

ERUPTION PATTERN OF PERMANENT TEETH IN TANZANIA CHILDREN AND ADOLESCENTS IN DAR ES SALAAM.

Mugonzibwa EA, Rugarababu PGM.

Department of Preventive and Community Dentistry,
Faculty of Dentistry, P. O. Box 65014, Muhimbili University College of
Health Sciences, Dar es Salaam, Tanzania.

ABSTRACT

The aim of the study was to estimate the mean ages of permanent teeth eruption in 3 - 18 years old children and adolescents in Ilala districts, Dar es Salaam. The study included 858 subjects of whom 419 were boys and 439 girls. The tooth was considered erupted when any part of the tooth crown was visible in the oral cavity. Generally permanent teeth erupted earlier in girls than in boys. The differences were 0.1 - 0.2 years for incisors and first molars, 0.2 - 0.4 years for canines and premolars and 0.3 - 0.5 years for second molars. Except for the second premolars, mandibular teeth erupted earlier than the maxillary in both girls and boys. The difference was about 0.1 - 0.4 years. The order of eruption of the teeth was M1, 11, 12, Pm1, c, Pm2, M2 and M3 in the maxillar; and M1, 11, 12, c,

Pm1, Pm2, M2 and M3 in the mandible. The children entered the first and second phases of the mixed dentition at the ages of 4 and 8 years, respectively. Except for the third molars, all teeth were erupted at the age of 15 years in girls and boys. The results indicate that teeth erupt earlier in girls than boys, and the mandibular erupt earlier than the corresponding macillary teeth. The mean ages of eruption of permanent teeth in children and adolescents in present study were bigger compared to those in previous African studies. However, due to wide variation of teeth eruption patterns which exist in different tooth pairs, individuals and population groups as reported elsewhere more studies on the subject especially the longitudinal types are justified.

INTRODUCTION

There is no information on the ages of eruption of the primary and permanent dentition in the Tanzanian population. The knowledge on the ages of eruption of permanent teeth currently in use in Tanzania is derived from American and Scandinavian literature (1,2). Knowledge of the variation of timing of eruption of permanent teeth in different age groups among the Tanzanian children is essential for guidance of development of the dentition, occlusion and in diagnosing some growth disturbances. Developmental norms of eruption of the permanent teeth need to be established for anthropological use (3) and may have forensic application (4).

Variation of tooth eruption patterns is believed to be multifactorial (5,6). The timing of eruption of the permanent teeth differences among ethnic groups have been attributed to genetic factors (7), environmental factors including nutritional and health conditions (8,9,10,11,12), fluoride content

(13) and climate (14,15). All the reports do not clearly reveal whether the differences may be attributed to the genetic or environmental factors.

A number of reports on eruption of the permanent teeth in various population samples have been published (12,16,17,18,19,20,21,22,23,24,25, 26) showing earlier eruption of permanent teeth in African Black children than their Caucasian and Indian counterparts. In the African Black population age of eruption of first permanent teeth has been reported to be 2-7 years and six months (12,17).

The aim of the present study was to estimate the mean ages of permanent teeth eruption in 3-18 year old children and adolescents in Ilala district, Dar es Salaam.

Subjects and Methods

This study was part of a major oral health survey designed to estimate the pattern of oral health conditions among a group of Tanzanian subjects in Dar es Salaam.

Detailed description of the sampling scheme can be found elsewhere (27). This report concerns 858 children and adolescents with age ranging from 3 - 18 years. Among the subjects 49% were boys and 51% were girls. Age was recorded on the basis of whole years based on information obtained from parents for young children and from individual adolescents.

The examination was performed by five examiners including the authors under the shade of the tree with the subject sited in an ordinary chair, using natural light and a mouth mirror. A permanent tooth was recorded as erupted if any part of its crown had pierced the gingiva and appeared in the oral cavity. Exfoliated and extracted or missing teeth were recorded. No X-rays were used.

In this study, each tooth-type is denoted by the following conventional symbols; 11 = central incisor, 12 = lateral incisor, c = canine, Pm1 = first premolar, Pm2 = second premolar, M1 = first molar, and M2 = second molar.

Maxillary and mandibular teeth were treated separately.

Fifty subjects were re-examined during data collection for assessing the consistency of the measurements. Twenty two subjects were re-examined by a different examiner while 27 were re-examined by the same examiner. No subject was examined by more than two examiners. Kappa value (28) 0.94 with the range of 0.84-1.00 was observed for intra-examiner measurements. For inter-examiner agreements kappa value 0.84 was calculated.

