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RELATIONSHIP OF DENTAL & CHRONOLOGICAL AGE USING MODIFIED DEMIRJIAN METHOD IN PAKISTANI POPULATION

[1]SYED MUZZAMIL ALI SHAH, [2]ABDUR REHMAN, [3]RAFEY AHMED JAMEEL, [4]MASOOMA ZEHRA, [5]AYESHA BASIT, [6]NADEEM HAFEEZ KHOKHAR

ABSTRACT

The study was designed to determine the correlation between dental age and chronological age in a sample of Pakistani population using modified Demirjian method which was specifically designed for Pakistani population. The sample of the study consisted of 146 subjects between the ages of 7 to 15 years. Data analysis from this study suggests that the modified Demirjian's method appropriately identified the dental age in relation to the maturity score. Pearson Correlation test showed that in both genders, age & maturity score was highly significant (P=0.001). The data suggest that modified Demirjian method shows high accuracy when applied to Pakistani population.

Keywords: *Demirjian's method, Maturity score and Dental Maturity.*

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INTRODUCTION

A variety of methods are used in orthodontics to evaluate the age of a patient. Chronological age is defined by birthdate and skeletal age can be assessed, for example, by hand wrist ossification, cervical vertebrae maturation staging, differences in the developmental stages of different biological systems.[1] [2]Several indices have been developed to determine the developmental stage of a child for a certain biological system, namely indices for sexual maturity, somatic maturity, skeletal age, and dental age.[3-6] Such knowledge as dental and skeletal age can be useful in taking the decision about extracting primary teeth and to decide on timing of the orthodontic treatment.[7-10] In patients with delayed dental maturity, orthodontic treatment may be started at a later stage, thus leading to shorter treatment duration and more stable result.[11] In case of over-retained deciduous teeth, the method facilitates determination of the right time for starting treatment.[12] The degree of calcification and the stages of the teeth give the clinician information about abnormal sequences (e.g. eruption of second molar ahead of second premolar in the mandible arch) so that the preventive measures can be taken in time.[13] Pediatricians are interested to know if the dental and skeletal maturity of a child with certain disease is delayed or advanced.[14] The correlation between dental and chronological age is also useful in forensic dentistry to estimate the age or to identify the child.[15] Dental age is usually based on the maturation of the teeth, so the age of an individual is determined by the dentition.[16] Eruption and calcification of dental tissues has been used to determine dental age. Tooth calcification is superior to tooth emergence because emergence of a tooth is a transitory event and its accurate time is very difficult to establish whereas calcification is a continuous process that can be assessed by permanent records such as x-ray films.[17] Dental age is an important factor to consider when treating malocclusion or inappropriate growth of the face.[18] Dental Age as a means for determining chronological age is valuable in cases of adopted children, children who have committed legal offences, or in forensic cases.[3] There is a good correlation between dental age and chronological age in general, except some situations where two entities evaluate independent. Among all the growth indicators, dental age has the weakest correlation with

[1] Associate Professor, Department of Community & Preventive Dentistry, Hamdard University Dental Hospital, Hamdard University Karachi. Email: muzamilali79@hotmail.com Contact No: +92 333 2133849

[2] Associate Professor, Science of Dental Material Department, Hamdard University Dental Hospital, Hamdard University Karachi. Email: abdurrehmanmds@gmail.com Contact No: +92 333 2382612

[3] Assistant Professor, Department of Oral Biology & Tooth Morphology, Dow University of Health Sciences, Karachi. Email: dr_srajk@hotmail.com Contact No: +92 333 2170848

[4] FCPS Trainee, Department of Operative Dentistry, Hamdard University Dental Hospital, Hamdard University, Karachi, Pakistan. Email: masoomazehra6@gmail.com Contact No: +92 314 8713256

[5] Associate Professor, Department of Oral & Maxillofacial Surgery, Hamdard University Dental Hospital, Hamdard University Karachi, Pakistan. Email: ayeshabasitpk@gmail.com Contact No: +92 333 2257147

[6] Professor & HOD Science of Dental Material Department, Hamdard University Dental Hospital, Hamdard University Karachi. Email: nadeemdmd@gmail.com Contact No: +92 321 2014262

