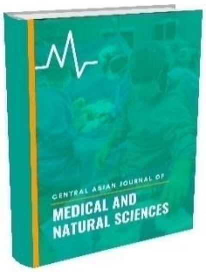
CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES




Volume: 04 Issue: 05 | Sep-Oct 2023 ISSN: 2660-4159

http://cajmns.centralasianstudies.org

# The Influence of Body Mass Index and Craniofacial Morphology on the Eruption of Permanent Dentition in Children

1. **Sameerah Jameel Tarfa**

*Received 2nd Aug 2023,*
*Accepted 19th Aug 2023,*
*Online 12th Sep 2023*

[1] Msc Conservative Dentistry, University of Thi-Qar, College of Dentistry

**Key words:** dental eruption, oral cavity, body mass index, WHO.

**Abstract:**

**Background:** Obesity among children is becoming more commonplace on a global scale. Increased body mass index (BMI) has been linked to greater craniofacial dimensions as well as accelerated dental and skeletal development, according to reports. The timing of orthodontic treatment in relation to pubertal development and teeth emergence depends on this connection.

**Methods:** The study data was entered as nominal (ordinal) data, and SPSS version 26 was used to do the analysis. In the beginning, the frequency distributions of the study variables were figured out. Since the study data is nominal ordinal data, intersection tables were made between the variables to describe some key markers for the research. Also, the chi-square test (x2) was done to see if there was a connection between the study factors and the images. Also, the Kolmogorov-Smirnov test and the Shapiro-Wilk test were used to figure out how well each of the Mass measures (BMI, Facial, and Body) fit together.

**Aim of the study:** to ascertain the relationship between the average age, gender, Facial shape index with body mass index of permanent tooth eruption and During dental eruption.

**Conclusion:** the most significant percentage of those who had a face shape (Eury Prosopis), we note that there is no relationship between the time of tooth eruption and body mass index (BMI), where we note that the value of the level of morale (Sig = 0.293), which is greater than (0.05), and therefore there is no relationship between BMI and the time of tooth eruption, as we notice an excellent convergence for those who have a normal BMI and a delay in tooth emergence.

## Introduction

The migration of the developing tooth from its intraosseous site to its final position in the oral cavity is a dynamic process. Formation of the periodontium, completion of root growth, and establishment of a functional occlusion comprise dental eruption [1]. Although clinical eruption and complete dental eruption cannot be equated, the terms are frequently used interchangeably [2]. It has been demonstrated that, with the exception of the third molars, tooth eruption is an orderly, sequential, and age-specific phenomenon that begins at approximately 6 years of age and continues until approximately 12 years of age. It has been demonstrated that there are ethnic differences in the age and timing of tooth eruption. Numerous studies have examined the direct effects of genetics, hormones, geography, race, sex, socioeconomic status, nutrition, and growth. Recent studies have linked mutations in the PTHR1 gene and the GNAS gene, respectively, to primary eruption failure (the cessation of supraosseous eruption) and other dental eruption issues [3]. Other causes, such as dentigerous cysts and craniofacial malformations, such as cleft palate, have been linked to anomalies in dental eruption [4-6].

Nutritional status is determined by a person's dietary requirements and the amount of nutrients they consume, assimilate, and utilise. A person's capacity to grow and develop physically is affected by their nutritional state. Growth, body size and proportions, chemical makeup, and the quality and texture of particular tissues, such bones and teeth, may all be hampered by inadequate nutrition. The American Dental Association has recognised the link between what people eat and their teeth. Individuals may be classed as underweight using the body mass index (BMI), severely emaciated, overweight, or obese, stands out among the instruments for assessing nutritional status in epidemiological research [7].

