

Research Article

Differences in the Accuracy of Age Estimation in Children Using the London Atlas and the Atlas of Dental Development in the Indonesian Population at RSGMP Nala Husada

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ABSTRACT

Introduction: Teeth can be used for age estimation of the victim. Several atlases can be used to estimate age through teeth, such as the London Atlas (AL) and The Atlas of Dental Development in the Indonesian Population (ADDIP). The Atlas of Dental Development in the Indonesian Population (ADDIP) is a modification of the London atlas (AL), made by looking at the process of dental development of children in Indonesia from the age of 5 years to 23 years. Therefore, this study aims to compare the accuracy of child age estimation using the London Atlas (AL) and the Atlas of Dental Development in the Indonesian Population (ADDIP).

Material and Methods: This study used 128 panoramic radiographs from pediatric patients aged 5 years to 16 years at RSGMP Nala Husada Surabaya from February to May 2025. Data analysis was conducted using SPSS software for different tests, including a Wilcoxon test.

Results and Discussions: Using the London Atlas (AL) method, the average difference between chronological age and dental age was found to be between -0.13 and -1.51 years. Meanwhile, according to ADDIP, the average difference between chronological age and dental age was found to be between -0.03 and -1.31 years.

Conclusion: ADDIP shows a smaller difference between chronological age and dental age than the AL, suggesting that ADDIP demonstrated higher accuracy than AL for estimating age in Indonesian children.

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INTRODUCTION

Age estimation plays a crucial role in human identification, particularly in mass disaster situations. Forensic anthropologists can estimate age through skeletal remains. Teeth, however, are more durable postmortem and exhibit less variability compared to skeletal age. Age estimation based on dental developmental stages is considered the most accurate indicator when compared to other maturation processes.¹

Dental age estimation through the assessment of tooth development stages provides high accuracy in determining the age of children and adolescents. This is primarily due to the minimal influence of genetic and environmental factors on dental development.²

Dental age estimation methods can be performed using several techniques, including clinical, radiographic, histological, and biochemical approaches.³ Among these, radiographic methods offer several advantages, such as ease of acquisition and interpretation, the does not require tooth extraction for histological analysis, and applicability to both living and deceased individuals.⁴ Radiographic modalities used in dental age estimation include periapical, panoramic, cephalometric, and cone-beam computed tomography (CBCT). In this study, panoramic radiography was utilized because it provides a comprehensive view of all teeth in both the maxilla and mandible on a single image receptor, allowing clear visualization of dental developmental stages.³

Dental age estimation using panoramic radiographs can be conducted through two main techniques: scoring procedures and atlas methods. In the scoring procedure, dental developmental stages are identified and assigned scores based on previously established criteria. In contrast, the atlas method involves direct comparison of dental

radiographs with standardized developmental atlases.⁴ The atlas-based method is easier to apply and demonstrates high accuracy across various populations; however, it has limitations, as it may not represent all variations in dental developmental stages, potentially leading to variability in assessment.³

Adisty et al.⁵ developed the ADDIP atlas, which illustrates stages of primary tooth root resorption, permanent tooth calcification, and eruption through radiographic images across age groups ranging from 5 to 23 years, for both sexes. This method differs from the AL method, which utilizes median stages to construct the atlas. The use of median stages presents limitations, particularly when an even number of stages exists, resulting in the absence of a true median for certain variables. Consequently, ADDIP has demonstrated higher accuracy compared to AL.⁵

The AL method evaluates dental development within the alveolar bone until permanent teeth erupt through the alveolar crest.¹ One advantage of AL is its ability to depict dental development from as early as 30 weeks in utero up to 23.5 years of age. However, its limitations include the absence of clearly defined age ranges for each developmental stage and the lack of sex differentiation. Nevertheless, several studies have reported high accuracy of AL in estimating age in children.²

Nala Husada Dental and Oral Hospital (RSGMP Nala Husada) was established in 2002 and is located in East Surabaya at Jalan Arif Rahman Hakim No. 150. The hospital functions as a provider of dental and oral healthcare services, prioritizing curative and rehabilitative treatments integrated with preventive and promotive efforts, as well as referral services. The Dental and Oral Teaching Hospital (RSGMP) Nala Husada, Universitas Hang Tuah Surabaya, is supported by dentists, dental

specialists, pharmacists, paramedics, administrative staff, and adequate dental technology facilities. The hospital serves both adult and pediatric patients and is equipped with a Dental Radiology Unit that provides panoramic radiographic services for both groups. Therefore, this study was conducted at RSGMP Nala Husada.