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general somatic development.[4, 19, 20] Physical growths often deviate to the chronological age, but correlates well with skeletal age that represents relative stage of bone maturation.[18] These correlations between dental, skeletal and chronological age could be relevant for general dentists and orthodontists and pediatricians as well. For the Dentists these correlations allow an overall summary of dental development and can be used as a basis for further therapeutic decisions. Techniques for chronological age estimation in children based on dental maturation may be divided into those using the atlas approach and those using scoring systems whereas in adults there are the morphological and radiological techniques.[21] The atlas approach, developed by different authors uses radiographs where morphologically different stages of tooth mineralization are compared with atlas tables.[22, 23]The techniques that are using the scoring system tried to simplify chronological age estimation and restricted the number of teeth studied to (developed by Demirjian, Goldstein, Tanner in 1973 and used in many studies).[6,19,24,25] Other methods which used scoring system are Zurich method and Kvaal dental age calculation.[26]

This study was using modified Demirjian method developed by R.H. Sukhia et al[12] & comparing it to the original Demirjian method. As the Demirjian method was based on French Canadian population so it has been reported to over predict the dental age in some age group in sub-continent population**.**

MATERIAL AND METHODS

The descriptive study was conducted in the department of Orthodontics from 1st August 2020 to 30th January 2021 after approval of institutional review board. Chronological age was taken from the history forms & it was later compared to Demirjian method of dental age estimation after analyzing the OPG. A data sheet was designed in which different variables pertaining to our study were mentioned. Inclusion criteria for this study included: Patients attending the OPD of Orthodontics at Hamdard University Dental Hospital, Age group from 7 years- 15 years and No missing tooth except third molars. Exclusion criteria included: Any growth retardation or syndrome, Missing teeth other than third molars and Cleft lip or palate. The data was entered and analysed using SPSS 23. Total 502 records were analyzed, out of which 146 records were selected based on the inclusion criteria. This study was used modified Demirjian method developed by R.H. Sukhia et al[12] & comparing it to the original Demirjian method. As the Demirjian method was based on French Canadian population so it has been reported to over predict the dental age in some age group in sub-continent population**.** It is based on scoring system of different stages of tooth development which were compared to DPT/OPG and were then given a score. Teeth from central incisor to second molar of left upper quadrant were assessed for this purpose. The scores were summed to achieve a total maturity score which were converted into dental age based on separate tables for boys & girls. Chi square test was used for significance testing. p-value ≤ 0.05 was considered significant. To avoid examiner bias at the time of collecting data, chronological age was first recorded on a data collection sheet & the dental age score was tabulated later on a separate sheet.

RESULTS

The mean age group for this study was 12.63 years. Data analysis from this study suggests that the modified Demirjian's method developed by R.H. Sukhia et al appropriately identified the dental age in relation to the maturity score (Table1). Pearson Correlation test should that in both genders, age & maturity score was highly significant (P=0.001), thus correctly identifying the chronological age with reference to maturity score.

This was observed in all age groups & in both sexes. Total participants analyzed in this study were 146, out of which 89 were females & 57 were males. Age groups

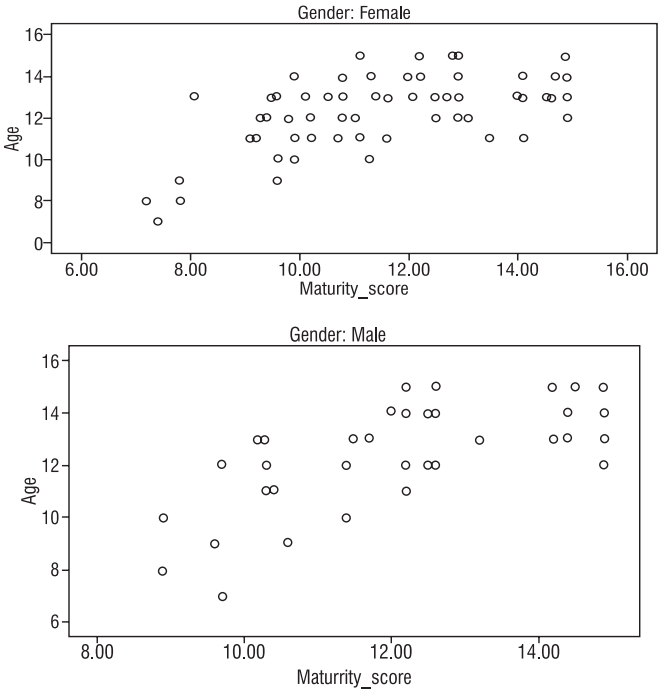

Fig 1 & 2: Maturity score among Male and Female Patients.