Malnutrition is described by the WHO as "the cellular imbalance between the supply of nutrients and energy and the demand of the body so that they can assure growth, maintenance, and specific functions". In addition to being connected to nursing and pregnancy, malnutrition also means inadequate nutrition or process abnormalities [8]. In underdeveloped nations, malnutrition continues to be the greatest cause of newborn and child mortality as well as the main factor in poor health and stunted development [9]. The dietary disorder known as obesity has been called the "pandemic" of the twenty-first century since it affects people of all ages. Childhood obesity has been associated to several systemic disorders [10, 12], including arterial hypertension, type II diabetes, dyslipidemia, obstructive sleep apnea, orthopaedic and psychological difficulties, and changes to the process of growth and development.

One of the most popular metrics used to assess and evaluate somatic development in large populations, particularly among youngsters, is body mass index. Additionally, it is among the most popular and straightforward techniques for determining a person's nutritional status. Body mass index (BMI), also known as the Quetelet index, is computed by dividing a person's weight in kilogrammes by their height in metres squared (13, 14).BMI= weight(kg)/height $m^2$

## Material And Methods

**Methods** Age is the basic factor that is required in the current study, so in order to cover the emergence times of permanent teeth, the age range examined was determined to be between four to fifteen years old to give accurate data from zero to 100% emerged for each tooth type,The examination of children and teenagers started from the first of November -2022 to the middle of December -2022, After receiving sanction from the Ministry of Education to conduct this research, the school administration was contacted and informed of the study's objectives, A child was included in the examination if he was deemed Iraqi based on the ethnicity of his parents; however, children with systemic diseases were excluded, Students were examined in their classroom, seated in a chair with a high back near a window to take advantage of natural light while the examiner stood behind the chair (WHO, 1997), and birth certificates were occasionally used to verify birth dates, If the child's exact date of birth was unknown or he possessed any orthodontic appliance, he was excluded from the examination.

The criteria used:

1. The presence or absence of erupted teeth was recorded.
2. A tooth was deemed to have erupted when any portion of its crown penetrated the gingiva.
3. The probe was used to confirm crown emergence in the presence of any suspension.
4. Permanent teeth that were extracted were documented as erupted (WHO).

**Statistical analysis**

The data of the study was represented in the form of nominal (ordinal) data, as the analysis was used through the (Statistical Package for Social Sciences) (SPSS) version 26. In the beginning, the frequency distributions of the study variables were found, and the study data is nominal ordinal data, so intersection tables were made between the variables to determine some critical indicators for the study. Furthermore, the chi-square test (x^2) was also used to determine whether or not there was a relationship between the study variables and graphs. Furthermore, the (Kolmogorov-Smirnov) test and (Shapiro-Wilk) test were also used to find out the moderation of each of the Mass indexes (BMI, Facial) as they are numeric data. Moreover, when comparing whether there are differences between the means of the mentioned indicators between males and females.

**Result, discussion and conclusion**

**Gender:** "Table (1) shows the distribution of the sample according to gender for a sample size of (136), as it was found that the number of males is (102) and at a rate of (75%), while the number of females is (34) and at a rate of (25%), as shown in table (1)

**Table (1) Frequencies and percentages of the sex variable**

| Gender | Frequency | Per cent |
|---|---|---|
| Male | 102 | 75 |
| Female | 34 | 25 |
| **Sum** | **136** | **100** |

**2. Body Mass Index (BMI): "**Through the study sample, it became clear that there were (6) of those who were under average weight at a rate of (4.4%), while the most significant percentage of those who were of average weight and with several (98), i.e., at a rate of (72%). While those who had an increase in weight number (18) by (13.2%) and those who were (Obese) their number (14) or (10.3%) as shown in the table below.

**Table (2) Frequencies and percentages of BMI**

| BMI | Frequency | Per cent |
|---|---|---|
| Under Weight | 6 | 4.4 |
| Normal | 98 | 72.1 |
| Over Weight | 18 | 13.2 |
| Obese | 14 | 10.3 |
| **Sum** | **136** | **100** |

**3- Facial shape index:** Through the study sample, it became clear that there were (5) people with a face shape (Hypereury Prosopis) with a percentage of (3.7%), while the most significant percentage of those who had a face shape (Eury Prosopis) and a number (51), i.e. a percentage (37.5%), while those who had Meso Prosopis had several (32) and a percentage of (23.5%), while those who had (Hyperlepto Prosopis) had several (40), or a percentage of (29.4%), while they were in the form of (Leptoprosopic Prosopis) with several (37.5%). (8) at a (5.9%) rate, as shown below.

