International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Assessing Relationship between Biological and Chronological Age Using Dental Maturity among Children

Lalringzo E[1], Tyagi R[2], Pandey H[3], Kapoor S[4]

[1]PhD Scholar, Department of Psychiatry, All India Institute of Medical Sciences Rishikesh, Uttarakhand-249203, India.
Email: *estherlalringzo[at]gmail.com*

[2]Post-Doctoral Fellow, Department of Anthropology, University of Delhi, Delhi-110007, India

[3]Forensic Science Unit, Department of Anthropology, University of Delhi, Delhi-110007, India.
Email: hmt9321@[at]gmail.com

[4]Professor, Department of Anthropology, University of Delhi, Delhi-110007, India

Abstract: ***The present study assessed therelationship between chronological and biological age using dental profile. The study was conducted among children of age 7-8 living in urban areas of Delhi.Morphological examination technique was used andphotographs of teeth were taken to identify dental problems. Information regarding the dental hygiene as well as food preferences were also obtained.Findings of the study showed that respondents were having the first premolar both in the upper and lower jaw indicating that their biological age is more than their chronological age and eruption of the first premolar is earlier among the boys.***

Keywords: Dental Maturity, Children, Biological age, Chronological age, Anomalies

1. Introduction

Growth and development are a critical feature of children's lifeand the growth factor can be used as a decisive variable for orthodontic treatment. Every individual hasa special internal clock of maturity and the growth pattern is different for everyone varying from normal, slow and faster. The growth that can be visually evaluated is termed as the physiological growth or biological growth giving an idea of the biological age. Lucio et al (2007) stated that children with the similar chronological age may show variation in the developmental stages of different biological systems and such differences have led to the concept of biological age as a parameter to define progress toward child's absolute development or maturity.

As per UNICEF's guidelines of 1989, knowing one's age is counted as a basic right for every human being. Moreover, estimation of age and sex is also crucial for personal identification in forensic analysis.A child's tempo of biological age does not necessarily proceed with respect to chronological age. Within a group of children of the same age and sex, variation occurs in biological age. Some children are biologically in advance of their chronological age, and others lag biologically behind their chronological age and may have not attained the same level of biological age (Malina et al, 2004). Biological age can be assessed with the help of dental age, skeleton age, or sexual age.

Abnormalities or deformities found in individual's teeth have great importance in forensic science as they are influenced by genetic and environmental factors which tells a lot about individuality. In cases like mass-disasters, highly decomposed bodies, exhumed bodies forensic odontology is very significant in the identification of individuals. Identification is the establishments of a person's individuality. Proper identification is required for both legal and humanitarian reason if deceased person is skeletonized, burned, decomposed, or dismembered (Sivapathasundharam, 2012). The present study is focused on assessing the biological and chronological age using dental maturity of children of age group 7-8 years. The age estimation is important in both postmortem identification as well as living individual in whom chronological age is under question.

2. Methodology

To conduct present study, field work was done among North-Indian population. The population groups were from urban areas of New Delhi (Figure 1).Areas covered for field work were Malka Ganj, Kamla Nagar, and a private school (Junior Model School) at Samaypur, Delhi. The present study was conducted by collecting dental records of 30 children; 15 girls and 15 boys of chronological age group 7-8 years.The chronological age was calculated on the basis of recorded date of birth of child.

Figure 1: Map of Delhi (Field Area)

Data were collected from schools and permission was obtained from the respective principlesprior to data collection. A consent form along with a semi-structured proforma was provided to the teachers of the schools and requested the students to get it filled/signed by their parents.The basic information asked in the proforma included the details such as name, sex, age, date of birth, mother's qualification, father's qualification, family strength, and monthly income of family. Important information regarding the dental hygiene and food preference of the children were also recorded. Teeth were counted and details of teeth were recorded in the prepared tables.Simultaneously photographs of tooth were also taken to identify dental problems like staining, blackening, and other kind of dental anomalies (Figure 2).The data was analysed using percentage and frequency distribution for selected factors as per objectives of the study.

