THE DIFFERENCES OF CHRONOLOGICAL AGE WITH DENTAL AGE BASED ON THE ALQAHTANI METHODE AGED 6-12 YEARS

(PERBEDAAN USIA KRONOLOGIS PASIEN DENGAN USIA GIGI BERDASARKAN METODE ALQAHTANI PADA ANAK USIA 6-12 TAHUN)

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ABSTRACT

The chronological age of a person can not provide sufficient information. We can use the dental age in panoramic radiographs to know the growth process appropriately compared to The London Atlas of the Alqahtani method. Children aged 6-12 years have various factors that can affect the velocity in tooth growth and development, such as male and female. This study aims to determine the chronological patient's age differences with dental age based on the Alqahtani method on a panoramic radiograph at Unjani Dental and Oral Education Hospital. This type of research is Analytical Observational with the Cross-Sectional Study method. Research subjects were obtained from all medical records panoramic radiographs with 72 panoramic radiographs aged 6-12 years, divided into 36 male patients and 36 female patients. Differences in chronological age with dental age were analyzed statistically using the Mann-Whitney test and Wilcoxon test, previously tested for the normality using Kolmogorov- Smirnov. The results showed a significant difference between chronological age and dental age by gender and in all patients at the Unjani Dental and Oral Education Hospital ($p<0,05$). Based on the analysis of the data obtained, all patients in RSGMP Unjani aged 6-12 years have different dental developmental growth processes, and the dental development growth of female

patients was faster than male patients. It can be concluded that the dental age is not always comparable with chronological age because of various factors such as gender, genetics and environment, which can affect the dental age.
***Keywords**: alqahtani method, chronological age*

ABSTRAK

Usia kronologis seseorang tidak dapat memberikan informasi yang cukup. Kita dapat menggunakan usia gigi pada radiografi panoramik untuk mengetahui proses pertumbuhan secara tepat dibandingkan dengan metode The London Atlas of the Alqahtani. Anak usia 6-12 tahun memiliki berbagai faktor yang dapat mempengaruhi kecepatan pertumbuhan dan perkembangan gigi, seperti laki-laki dan perempuan. Penelitian ini bertujuan untuk mengetahui perbedaan usia kronologis pasien dengan usia gigi berdasarkan metode Alqahtani pada radiografi panoramik di RS Pendidikan Gigi dan Mulut Unjani. Jenis penelitian ini adalah Analytical Observational dengan metode Cross-Sectional Study. Subyek penelitian diperoleh dari seluruh rekam medis radiografi panoramik dengan 72 radiografi panoramik usia 6-12 tahun yang terbagi menjadi 36 pasien laki-laki dan 36 pasien perempuan. Perbedaan usia kronologis dengan usia gigi dianalisis secara statistik menggunakan uji Mann-Whitney dan uji Wilcoxon yang sebelumnya diuji normalitasnya menggunakan Kolmogorov-Smirnov. Hasil penelitian menunjukkan perbedaan yang signifikan antara usia kronologis dan usia gigi menurut jenis kelamin dan pada semua pasien di Rumah Sakit Pendidikan Gigi dan Mulut Unjani ($p<0,05$). Berdasarkan analisis data yang diperoleh, semua pasien di RSGMP Unjani usia 6-12 tahun memiliki proses pertumbuhan gigi yang berbeda, dan pertumbuhan gigi pasien wanita lebih cepat dibandingkan pasien pria. Dapat disimpulkan bahwa usia gigi tidak selalu sebanding dengan usia kronologis karena berbagai faktor seperti jenis kelamin, genetik dan lingkungan dapat mempengaruhi usia gigi.
Kata Kunci: *metode alqahtani; usia kronologis*

INTRODUCTION

The assessment of a person's age is very important. According to the child protection Commission of Indonesia, problems that arise are age-related administrative settlement failing in optimizing the recording of births, i.e. more than 50 million or more from half the number of children in Indonesia currently does not have a birth certificate.[1] The birth certificate is valid on the status of administrative records, and the birth of the form of identification issued by the Office of population and the civil registry is very instrumental in everyday life.[2] the Data provided in the age of the birth certificate is called chronological age.