**Table (3) Frequencies and percentages of the face shape index**

| Facial | Frequency | Per cent |
|---|---|---|
| Hypereury Prosopis | 5 | 3.7 |
| Eury Prosopis | 51 | 37.5 |
| Meso Prosopis | 32 | 23.5 |
| Hyperlepto Prosopis | 40 | 29.4 |
| Leptoprosopic Prosopis | 8 | 5.9 |
| **Sum** | **136** | **100** |

we note by conducting the independence test (X2), we note that there is no relationship between the time of tooth eruption and body mass index (BMI), where we note that the value of the level of morale (Sig = 0.293), which is greater than ( 0.05) and therefore there is no relationship between BMI and the time of tooth eruption, as we notice an excellent convergence for those who have a normal BMI and have a delay in the emergence of teeth or their early appearance, as shown in the table below.

**Table (4) shows the relationship between tooth eruption time and body mass index.**

| EPT / BMI | Normal | | Delayed | | Early | |
|---|---|---|---|---|---|---|
| | **Freq.** | **%** | **Freq.** | **%** | **Freq.** | % |
| Under Weight | 0 | 0 | 6 | 9 | 0 | 0 |
| Normal | 40 | 74 | 47 | 70 | 11 | 73 |
| Over Weight | 9 | 17 | 7 | 10 | 2 | 13 |
| Obese | 5 | 9 | 7 | 10 | 2 | 13 |
| **Sum** | **54** | **39.7** | **67** | **49.2** | **15** | 11 |

## Discussion

the importance of craniofacial shape and weight has a great impact on dentition timing sequences. Then what is the related study result in general referred to it.

Dental development occurs from around the sixth week of pregnancy through late adolescence. This process includes the creation and eruption of the 32 permanent teeth as well as the production, shedding, and eruption of the 20 primary (deciduous or shedding) teeth. The teeth are impacted by both inherited and environmental influences throughout this prolonged period of development. The developmental processes connected to tooth timing, positioning, morphology, structure, and composition are influenced by thousands of genes [15].

Early prenatal requirements for dental development include differentiation of the oral ectoderm and migration of neural crest cells into the craniofacial region, from which tooth buds will ultimately emerge. In the sixth week of pregnancy, oral ectoderm begins to develop in the area where the primary teeth will eventually erupt. As the oral ectoderm multiplies, colonies are formed in the mesenchyme.

Eventually, these colonies interact with ectomesenchyme cells derived from the neural crest, resulting in the formation of tooth bud primordia [16].

Many genes, including transcription and growth factors, need to be expressed during these early phases of tooth formation, which are regulated by the oral epithelium. Transgenic rodents lacking the transcription factors MSX1 and MSX2 do not develop canines, for example. As a consequence of the interaction between ectodermal and underlying ectomesenchyme cells, the highly specialised cells that compose dental tissues and regulate tooth size and shape are generated. Diverse transcription factor expression patterns in regions where teeth are developing are believed to genetically regulate tooth location and type (incisor, cuspid, premolar, and molar). The oral epithelium gives rise to ameloblasts, or cells that produce enamel; Dentin and pulp are produced by odontoblasts, which develop from ectomesenchyme cells; mesenchyme cells develop into cement oblasts. Each of these cell types must specialise in these tasks in order to properly manufacture, process, and control the mineralization of the extracellular matrix during tooth formation [17].

## Conclusion

the most significant percentage of those who had a face shape (Eury Prosopis), we note that there is no relationship between the time of tooth eruption and body mass index (BMI), where we note that the value of the level of morale (Sig = 0.293), which is greater than ( 0.05) and therefore there is no relationship between BMI and the time of tooth eruption, as we notice an excellent convergence for those who have a normal BMI and have a delay in the emergence of teeth or their early appearance.