Chi square test was used to compare the proportions of subjects with erupted teeth. The level of statistical significance used was $p < 0.05$.

RESULTS

Generally, the permanent teeth erupted earlier in girls than in boys. The differences were 0.1-0.2 years for incisors and first molars, 0.2 - 0.4 years for canines and premolars and 0.3-0.5 years for second molars. Except for the first

premolars, mandibular teeth erupted earlier than the maxillary in both girls and boys. The difference was about 0.1-0.4 years. Based on the mean ages of eruption the following orders of eruption of the teeth in both arches were observed: M1, 11,12, Pm1, c, Pm2, M2, and M3 in the maxillar and M1, 11,12,c,Pm1, Pm2, M2 and M3 in the mandible.

No child had a permanent tooth erupted at the age of 3 years in both girls and boys. Girls had 2-5% of the permanent first molars erupted at the age of 4-5 years. The maxillary and mandibular first permanent molars were all erupted at an earlier age in boys. The first phase of mixed dentition was complete between 10 and 11 years girls being advanced in the mandible. Children entered the second phase of the mixed dentition at the age of 8 years. Except for the third molars, all teeth were erupted at the age of 15 years in both girls and boys.

DISCUSSION

In the present study, Kappa values were good indicating intraexaminer and inter-examiner consistency.

The mean ages of eruption of the permanent teeth in the Tanzanian children and adolescents were bigger compared to the Gambians, Ghanians, Kenyans, Swedish and Ugandans (12,18,20,23,29). While Japanese mandibular permanent teeth (30) erupt earlier compared to the present findings, Chinese (10) permanent incisors erupt later.

Results in the present study showed that children were in the first phase of mixed dentition at the age of four years. They also had entered the second phase of the mixed dentition at the age of eight years being in agreement with recent Finnish study (26). This was three years later compared to the Kenyan studies (17,24) where children had entered the second phase of the mixed dentition at the age of 5 years.

Like in earlier reports (18,20,24,29,30,31) it was observed that generally eruption of permanent teeth in girls was in advance as compared to boys. This study could not establish factors contributing to the reported differences in the ages of eruption of permanent teeth between girls and boys.

The sequences of eruption of permanent teeth in the present study were M1, 11,12,Pm1,c,Pm2, M2 and M3 in the maxilla and M1, 11,12,c,Pm1, Pm2, M2 and M3 in the mandible. This was in agreement with recent Kenyan studies (23,24) except in the maxillar where Hassanali and Odhiambo (23) reported a different sequence of eruption of the dentition: M1, qq,12,Pm1,Pm2,c and M2. The orders of eruption in the present study were based on the mean ages of eruption of the permanent teeth.

No significant differences between right and left side in ages of eruption of permanent teeth were observed being in agreement with

earlier reports (12,20,26,30,32). The findings in this sample are also in agreement with previous studies on the mandibular teeth erupting earlier than maxillary teeth (12,24,26). However, mean ages of eruption of the second premolars were similar in both arches. This finding corresponds to Billewicz and McGregor (12) report among the Gambian children.

The present results indicate that eruption pattern of the permanent teeth in Tanzanian children is similar with other population of different ethnic origin except that in these children the teeth erupt clearly earlier than in caucasian children. However, due to wide variation of teeth eruption patterns which exist in different tooth paiers, individuals and population groups as reported elsewhere more studies on the subject especially the longitudinal types are justified.

ACKNOWLEDGEMENT

To the Ilala district authorities for giving permission to conduct the study in Ilala district. To Pirjo Halonen of the Computer Centre, University of Kuopio for analyses

assistance. Hard work and cooperation by the research group during data collection is appreciated. This study was supported by the MMC Dental School Development Project of the University of Kuopio, Finland.