Some studies state that chronological age cannot provide sufficient information about the growth of a person appropriately. Hence, it needs to be determined biological age, which can assess the level of development and maturase. Biological age is the calculation of the age of biological maturity based on the body. In this dental age, more biological age meets the criteria and is associated with dentistry.[3-8] Dental age helps us know the age of a person who did not have birth documentation, social procedure purposes, case law, forensic identification, the importance of education or health care as care orthodontic, conservation teeth, surgery etc.[2.9-11]

Dental Age can be determined using comparing the image of panoramic radiography in methods of tooth development and eruption, of which there are such methods *Schour and Massler (1941-1944)*, method *Ubelaker (1987)*, and the *London Atlas* method *Alqahtani (2010)*.[12] In the year 2014, s. J Alqahtani, m. P Hector, and h. m. Liversidge had done a comparison test against the *Alqahtani* method with other methods. The *London Atlas Alqahtani* method is a method to determine the dental age has the smallest error numbers compared to method *Schour and Massler* and methods *Ubelaker.* The comparison criteria are included in the process of slow growth, the normal growth process or the process of rapid growth.[11.12]

The difference in identifying the growth and development of existing teeth aimed to find out the speed (fast or slow) of the growth of teeth in children ages 6-12 years. The six years of tooth eruption occurs the first permanent molar teeth on the lower jaw and the first at the age of 12 years will happen the second molar eruption of teeth of the maxilla. Each child has a pattern of growth and development that are the same, but its velocity is different; internal or external factors cause this; for example, gender can affect tooth calcification and eruption time.[8]

In previous studies, the chronological age differences related to the dental age performed by Wardhani (2015) states that there is a difference between chronological age and the child's age. Still, at the tooth research, the measuring instrument used to determine the dental age is the

method *Demerjian,* thereby making researchers interested in using other methods such as measuring instrument *Alqahtani*. A study conducted in West Java province by Rusydiana, et al. in 2016, *Alqahtani* methods were used only to identify the dental age without making a comparison with chronological age.[14]

Alqahtani Method is one method of determining the dental age which aims to obtain maximum accuracy by using panoramic radiography photos.[15] it has some interest among others; help see a chronological age of conformity with the dental age, help enforce the diagnosis, treatment and support as an appropriate treatment to prevent the onset of complications such as TMD (*Temporomandibular Disorder*). That way, the dental age can give you the knowledge to the community to estimate the chronological age.[9-10,16-20]

Based on the research background, the authors are interested in finding out the difference between chronological age and dental age using methods *Alqahtani* as a measurement tool.

METHOD

Research was done at the permission of the Commission of ethics of the University of Padjajaran, letter number 1 510/UN6. EC/KEP/2018 the date December 28th 2018. The design of this study using observational analytic study with the method of Cross-Sectional Study. The subject obtained from the entire medical record picture panoramic radiography, panoramic radiography 72, divided into Radiology patients 36 male and 36 female Radiology patients in hospital oral Education Unjani. The subject of research, including an overview of panoramic radiography patients aged 6-12 years on the panoramic radiography description, contained the mandible teeth' seeds on the upper jaw and right regio jaw below. The quality of the photo's description (not *superimposed*) and read that saw calcification description teeth, tooth eruption pattern of normal, resorption root, maxilla, mandible, and temporomandibular joint. There are no edentulous, disruption of the eruption, or growth on the mandible tooth anomalies regio right maxilla and mandible.