Figure 2: Dental photographs of children belonging to age group 7-8 years

3. Results

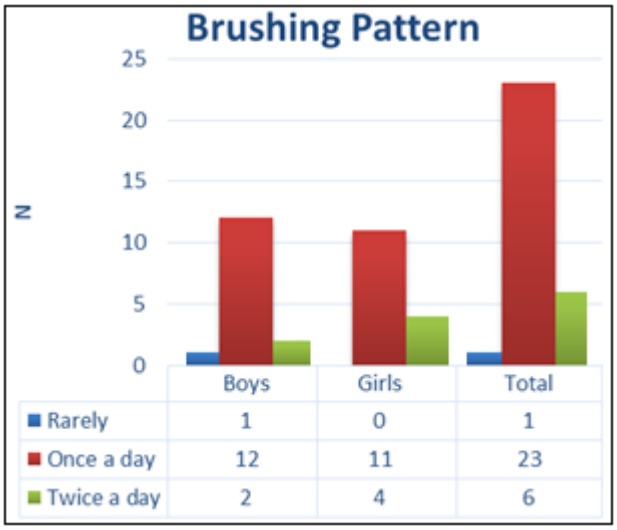


Figure 3: Brushing pattern of respondents

Figure (3) depicts that about 6.66% of total number of boys do brushing rarely. It is reported that 76.66% boys & 73.33% girls do brush once a day; and 13.33% boys & 26.66% girls do brush twice a day. Overall, dental hygiene of girls is better thanthe boys.

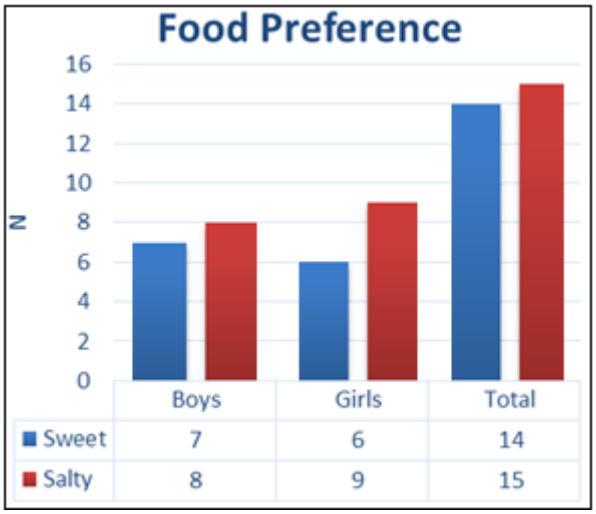
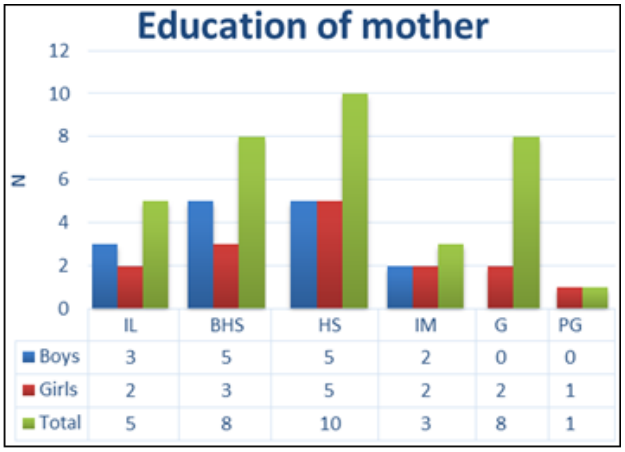


Figure 4: Food preferences of respondents

Figure (4) depicts that about 46.66% boys & 40% girls prefer sweet food; and 53.33% boys & 52.94% girls prefer