TABLE 1: CHRONOLOGICAL AGE WITH REFERENCE TO MATURITY SCORE

Gender	MATURITY SCORE	p Value
Male	Pearson Correlation 0.679**	0.001
Female	Pearson Correlation 0.411**	0.001

**. Correlation is significant at the 0.01 level (2-tailed).

TABLE 2:AGE DISTRIBUTION AMONG ALL SUBJECTS

Age	Frequency	Percent	Valid Percent	Cumulative Percent
7	2	1.4	1.4	1.4
8	4	2.7	2.7	4.1
9	5	3.4	3.4	7.5
10	5	3.4	3.4	11.0
11	13	8.9	8.9	19.9
12	29	19.9	19.9	39.7
13	41	28.1	28.1	67.8
14	26	17.8	17.8	85.6
15	21	14.4	14.4	100.0
Total	146	100.0	100.0	

analyzed for this study were from 7 to 15 years.

DISCUSSION

The maturity score devised by R.H. Sukhia et al[12] for Pakistani population when applied on our data set revealed direct relationship with the chronological age & maturity score which means that these scores can serve as appropriate measures for our population & can assist in correctly determining the correct maturity score. Past studies comparing the Demirjian's method of age determination in correspondence to Pakistani population in males was over-predicted in the 7 year and 11–15-year age group, while in females, there was an over-prediction in all the age groups R.H. Sukhia et al.[12] Statistically significant differences were found in chronological and dental age assessed by Demirjian's method for Pakistani males and females.[11]

Demirjian's method of Dental age assessment has been widely used by many researchers for various fields of Orthodontic research.[1,20,26-28] Nevertheless, as the Demirjian's method was formulated using French-Canadian standards thus this can be attributed to the over prediction in case of Pakistani population or in other races. The present study focuses in 7 teeth scoring system devised by Demirjian & Goldstein.[24] As the present research was retrospective and based on data collected from the OPG records, data below 7 years of age could not be included as the sample was limited in this range. This is a constraint of this study. Patients who had any craniofacial syndromes were not included in this study, also those individuals who had missing teeth other than third molars were excluded. Out of 146 participants, there were 89 female and 57 male participants. Our data should correlation in both genders (Table 1). Although male participants from the age of 7-10 were much less in number (Fig 2) but the analysis showed that across all the age groups the modified Demirjian's method correctly predicted the age. R.H. Sukhia et al[12] reported the mean difference between chronological age and dental age assessed according to Demirjian's method was 0.59 years for the male sample and 0.83 for the female sample.

Leurs et al[23] reported an overestimation of 0.4 and 0.6 years for Dutch boys and girls, respectively. Similarly, Baghdadi[21] studied on Saudi population reported a mean age difference of 0.77 for boys and 0.83 for girls. Furthermore, the difference in the mean was statistically significant for all age groups and genders, except in 8 years old, 11 years old & 13-year-old boys. The short coming of the present study is decrease numbers of participants compared to other studies done on the same subject.

CONCLUSION

The maturity score devised by R.H. Sukhia et al[12] for Pakistani population when applied on our data set revealed direct relationship with the chronological age & maturity score which means that these scores can serve as appropriate measures for our population & can assist in correctly determining the correct maturity score. The data suggest that modified Demirjian method shows high accuracy when applied to Pakistani population.

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CONTRIBUTIONS BY AUTHORS

1 Syed Muzzamil Ali Shah:	Study design, Data collection, Discussion, Conclusion.
2 Abdur Rehman:	Methodology, Statistical analysis, Results, Literature review.
3 Rafey Ahmed Jameel:	Data collection, Literature review.
4 Masooma Zehra:	Introduction, Data collection.
5 Ayesha Basit:	Literature review.
6 Nadeem Hafeez Khokhar:	Data collection, Literature review