This study aims to determine the difference between chronological age and dental age using the AL and ADDIP methods. A smaller difference between chronological age and dental age indicates a more accurate method for age estimation.

MATERIAL AND METHODS

This study employed analytical observational design with a cross-sectional approach. The study aimed to compare the accuracy of two dental age estimation methods, namely AL and ADDIP, by evaluating the difference between chronological age and dental age. The method demonstrating the smallest difference between chronological age and dental age was considered to have higher accuracy in age estimation.

Chronological age was defined as the age calculated from the date of birth to the date of panoramic radiograph acquisition and expressed in decimal form. Dental age, on the other hand, was defined as the estimated age obtained by matching the patient's panoramic radiograph with either the AL or ADDIP atlas. To ensure objectivity, the date of birth on each panoramic radiograph was concealed using a white sticker during the study, preventing the examiner from identifying the subject's chronological age.

The study population consisted of panoramic radiographs of pediatric patients aged 5 to 16 years obtained from the Dental and Oral Teaching Hospital, Nala Husada, Surabaya, between February 2025 and May 2025. A total of 128 panoramic

radiographs were included, comprising 66 radiographs from male patients and 62 from female patients.

The inclusion criteria were as follows: panoramic radiographs of sufficient quality for interpretation, obtained from pediatric patients aged 5 to 16 years, with complete permanent dentition. The exclusion criteria included: poor-quality radiographs that were not interpretable, severe dental caries, teeth that had undergone endodontic treatment, pathological jawbone lesions, missing teeth on both sides, medical conditions affecting dental development, history of trauma, and craniofacial deformities.

This study received ethical approval from the Ethics and Research Committee of RSGM Nala Husada, Universitas Hang Tuah Surabaya, with certificate number EC/003/KEPK.RSGMNH/IV/2025.

Chronological age was defined as the age from birth to the time of panoramic radiograph acquisition. Dental age was calculated based on the developmental stages of teeth observed in the panoramic radiograph using either the AL or ADDIP method. If the chronological age was greater than the dental age, the result was classified as underestimated. Conversely, if the chronological age was lower than the dental age, it was classified as overestimated.⁶

Panoramic radiographs that met the inclusion criteria were collected, and patient names and dates of birth were concealed to maintain objectivity in age estimation measurements. Dental age was determined by matching the stages of dental growth and development observed in the panoramic radiographs with both atlases. The difference between chronological age and dental age was calculated in years.

Chronological age was categorized into 11 groups: 5.00–5.99 years; 6.00–6.99 years; 7.00–

7.99 years; 8.00–8.99 years; 9.00–9.99 years; 10.00–10.99 years; 11.00–11.99 years; 12.00–12.99 years; 13.00–13.99 years; 14.00–14.99 years; and 15.00–15.99 years.

Data normality was assessed using the Kolmogorov–Smirnov test, as the sample size consisted of 128 panoramic radiographs. Subsequently, comparative tests were conducted to determine the differences between chronological age and dental age for each method. The method with the smallest difference between chronological age and dental age was considered to have the highest accuracy. Data analysis was performed using SPSS.

RESULTS AND DISCUSSIONS

This study was conducted by analyzing panoramic radiographs from 128 pediatric patients at RSGMP Nala Husada, with a mean chronological age of 9.43 ± 2.48 years. Sex differentiation was not performed in this study, as both the AL and ADDIP methods utilize identical dental development atlases for male and female subjects.

Data analysis was carried out using SPSS for Windows version 26. The normality of data

distribution was assessed using the Kolmogorov–Smirnov test, as the sample size consisted of 128 panoramic radiographs. The results of the normality test showed $p < 0.05$, indicating that the data were not normally distributed; therefore, a non-parametric test, namely the Wilcoxon signed-rank test, was applied.

Table 1. Descriptive Analysis of AL and ADDIP

N	DAE method	Mean±SD CA (years)	Mean DA ± SD (years)	(CA – DA) ±SD (years)
128	AL		10.17 + 2.86	-0.4595 + 1.39
128	ADDIP	9.43 + 2.48	9.18 + 2.65	0.4344 + 1.25

Note: DAE: Dental Age Estimation, CA: Chronological Age, DA: Dental Age

Based on the comparative analysis using the Wilcoxon test, the significance value for the difference between chronological age and dental age using the AL method was 0 ($p < 0.05$), indicating a statistically significant difference between chronological age and dental age. Similarly, the significant value for the difference between chronological age and dental age using the ADDIP method was 0.014 ($p < 0.05$), also indicating a statistically significant difference between chronological age and dental age.