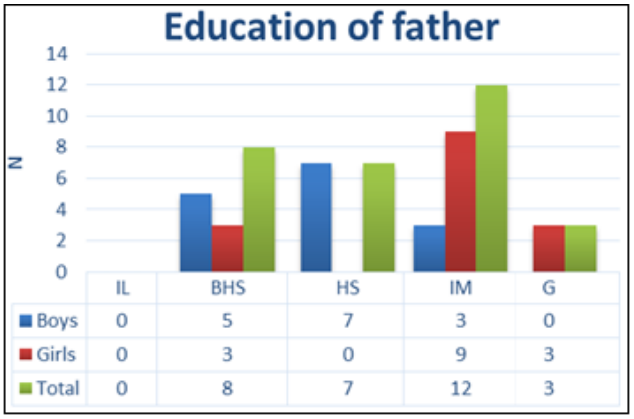
salty food. Overall, majority of both boys and girls prefer salty foods as compared to sweet food.



IL: Illiterate, BHS: Below high school, HS: High school, IM: Intermediate,
G: graduate, PG: Post graduate

Figure 5: Education level of respondent's mother

Figure (5) depicts thatthe illiteracy rate of the girls and the boy's mother are 20% and 13.33% respectively. Educational qualification of most of the boy's mothers was high school whereas for girl's mothers it is graduation. On other hand, percentage of illiteracy is more in case of mothers of girls. Although post-graduation qualification is reported only for mothers of girls. Overall education qualification of girl's mothers is far better than boy's mothers.



IL: Illiterate, BHS: Below high school, HS: High school, IM: Intermediate, G: graduate

Figure 6: Education level respondent's fathers

Figure (6) depicts that the educational qualification of about 33.33% of fathers of boys and 20% of fathers of girls are below high school. Intermediate qualification is reported among 60% girl's fathers that are quite higher than that of fathers of boys. The frequency of graduation qualification is reportedonly for fathers of girls20%. Overall, educational status is better for fathers of girls as compared to fathers of girls.

Table 1: Distribution of upper jaw incisors among respondents

Respondents	Right			Left		
	0 N(%)	1 N(%)	2 N(%)	0 N(%)	1 N(%)	2 N(%)
Boys (15)	0(0)	0(0)	15(100)	0(0)	1(6.66)	14(93.33)
Girls (15)	0(0)	3(20)	12(80)	0(0)	3(20)	12(86.66)
Total (30)	0(0)	3(10)	27(90)	0(0)	4(13.33)	27(89.99)

Table(1) depicts that in right upper jaw, the number of incisors is 100% complete among the boys and 80% girlswere reported to have complete count of incisors while 20% shows only one incisor. For left upper jaw, about 93.33% boys show a complete count of incisors while 6.66% boys have only 1 incisor. Among the girls, 86.66% girls shows 2 incisors while 20% have only 1 incisor. Overall, permanent tooth eruption is reported highly among girls as compared to boys.

Table 2: Distribution of upper jaw caninesamong respondents

Respondents	Right		Left	
	0 N(%)	1 N(%)	0 N(%)	1 N(%)
Boys (15)	0(0)	15(100)	0(0)	15(100)
Girls (15)	0(0)	15(100)	1(6.66)	14(93.33)
Total (30)	0(0)	30(100)	1(3.33)	29(96.66)

Table (2) depicts that 100% of the boys and girls showed a complete count of canine in the right upper jaw.100% of boys are reported of having complete count of caninein the left upper jaw canines while 93.33% of girls showed complete count of canine and 6.66% do not have canine.

Table 3: Distribution of upper jaw premolars among respondents

Respondents	Right		Left	
	0 N(%)	1 N(%)	0 N(%)	1 N(%)
Boys (15)	0(0)	15(100)	2(13.33)	13(86.66)
Girls (15)	2(13.33)	13(86.66)	2(13.33)	13(86.66)
Total (30)	2(6.66)	28(93.33)	4(13.33)	26(86.66)

Table (3) depicts that in the right upper jaw,100% of boys and 86.66% of girls have a complete count of premolar while 13.33% of girls do not have premolar. Overall, only girls were reported of not having premolar.In the left upper jaw, 86.66% both the boys and girls having complete count of premolar and 13.33% do not have premolar. Overall, eruption of is not seen in 13.33% of both boys and girls.