The patient's chronological age is derived from the date of photo capture with the date of birth on the medical record. Converted in the form of the month that will then be set according to the specified age range, that is; Age range 73-84 months = 6.5 years, 85-96 months =7.5 years, 97-108 months = 8.5 years, 109-120 months = 9.5 years, 121-132 months = 10.5 years, 133-144 months = 11.5 years, 145-156 months = 12.5 years. Panoramic radiography is given code to distinguish gender between males and females, with categories A for males and B for females. Then compare the picture of the panoramic radiography that has been collected with developmental diagrams and the

eruption of the human tooth method of Alqahtani by comparing the one research subject with the images contained in the diagram. Benchmarking begins in an atlas image similar to the patient's chronological age and is noted accordingly in the assessment form. After that, the comparison was carried out in an atlas image with a younger age of one year or more and an older age of one year or more of the patient's chronological age and then recorded appropriateness. The benchmarking results of which views are equal to the panoramic radiography, hence the dental age. After the dental age, a chronological comparison of male and female patients was carried out in a pre-determined medical record. It is said that the process of growth is slow when the dental age is less than the chronological age. The normal growth process was the same as chronological age, or the rapid growth process when the dental age is greater than the chronological age.

The Data obtained from the examination is done to test normality using the Kolmogorov-Smirrnov test. The abnormal distribution data used Mann-Whitney test to the chronological age difference with the dental age based on Alqahtani method aged 6-12 years on the picture of the panoramic radiography of the patient based on male and female at the RSGMP Unjani. The research used Wilcoxon's test to see the chronological age difference with the dental age based on Alqahtani's method of 6-12 years on the picture of the panoramic radiography of all patients in RSGMP Unjani.

RESULT

The distribution of characteristic research subjects and research results of chronological age differences with the dental age can be seen in Tables 1, 2, 3, 4 and 5.

Table 1. Characteristic distribution of panoramic radiographic imagery

Characteristic	Male		Female	
	N	(%)	n	(%)
Chronological Age				
5,5 year	0	0	0	0
6,5 year	9	25	6	16.7
7,5 year	9	25	7	19.4
8,5 year	3	8.3	11	30.6
9,5 year	4	11.1	3	8.3
10,5 year	8	22.2	5	13.9
11,5 year	2	5.6	2	5.6
12,5 year	1	2.8	2	5.6
Dental Age				
5,5 year	13	36.1	4	11.1
6,5 year	8	22.2	2	5.6
7,5 year	9	25.0	5	13.9
8,5 year	3	8.3	8	22.2
9,5 year	1	2.8	6	16.7
10,5 year	1	2.8	2	5.6
11,5 year	0	0	5	13.9
12,5 year	1	2.8	4	11.1
TOTAL	36	100	36	100

Table 1 shows the number of research subjects of each age category based on the gender of males and females used in this study. The data in the table indicates that in male patients, the majority have a chronological age of 6.5 and 7.5 years, with a percentage of each is 25%, while the majority of the dental age obtained in male patients is 5.5 years 36.1%. In female patients, the majority has a chronological age of 8.5 years, with a percentage of 30.6%. The majority of the dental age obtained in female patients is 8.5 years,with 22,2%.

Table 2. Chronological age comparison for male patients with female

Chronological Age	N	Mean±SD	Min.	Max.
Male	36	8.58±1.81	6.50	12.5
Female	36	8.72±1.70	6.50	12.5

Table 2 shows the chronological age of male patients and female patients having the same large chronological age average. In male patients, the average chronological age in the study is ± 102 months or ranges from ± 8.5 years, with the highest age being 146 months which includes the age of 12.5, and the lowest age is 76 months which consists of the age of 6.5 years. In female patients, the average chronological age in this study is ± 104 months or ranges from ± 8.5 year, with the highest age being 150 months, including the age of 12.5 years and the lowest age is 73 months, which includes the age of 6.5 years.

Table 3. Comparison of male patient dentistry with female

Dental Age	N	Mean±SD	Min.	Max.
Male	36	6.91±1.59	5.50	12.5
Female	36	9.05±2.14	5.50	12.5

Table 3 shows that there is a difference between the dental age of male patients with the female. The result shows from the female patient data spread, which in the majority male patient has aged 5.5 years with an average dental age in the study is ± 6.91 years. While in female patients majority has an age of 8.5 years, with an average dental age in this study is ± 9.05 years.