## Reference


1. Hernández, M.; Espasa, E.; Boj, J.R. Eruption chronology of the permanent dentition in Spanish children. J. Clin. Pediatr Dent. 2008, 32, 347–350.
2. Suri, L.; Gagari, E.; Vastardis, H. Delayed tooth eruption: Pathogenesis, diagnosis, and treatment. A literature reviews. AJODO 2004, 126, 432–445.
3. Agarwal, K.N.; Gupta, R.; Faridi, M.M.A.; Kalra, N. Permanent dentition in Delhi boys of age 5–14. Indian Pediatr. 2004, 41, 1031–1035.
4. Khan, N.B.; Chohan, A.N.; AlMograbi, B.; AlDeyab, S.; Zahid, T.; AlMoutairi, M. Eruption time of permanent first molars and incisors among a sample of Saudi male schoolchildren. Saudi Dent. J. 2006, 18, 18–24.
5. Kutesa, A.; Nkamba, E.B.; Muwazi, L.; William Buwembo, W.; Rwenyonyi, C.H. Weight, height and eruption times of permanent teeth of children aged 4–15 years in Kampala, Uganda. BMC Oral. Health 2013, 13, 15.
6. Kurosaka, H.; Itoh, S.; Morita, C.; Tsujimoto, T.; Murata, Y.; Inubushi, T.; Yamashiro, T. Development of dentition: From initiation to occlusion and related diseases. J. Oral. Biosci. 2022, 64, 159–164.
7. Nahajowski, M.; Hnitecka, S.; Antoszewska-Smith, J.; Rumin, K.; Dubowik, M.; Sarul, M. Factors influencing an eruption of teeth associated with a dentigerous cyst: A systematic review and meta-analysis. BMC Oral. Health 2021, 21, 180.
8. Paradowska-Stolarz, A. MSX1 gene in the etiology orofacial deformities. Postepy Hig. Med. Dosw. 2015, 69, 1499–1504.
9. Almotairy, N.; Pegelow, M. Dental age comparison in patients born with unilateral cleft lip and palate to a control sample using Demirjian and Willems methods. Eur. J. Orthod. 2018, 40, 74–81.

10. Arid, J.; Vitiello, M.C.; da Silva, R.A.B.; da Silva, L.B.; Mussolino de Queiroz, A.; Küchler, E.; Nelson-Filho, P. Nutritional status is associated with permanent tooth eruption chronology. Braz. J. Oral Sci. 2017, 16, 1–7.

11. Reis, C.L.B.; Barbosa, M.C.F.; Henklein, S.; Madalena, I.R.; de Lima, D.; Oliveira, M.; Küchler, E.; de Oliveira, D. Nutritional Status is Associated with Permanent Tooth Eruption in a Group of Brazilian School Children. Glob. Pediatric Health 2021, 8, 1–6.

12. Ayatollahi, S.M.; Ghoreshizadeh, Z. Prevalence of obesity and overweight among adults in Iran. Obes. Rev. 2010, 11, 335–337.

13. Nuttall FQ. Body Mass Index Obesity, BMI, and Health: A Critical Review. Nutrition Today 2015;50(3):117–128. DOI: 10.1097/ NT.0000000000000092.

14. Onis M, Onyango AW, et al. Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World Health Organization 2007;85(9):660–667. DOI: 10.2471/BLT.07.043497.

15. Balic A, Thesleff I. Tissue Interactions Regulating Tooth Development and Renewal. Curr Top Dev Biol 2015; 115:157.

16. Hu S, Parker J, Wright JT. Towards unraveling the human tooth transcriptome: the dentome. PLoS One 2015; 10: e0124801.

17. Thesleff I, Aberg T. Tooth morphogenesis and differentiation of ameloblasts. In: Dental enamel, John Wiley & Sons, Chichester, UK 1997. p.3.