclusion and nutritional status among 9-11 years old children." Iraqi Orthod J 12.1 (2016): 13-4.

[17] Maki, Kenshi, et al. "Effects of dietary consistency on the mandible of rats at the growth stage: computed X-ray densitometric and cephalometric analysis." The Angle Orthodontist 72.5 (2002): 468-475.

[18] Mieke Sylvia, M. A. R. "Normal variations in the size of teeth, jaws and faces of the inhabitants of the islands of Flores and Timor, East Nusa Tenggara." Dentistry Scientific Magazine, Fourth Edition (1993): 460-7.

[19] Christian, Parul, and Emily R. Smith. "Adolescent undernutrition: global burden, physiology, and nutritional risks." Annals of Nutrition and Metabolism 72.4 (2018): 316-328.

[20] Lantu, Virginia AR, Shirley ES Kawengian, and Vonny NS Wowor. "The relationship between nutritional status and the eruption of permanent teeth in students at SD Negeri 70 Manado." e-GiGi 3.1 (2015).Cassidy, Kevin M., et al. "Genetic influence on dental arch form in orthodontic patients." The Angle Orthodontist 68.5 (1998): 445-454.