Table 4: Distribution of upper jaw molars among respondents

Respondents	Right			Left		
	0 N(%)	1 N(%)	2 N(%)	0 N(%)	1 N(%)	2 N(%)
Boys (15)	0(0)	1(6.66)	14(93.33)	0(0)	0(0)	15(100)
Girls (15)	0(0)	1(6.66)	14(93.33)	0(0)	0(0)	15(100)
Total (30)	0(0)	2(6.66)	28(93.33)	0(0)	0(0)	30(100)

Table (4) depicts that in the right upper jaw,93.33% of the boys and girls have complete count of the molarwhile 6.66% have only 1 molar. In the left upper jaw 100% of both boys and girls are reported of having complete count of molars.

Table 5: Distribution of lower jaw incisors among respondents

Respondents	Right			Left		
	0 N(%)	1 N(%)	2 N(%)	0 N(%)	1 N(%)	2 N(%)
Boys (15)	0(0)	1(6.66)	14(93.33)	0(0)	2(13.33)	13(86.66)
Girls (15)	0(0)	2(13.33)	13(86.66)	0(0)	3(20)	12(80)
Total (30)	0(0)	3(9.99)	27(89.99)	0(0)	5(16.66)	25(83.33)

Table (5) depicts that in right lower jaw, 93.33% of boys were reported of having complete count of incisors while 6.66% have only 1 incisor. Among the girls, 86.66% are reported of having complete count of incisors and 13.33% are having only 1t incisor. In the leftlower jaw, 86.66% of boys were reported of having complete count of incisors while 13.33% have only 1 incisor and 80% girls are reported of having complete count of incisors while 20% are having only 1 incisor. Overall, permanent tooth eruption is found to be higher among girls as compared to boys.

Table 6: Distribution of lower jaw caninesamong respondents

Respondents	Right		Left	
	0 N(%)	1 N(%)	0 N(%)	1 N (%)
Boys (15)	0(0)	15(100)	0(0)	15(100)
Girls (15)	1(6.66)	14(93.33)	0(0)	15(100)
Total (30)	1(3.33)	29(96.66)	0(0)	30(100)

Table (6) depicts thatin the right lower jaw,100% boys are reported of having complete count of deciduous canine while 93.33% of girls are reported of having complete count of canines and 6.66% do not have canine.In the left lower jaw,100% of both boys and girls are reported of having complete count of deciduous canine.

Table 7: Distribution of lower jaw premolar among respondents

Respondents	Right		Left	
	0 N(%)	1 N(%)	0 N(%)	1 N(%)
Boys (15)	2(13.33)	13(86.66)	0(0)	15(100)
Girls (15)	2(13.33)	13(86.66)	3(20)	12(86.66)
Total (30)	4(13.33)	26(86.66)	3(10)	27(93.33)

Table (7) depicts that in the right upper jaw, among both boys and girls, 86.66% are reported of having complete count of premolar and 13.33% are reported of not having premolar. Overall, equal number of both boys and girls are reported of not having premolar. For right upper jaw premolar100% of boys are reported of having complete count of premolar while 86.66% girls are reported of having complete count of premolar and 13.33% are reported of not having premolar. Overall, only girls were reported of missing premolar.

Table 8: Distribution of lower jaw molar among respondents

Respondents	Right			Left		
	0 N(%)	1 N(%)	2 N(%)	0 N(%)	1 N(%)	2 N(%)
Boys (15)	0(0)	0(0)	15(100)	0(0)	0(0)	15(100)
Girls (15)	0(0)	1(6.66)	14(93.33)	0(0)	1(6.66)	14(93.33)
Total (30)	0(0)	1(3.33)	29(96.66)	0(0)	1(3.33)	29(96.66)

Table (8) depicts that in theright and left lower jaw molars, 100% of boys are reported of having complete count of molar. Among girls, 93.33% are reported of having complete count of molar and 6.66% of having only 1 molar. Overall, only girls are reported of having only 1 molar.