Table 4. Chronological age difference with the dental age based on gender

Characteristic	N	Mean±Sum	Sign.
Male			
UG<UK	25	13.92±348.00	0.000
UG>UK	1	3.00±3.00	
UG=UK	10	0.00±0.00	
Female			
UG<UK	1	24.50±98.00	0.033
UG>UK	22	11.50±253.00	
UG=UK	10	0.00±0.00	
Total Difference			
Male	36	42.89±1544.00	0.007
Female	36	30.11±1084.00	

Description: $p < 0.05$ significant

Based on table 4, the study showed a significant difference between the chronological age and the dental age based on the gender of male and female patients. These results were shown from the differences between the chronological age and the patient's dental age, wherein most male patients have a 3-year difference. In the female majority, patients have a 1-year difference. With a range of 1-3 years.

Table 5. Chronological age difference and all patient dental age in RSGMP Unjani

Characteristic	N	Mean±Sum	Sign.
Total Difference			
UG<UK	29	36.41±1056.00	
UG>UK	23	11.50±322.00	0.001
UG=UK	20	0.00±0.00	

Description: $p < 0.05$ significant

Based on table 5, the study results showed a significant difference between the age of chronological with the dental age of all patients in

RSGMP Unjani. The result showed that the majority of patients were patients experiencing slow growth of a tooth. The patient's dental age was smaller than its chronological age with an average of36.41, showing that only a few patients in the RSGMP Unjani have growth of normal tooth development or the fit of the dental age with its chronological age.

DISCUSSION

The result follows Amin, Alshihri, Kruger and Tennant in Saudi Arabia; there is a difference between the chronological age and the dental age in male and female patients. The majority of the difference was one year, with 69.1% for male patients and 62.7% for female patients.[20] The result follows students of the Faculty of Dentistry research at the University Dental and oral hospital Hasanuddin in 2015. The study indicates a low difference in the dental age and the female chronological of 0.155. In contrast, males indicate a greater number of differences of 0491.[13.] Therefore, this research follows Natalia (2011), showing a meaningful difference in the eruption of any permanent dental element based on the male and female gender. The results show that the eruption time of each permanent dental element in females is faster than in males, especially in tooth growth and development.[21]

These differences show that the process of rapid tooth development growth is more widely found in female compared to male. While the growth process of slow tooth development is more commonly found in males than females.

Influenced by heredity, gender factor, socio-economic state, disease, local, and nutritional factors, the types of dental eruption in each individual are described in teeth theory's eruption. The classification includes nutritional content such as calcium intake, phosphorus, vitamin C and D, diet, and different types of food in each race. Deficiency of the substance can inhibit the growth and development of teeth and slow down the eruption time of teeth.[22]

Soetjiningsih explains two factors that affect child growth, namely genetic factors (intrinsic) and environmental factors (extrinsic). Genetic factors are the basic capital in achieving the result of the child's growth process. This factor is normal and pathological; this factor often causes gender, ethnic/language, growth disorder in developed countries. In contrast, in a developing country, growth disorders other than the leave by Genetic factors also lack adequate environmental factors for optimal child growth, such as the difference found in all patients in the RSGMP Unjani Cimahi. Therefore, this research supports the theory of optimal growth potential, which describes that genetic factors provide the upper limit of the growth curve. When the environmental factor supports, then the growth is achieved; conversely. Environmental factors cause a maximum growth curve not achieving.[23]

The results follow Kurita, Menezes, Casanova, and Haiter-Neto (2007) by researching Brazil's subject. The study differed from the subject in China. Although both studies use the same method, the difference in the study results can occur because differences among ethnic groups were found in teeth development.[7,24]

The theory that follows the research was the growth and development process, such as the eruption of the permanent teeth of the maxilla and the lower jaw varies with each individual between the sexes.