Table 2. Wilcoxon Test Results by Age Group for AL

Age Group (Years)	N (Male/Female)	Chronological Age (Mean ± SD)	Dental Age (Mean ± SD)	Chronological Age – Dental Age	p-value	Trend
5.00–5.99	10 (4/6)	5.29 ± 0.23	6.80 ± 1.63	-1.51	0.012	0
6.00–6.99	12 (10/2)	6.56 ± 0.27	7.00 ± 0.67	-0.44	0.071*	0
7.00–7.99	17 (11/6)	7.56 ± 0.33	8.02 ± 1.17	-0.46	0.115*	0
8.00–8.99	23 (7/16)	8.54 ± 0.30	9.15 ± 1.52	-0.61	0.11*	0
9.00–9.99	14 (7/7)	9.58 ± 0.30	10.07 ± 1.86	-0.49	0.48*	0
10.00–10.99	22 (7/15)	10.39 ± 0.26	11.50 ± 1.66	-1.11	0.008	0
11.00–11.99	11 (6/5)	11.48 ± 0.22	12.86 ± 2.20	-1.38	0.091*	0
12.00–12.99	4 (3/1)	12.42 ± 0.22	13.00 ± 1.73	-0.58	0.465*	0
13.00–13.99	7 (5/2)	13.32 ± 0.20	13.78 ± 1.25	-0.46	0.249*	0
14.00–14.99	5 (3/2)	14.37 ± 0.27	14.50 ± 1.22	-0.13	0.893*	0
15.00–15.99	5 (3/2)	15.11 ± 0.13	15.50 ± 1.00	-0.39	0.593*	0

Note: $p > 0.05$ indicates no statistically significant difference; 0 = overestimated (dental age > chronological age); U = underestimated (dental age < chronological age).

Based on Table 2, the results of the comparative analysis between chronological age and dental age using the AL method across age groups showed no statistically significant differences in the following groups: 6.00–6.99 years ($p = 0.071$), 7.00–7.99 years ($p = 0.115$), 8.00–8.99 years ($p = 0.11$), 9.00–9.99 years ($p = 0.48$), 11.00–11.99 years ($p = 0.091$), 12.00–12.99 years ($p = 0.465$), 13.00–13.99

years ($p = 0.249$), 14.00–14.99 years ($p = 0.893$), and 15.00–15.99 years ($p = 0.593$).

The smallest difference between chronological age and dental age was observed in the 14.00–14.99-year age group, with a value of -0.13 years. In contrast, the largest difference was found in the 5.00–5.99-year age group, with a value of -1.51 years.

Table 3. Wilcoxon Test Results by Age Group for ADDIP

Age Group (Years)	N (Male/Female)	Chronological Age (Mean ± SD)	Dental Age (Mean ± SD)	Chronological Age - Dental Age	p-value	Trend
5.00–5.99	10 (4/6)	5.29 ± 0.23	6.60 ± 1.26	-1.31	0.012	O
6.00–6.99	12 (10/2)	6.56 ± 0.27	6.50 ± 0.79	0.06	0.814*	U
7.00–7.99	17 (11/6)	7.56 ± 0.33	7.17 ± 0.73	0.39	0.058*	U
8.00–8.99	23 (7/16)	8.54 ± 0.30	7.78 ± 0.90	0.76	0.001	U
9.00–9.99	14 (7/7)	9.58 ± 0.30	9.14 ± 1.46	0.44	0.221*	U
10.00–10.99	22 (7/15)	10.39 ± 0.26	10.09 ± 1.26	0.30	0.198*	U
11.00–11.99	11 (6/5)	11.48 ± 0.22	10.90 ± 0.94	0.58	0.075*	U
12.00–12.99	4 (3/1)	12.42 ± 0.22	12.00 ± 1.82	0.42	0.715*	U
13.00–13.99	7 (5/2)	13.32 ± 0.20	13.85 ± 1.86	-0.53	0.310*	O
14.00–14.99	5 (3/2)	14.37 ± 0.27	14.40 ± 1.67	-0.03	0.893*	O
15.00–15.99	5 (3/2)	15.11 ± 0.13	14.66 ± 1.52	0.45	0.593*	U

Note: $p > 0.05$ indicates no statistically significant difference; O = overestimated (dental age > chronological age); U = underestimated (dental age < chronological age).