4. Discussion

The present study was conducted among 30respondents of chronological age group 7-8 years on the basis of somatic development of toothand aims to assess the correlation between chronological and biological age using dental maturity. By analysing the data records, it wasreported that daily brushing habits were prevalent in both boys and girl; however, about 6.66% of boys were brushing rarely. Knowledge about oral hygiene was found to be higher among the girls and that brushing habits were reported to be better among girls as compared to boys.It was also found that majority of the respondents preferred salty food over sweet food.

It was reported that majority of respondents have a total count of 24 teeth. For tooth eruption pattern, it was reported that majority of the teeth were deciduous teeth in both the respondents' group although eruption of permanent teeth was seen in some respondentsand in some respondents, the deciduous teeth have fallen but eruption permanent teeth have not started. Eruption of the permanent incisors in the upper and lower jaw was found to be earlier among the girls as compared to the boys indicating that dental eruptionwas faster among girls as compared to boys. Demirjian et. al. (1972) also concluded that score of tooth eruption and maturity score was higher in girls as compared to boys. Eruption of permanent canine was reported only among girls with 6.66% and count of molars was found to be similar among both boys and girls. Premolars were found to be erupted earlier among boys as compared to girls indicating that dental maturity was found to be faster among boys as compared to girls. However, the results for eruption of permanent premolar were opposite to the results given by Demirjian et. al. (1972). Eruption of the first premolar was seen at the age of 9-11 years (Bardale, 2011) however, in present studyit was reported that dental maturity of respondents of age group 7-8 years wasfaster having first premolar in both upper and lower jaw, therefore, their biological age was more than their chronological age. Moreover, if boys and girls were compared, majority of boys showed eruption of first premolar earlier than girls

5. Conclusion

In today's world, age determination is very important for various reasons including birth certification validation, disputed birth records, legal issues etc. The chronological age of a child does not necessarily correlate with the biological age and sometimes children with the same chronological age may show differences in their biological development stages.Results from the present studyshowed that there is an association between biological age and chronological age. And the biological age of the boys was ahead of the girls among the study groups.

6. Acknowledgements

We are grateful to the Forensic Science Section, Department of Anthropology, Delhi University, India for all the support given throughout the study. Authors acknowledge the principal, faculty and staff of junior model school, children and their parents for their valuable time and cooperation without which it would not be possible to conduct this research.

7. Ethics approval and consent to participate

A consent form was provided to the respondents and those respondents willing to participate give their consent by filling up the consent form along with their signature with date.

8. Competing interest

The authors declare that they do not have any competing interest.

9. Funding

The research is a self-funded research and no fund was received from any organization.

10. Authors Contribution

LE and PH designed the research proposal which was approved by TR and HOD of Anthropology Department, Delhi University. LE and PH collected data among school going children of 7-8 years. Analysis of data was carried out by LE, PH, TR and KS to conclude the results.

References

[1] Bardale Rajesh, (2011). Principles of forensic medicine and toxicology, JP Brother Medical Publisher Pvt. Ltd.
[2] Demirjian. A., Goldstein H. and Tanner J.M. (1972), A new system of dental age assessment. Hum Bio; 3:411-421.
[3] Lucio Mitsuo Kurita, Alynne Vieira Menezes, Marcia Spinelli Casanova, FrancwascoHaiter-Neto (2007). Dental maturity as an indicator of Chronological age: radiographic assessment of dental age in a Brazilian population. Journal of applied oral sciences, 15(2):99-104.
[4] Malina and Bouchard (2004), Growth maturation and physical activity. Human kinetics; p.no-277.
[5] Rajendran and Sivapathasundharam, (2012), Shafer's textbook of oral pathology. Elsevier India; 880- 894.
[6] Subait AAA, Alousaimi M, Geeverghese M, Ali A, Metwally AE (2016) Oral health knowledge, attitude and behaviour among students of age 10-18 years old attending Jenadriyah festival Riyadh; a cross-sectional study. Saudi J Dent Res 7: 45-50.