The result of the internal factors affected the eruption time and the calcification of the tooth. In general, the female eruption time was faster than the male. These differences range from 1 to 6 months, wherein female growth acceleration occurs first, and the score of the tooth maturation in female is higher than that of male. Thus, it shows that the growth process of tooth development and skeletal growth, i.e. growth spurt in females, occurs earlier than in boys.[25] The theory states that puberty generally occurs at the age of 11 in female and 13 years in male. Puberty is often defined as the physical transformation of a child into adulthood, with changes encompassing the body's shape, size, and composition.[26]

The results of this study were also supported and following the previous research results published by Blenkin and Taylor and a study in Saudi Arabia in 2015 which equally showed that females achieved most of the stage Growth and development in the formation of teeth before male that hormonal changes can influence.[20] The study results differed from the study related to the Alqahtani method carried out by Rusydiana et al. in 2016. Research on age estimates using the Alqahtani method revealed that the difference between male and female does not have a statistically significant difference. Still, the identification results suggest that Girls have many age differences. So broadly, there remains a visible difference between males and females with a tendency to female more rapidly than males.[14]

The differences found in this study with previous studies due to several factors, namely 1) difference in the size of the research research subject obtained by researchers in RSGMP Unjani only 72 Panoramic radiography aged 6-12 years which has fulfilled the criteria of inclusion, 2) a picture of panoramic radiography, the subject of the study is a further printed software to be identified where the study did not occur difficulties due to the radiographic picture is clearly printed so that it appears to be a description of the eruption and the calcification of the tooth in the image, 3) age range, the age range of Alqahtani method has a unit of year with a span of approximately one year of the dental Age classification Different from the age range of other methods 4) Alqahtani method, this method is made based on the conclusion of the midpoint of all developmental diagrams and the

eruption of the tooth, and 5) internal factors such as genetic factors that are the basic capital of growth process development, or external factors that are broadly divided into the factors of prenatal and postwar environment, such as nationality, race or ethnicity to date, the method of Alqahtani has been widely used in the western population, such as in Countries of Portugal, the Netherlands, the United States, Canada, France and the United Kingdom.[11, 12,14]

CONCLUSION

Based on the research results that all patients in RSGMP Unjani aged 6-12 years have different dental developmental growth processes, and the dental development growth of female patients was faster than male patients. It can be concluded that the dental age is not always comparable with chronological age because of various factors such as gender, genetics and environment, which can affect the dental age.

CONFLICT OF INTEREST

We declare that there is no conflict of interest in the scientific articles.

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REFERENCES

1. Komisi Perlindungan Anak Indonesia. Akta kelahiran adalah hak setiap anak Indonesia**.** http://kpai.go.id//. 2013. [diunduh tanggal 9 Mei 2018].
2. Open Government Indonesia. Akta kelahiran. http://satulayanan.id//. [diunduh tanggal 1 Oktober 2018].
3. Adams C, Carabott R, Evans S. Forensic odontology: An essential guide. Chapter 7: Dental Age Essessment. UK: John Wiley & Sons, Ltd, 2014; 152: 137-9.
4. Roberts GJ, Parekh S, Petrie A, Lucas V.S. Dental age assessment (DAA): A simple method for children and emerging adults. British Dental Journal 2007; 204: 7.
5. Stepanovsky M, Ibrova A, Buk Z, Veleminska J. Estimation of chronological age from permanent teeth development. ITAT 2017; 1885: 153-158.
6. Mokhtar M. Dasar-dasar orthodonti: Pertumbuhan dan perkembangan kraniofasial. Medan: Bina Insani Pustaka; 2002. hal. 45-224.
7. Kurita LM, Menezes AV, Casanova MS, Haiter-Neto F. Dental maturity as an indicator of chronological age: Radiograph assessment of dental age in a Brazilian population. J Appl Oral Sci 2007; 2: 99-104.
8. Indriyanti R, Pertiwi AS, Sasmita IS. Pola erupsi gigi permanen ditinjau dari usia kronologis pada anak usia 6 sampai 12 tahun.