Based on Table 3, the results of the comparative analysis between chronological age and dental age using the ADDIP method showed no statistically significant differences in the following age groups: 6.00–6.99 years ($p = 0.814$), 7.00–7.99 years ($p = 0.058$), 9.00–9.99 years ($p = 0.221$), 10.00–10.99 years ($p = 0.198$), 11.00–11.99 years ($p = 0.075$), 12.00–12.99 years ($p = 0.715$), 13.00–13.99 years ($p = 0.310$), 14.00–14.99 years ($p = 0.893$), and 15.00–15.99 years ($p = 0.593$).

The smallest difference between chronological age and dental age was observed in the 14.00–14.99-year age group, with a value of -0.03 years. In contrast, the largest difference was found in the 5.00–5.99-year age group, with a value of -1.31 years.

Based on several studies, the age estimation process may involve physical examination, hand-

wrist radiographic assessment, and dental examination, including panoramic radiography. Dental development and tooth eruption are highly reliable indicators for age determination. This method is widely used for age estimation because it is minimally influenced by environmental and hormonal factors, is easy to apply, and is non-invasive. Numerous methods have been developed, yielding varying levels of accuracy and employing different statistical approaches for estimating age based on dental development in children and adolescents. Accuracy is a critical aspect in dental age assessment and refers to the minimal difference between chronological age and dental age.⁷ In this study, accuracy was determined by the mean difference between chronological age and dental age.

The AL method was introduced by Al Qahtani in 2010. AL is an atlas that comprehensively

illustrates the stages of dental development and can be used for age estimation from as early as 30 weeks in utero up to 23.5 years of age. Comparisons between the London Atlas and age estimation charts developed by Schour, Massler, and Ubelaker have demonstrated that the London Atlas provides the highest accuracy. Although it slightly overestimates age within the 3–16-year range, other methods tend to underestimate age relative to chronological age.⁸ The AL was developed based on radiographic assessment of dental development in Caucasian populations from the United Kingdom and Bangladesh, using developmental stage tables from Moorrees et al. and Bengston.¹

Unlike the Schour–Massler and Ubelaker atlases, which were developed using archaeological samples, the AL was constructed using contemporary living populations, making it more suitable in forensic contexts involving modern individuals. The AL provides a general representation of all stages of dental development based on the median age.¹ Age estimation in children using the AL is performed by comparing panoramic radiographs of the dentition with the developmental stages illustrated in the atlas.⁹ The AL is considered a more recent and comprehensive dental development atlas, complementing earlier atlases. It has been widely used due to its high accuracy and sensitivity, as well as its ease of application in estimating the age of children.¹⁰

The ADDIP atlas is used for dental age estimation in individuals aged 5 to 23 years. This age range was selected to encompass the beginning of the mixed dentition period at approximately 5 years of age and the completion of permanent dentition development and eruption by approximately 23 years. In the Indonesian population, the apical closure of third molars occurs at around 22 years

in males and between 23 and 24 years in females. The parameters analyzed in this atlas include stages of primary tooth root resorption, permanent tooth calcification, and permanent tooth eruption, all of which can be observed on panoramic radiographs.

ADDIP differs from AL in that it does not rely on median age stages for representing dental development. The use of median stages presents limitations, as not all variables have a defined median stage.⁵ ADDIP illustrates dental developmental stages in the right maxillary and mandibular regions, combining both sexes. The atlas consists of 19 developmental age categories ranging from 5 years \pm 6 months to 23 years \pm 6 months. The \pm value indicates that each age category applies to individuals within a range of six months above or below the specified age.

The main differences between ADDIP and other dental atlas methods include: the use of samples derived from the Indonesian population; the inclusion of multiple developmental parameters such as primary tooth root resorption, primary and permanent tooth calcification, and permanent tooth eruption; evenly distributed age categories; and the use of modified Demirjian et al. (1973) calcification stages, simplified into fewer stages (six stages for anterior teeth and eight stages for posterior teeth).⁵

Based on the results of age estimation using the AL method presented in Table 2, the smallest difference was observed in the 14.00–14.99-year age group (–0.13 years), while the largest difference was found in the 5.00–5.99-year age group (–1.51 years). These findings indicate that, on average, dental age was greater than chronological age, suggesting an overestimation. The Wilcoxon test yielded a p-value of 0.893, indicating no

statistically significant difference between dental age and chronological age.

These findings are consistent with a study by Cheong Harin¹ conducted in a Korean pediatric population, which reported a mean difference of -0.2 years between chronological and dental age.¹ Similarly, Sharma Preeti¹¹ reported a mean difference of -0.03 years in an Indian pediatric population.¹¹ Furthermore, Adisty⁵ reported a mean difference ranging from -2.013 to 1.99 years in an Indonesian pediatric population.⁵

Based on the results of age estimation using the ADDIP method presented in Table 3, the smallest difference was observed in the 14.00–14.99-year age group (-0.03 years), while the largest difference was found in the 5.00–5.99-year age group (-1.31 years). The Wilcoxon test for the 14.00–14.99-year age group yielded a p-value of 0.893, indicating no statistically significant difference between dental age and chronological age. These results also indicate that dental age tended to be higher than chronological age, reflecting an overestimation.