REFERENCES

1. Profitt WR, Fields HW, Ackerman HL, Thoms PM, Tulloch JFC. Contemporary Orthodontics. The C.V. Mosby company, St. Louis, 1986; pg. 7.
2. Thilander B, Ronning O. Introduction to Orthodontics. Tandlakarforlaget, Stockholm, 1985:47-54.
3. Savara BS, Steen JC: Timing and sequence of eruption of permanent teeth in a longitudinal sample of children from Oregon. J AM Dent Assoc 1978;99:209-14.
4. Garn SM, Sandusky ST, Nagy JM, Tr. Wbridge FL: Negrocausacoid differences in permanent tooth emergence at a constant income level. Arch oral biol 1973;18:609-15.
5. Lewis A, Garn SM: The relationship between tooth formation and other maturational factors. Angle orthod 1960;30:70-7.
6. Robinow M: The eruption of the deciduous teeth (factors involved in timing). J Trop Paediat Environ Child Hlth 1973;19:200-5.
7. Hatton ME: Measure of the effects of heredity and environment on eruption of the deciduous teeth. J Dent Res 1955;34:397-401.
8. Clements EMB, Davies-Thomas E, Pickett KG: Time of eruption of permanent teeth at independent, rural and urban schools. Br Med J 1957;1:1511-13.
9. Adler P: Effect of some environmental factors on quence of permanent tooth eruption. J Dent Res 1963;42:605-16.
10. Lee MMC, Low WD, Chang SFS: Eruption of the permanent dentition of southern chinese children in Hong Kong. Archs Oral Biol 1965;10:849-61.
11. Niswander JD, Sujaku C: Eruption of permanent teeth in children with major physical defects or disease. J Dent Child 1965;32:266-68.
12. Billewicz WZ, McGregor IA: eruption of permanent teeth in West African (Gambian) children in relation to age, sex and physique. Ann Human Biol 1975;2:117-28.

13. Short EM: Domestic water and dental caries. VI - the relation of fluoride domestic water to permanent tooth eruption. *J Dent Res* 1994;23:247-255.
14. Eleventh PB: Eruption of permanent dentition of American children living in the tropics. *Hum Biol* 1966;38:60-70.
15. Fiedlaender JS, Bailit HL: Eruption times of the deciduous and permanent teeth of Natives of Bougainville Island, territory of New Guinea: a study of racial variation. *Human Biol* 1969;41:51-65.
16. Steggerda M, Hill TJ: Eruption time of teeth among Whites, Negroes and Indians. *AM J Orthodont Oral surg* 1942;28:361-370.
17. MacKay DH, Martin WJ: Dentition and physique in Bantu children. *J Trop Med Hyg* 1952;55:265.
18. Houpt MI, Adu-Aryee S, Grainger RM: Eruption times of permanent teeth in the Brong Ahafo Region of Ghana. *Am J Orthod* 1967;53:95-99.
19. Lundstrom A, Lundstrom O: A dental examination of the mixed and permanent dentitions in a Nubian population. *Acta Odontol Scand* 1969;27:1281-88.
20. Krumholt L, Roed-Peterson B, Pindborg JJ: Eruption times of the permanent teeth in 622 Ugandan children. *Arch oral Biology* 1971;16:1281-88.
21. Richardson A, Akpata A, Franklin R: Comparisons of tooth eruption ages in European and African children. *Trans Eur orthod Soc* 1975;161-167.
22. Lavelle CLB: The timing of tooth emergence in four population samples. *J Dent* 1976a;5:231-36.
23. Hassanali J, Odhiambo JW: Ages of eruption of the permanent teeth in Kenyan African and Asian children. *Ann human Biol* 1981;8:425-434.
24. Manji F, Mwaniki D: Estimation of median age of eruption of permanent teeth in Kenyan children. *East African Med J* 1985;62:252-9.
25. Johannessen AC, Bjorvatn K, Myklebust D: Oral Health in children attending church-affiliated schools in Northern Cameroon: Tooth development and dental caries. *odontostomatol Trop* 1989;12:67-68.
26. Pahkala R, Pahkala A, Laine T: Eruption pattern of permanent teeth in a rural community in northeastern Finland. *Acta Odontol Scand* 1991;49:341-9.
27. Kikwilu E, Mandari G, Mugonzibwa E, et al: Ilala oral health survey: Study design and methods. *Community Health.*

- Statistics and Reviews 2/1987, Kuopio.
28. Cohen J: A coefficient of agreement of nominal scales. *Educ Psychol Meas* 1960;20:37-46.
 29. Hagg U, Taranger J: Timing of tooth emergency. A prospective longitudinal study of Swedish urban children from birth to 18 years. *Swed Dent J* 1986;10:195-206.
 30. Hoffding J, Maeda M, Yamaguchi K et al: emergency of permanent teeth and onset of dental stages in Japanese children. *Community dent Oral Epidemiol* 1984;12:55-8.
 31. Lavelle CLB: Study of tooth emergence in British Blacks and Whites. *J Dent Res* 1976b;55:1128.
 32. Kent RL Jr, Reed RB, Moorees CFA: Associations in emergency age among permanent teeth. *Am J Phys Antropol* 1978;48:131-42.