Bandung: Fakultas Kedokteran Gigi UNPAD. 2006.

9. Putri AS, Nehemia B, Soedarsono N. Prakiraan usia individu melalui pemeriksaan gigi untuk kepentingan forensik kedokteran gigi. Jurnal PDGI 2013; 62(3): 55-62.
10. Franklin D, Flavel A, Noble J, Swift L, Karkhanis S. Forensic age estimation in living individuals: Methodological considerations in the context of medico-legal practice. Dove Press Journal 2015; 5: 53-66.
11. AlQahtani SJ, Liversidge HM, Hector MP. Atlas of tooth development and eruption. American Journal of Physical Anthropology 2010; 142: 481-490.
12. AlQahtani SJ, Hector MP, & Liversidge HM. Accuracy of dental age estimation charts: Schour and Massler, Ubelaker, and the London Atlas. American Journal of Physical Anthropology 2014; 154(1): 70-8.
13. Wardhani Y. Perbedaan usia kronologis dan usia dental dengan menggunakan metode Demirjian berdasarkan kajian radiologi menggunakan radiografi panoramik di RSGM UNHAS. Makassar: Fakultas Kedokteran Gigi Universitas Hasanuddin. 2015.
14. Rusydiana F, Oscandar F, Sam B. Identifikasi usia berdasarkan metode Al-Qahtani melalui radiograf panoramik di RSGM FKG UNPAD. Bandung: Fakultas Kedokteran Gigi Universitas Padjadjaran. 2016.
15. Goltz RA. A comparison of four methods of dental age estimation and age estimation from the risser sign of the iliac crest. http://commons.emich.edu/honors/493. [accesed May 25th 2018].
16. Whaites Eric. *Essential of dental radiography and radiology*. Third Edition. Churgical Livingstone. Edinburgh London Newyork Oxford. 2002.
17. Ardakani F, Bashardoust N, Sheikhha M. The accuracy of dental panoramic radiography as an indicator of chronological age in Iranian individuals. The Journal of Forensic Odonto-Stomatology 2007; 25: 2.
18. Javadinejad S, Sekhavati H, Ghafari R. A comparison of the accuracy of four age estimation methods based on panoramic radiography of developing teeth. Journal of Dental Research, Dental Clinics, Dental Prospects 2015; 9(2): 72-78.
19. Senn DR, Stimson PG. *Forensic dentistry*. Second Edition. United States of America: CRC Press; 2010. p. 263-304.
20. Alshiri AM, Kruger E, Tennant M. Dental age assessment of Western Saudi children and adolescents. The Saudi Dental Journal 2015; 27, 131-136.

21. Artaria MD. Perbedaan antara laki-laki dan perempuan: Penelitian antropometris pada anak-anak umur 6-19 tahun. Jurnal Masyarakat Kebudayaan dan Politik 2009; 22(4): 343-349.
22. Kuswandari S. Maturasi dan erupsi gigi permanen pada anak periode gigi pergantian. Dental Journal 2014; 47(2): 72-76.
23. Soetjiningsih. Tumbuh Kembang Anak. Jakarta: EGC; 1998. hal. 1-36.
24. Stefanac-Papic J, Alkadri KZ, Legovic M, Galic N. Comparison of dental maturity between ethnic groups. Coll Antropol 1998; 22: 123-6.
25. Ikalor A. Pertumbuhan dan perkembangan. Jurnal Pertumbuhan dan Perkembangan 2013; 7(1): 1-6.
26. Muliani, Widianti IGA, Wardana NG, Yuliana, Karmaya M. Tahap pertumbuhan dan perkembangan tanda-tanda seks sekunder remaja SMPN 4 Bangli, desa Pengotan kecamatan Bangli. MEDICINA 2017; 48(2): 75-82.