This finding is consistent with the study by Adisty⁵ in an Indonesian pediatric population, which reported a mean difference ranging from -0.969 to 1.210 years. From these findings, it can be concluded that the ADDIP method demonstrates a smaller mean difference between dental age and chronological age, indicating higher accuracy compared to the AL method in the Indonesian pediatric population.¹²

Variations in age estimation results across studies may be attributed to several factors, including differences in sample size, study location, population characteristics, single-examiner assessments, and the absence of sex-based grouping.¹³ Maber and Liversidge stated that study

outcomes may vary due to differences between the sample population and reference standards, including factors such as age distribution, sample size, sampling bias, biological variation, environmental influences, dietary habits, and the accuracy of the evaluation method.

In forensic anthropology, the acceptable range of difference between chronological age and dental age is generally ± 0.5 to ± 1 year for both children and adults.¹⁴ Differences in study outcomes across populations may also arise due to genetic, ethnic, and sex-related factors influencing dental development. Ethnic variation, in particular, can affect the timing and pattern of dental development, leading to differences in the accuracy of dental age estimation methods across populations.⁵

Both intrinsic and extrinsic factors influence human growth and development. Nutritional intake also plays an important role in developmental processes. Several studies have demonstrated an association between the timing of dental development and population differences worldwide. Genetic and environmental factors have also been shown to influence the timing of dental development.¹⁴

Additionally, sample size and statistical approaches applied across age ranges may contribute to differences in results. Variability in dental development stages among populations, differences in age grouping, statistical methodologies, and the inherent accuracy of the evaluated methods may all influence the outcomes of age estimation studies.¹⁵

CONCLUSION

The results of this study indicate that both the AL and ADDIP methods can be used for age estimation in the Surabaya population aged 5 to 16 years.

However, ADDIP showed a smaller difference between chronological age and dental age than AL, with values remaining within the acceptable range of ± 0.5 to ± 1 year, as established in forensic anthropology. Therefore, ADDIP is considered more accurate than AL for age estimation in the Indonesian pediatric population.

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REFERENCES

- Cheong H, Roh BY, Kumagai A, Oh S, Lee SS. Validation of London Atlas for forensic age estimation in Koreans by comparing with Lee's and Willems' methods. *Heliyon*. 2023;9(9):e19957. Doi: 10.1016/j.heliyon.2023.e19957
- Agitha SRA, Annariswati IA. Dental age estimation methods in children based on radiograph panoramic. *J Radiol Dentomaksilofasial Indones* 2021; 5(2): 90. Doi: 10.32793/jrdi.v5i2.711
- Annariswati IA, Agitha SRA. Age estimation accuracy based on Atlas London and Schour-Massler in Tionghoa ethnic children. *J Radiol Dentomaksilofasial Indones*. 2021; 5(2): 52. Doi: 10.32793/jrdi.v5i2.704
- Sousa AM da S, Jacometti V, AlQahtani S, Silva RHA da. Age estimation of Brazilian individuals using the London Atlas. *Archives of oral biology* 2020; 113: 104705. Doi: 10.1016/j.archoralbio.2020.104705
- Setyari A, Soedarsono N. Age estimation of individuals aged 5 – 23 years based on dental development of the Indonesian population. *Forensic Sciences Research* 2022; 7(2): 115–23. Doi: 10.1080/20961790.2021.1995023
- Paz Cortés MM, Rojo R, Alía García E, Mourelle Martínez MR. Accuracy assessment of dental age estimation with the Willems, Demirjian and Nolla methods in Spanish children: Comparative cross-sectional study. *BMC pediatrics* 2020; 20(1): 361. Doi: 10.1186/s12887-020-02255-5
- AlOtaibi NN, AlQahtani SJ. Performance of different dental age estimation methods on Saudi children. *The Journal of forensic odonto-stomatology*. 2023;41(1):27–46.
- Ghafari R, Ghodousi A, Poordavar E. Comparison of the accuracy of the London atlas and Smith method in dental age estimation in 5-15.99-year-old Iranians using the panoramic view. *International journal of legal medicine* 2019; 133(1): 189–95. Doi: 10.1007/s00414-018-1920-3
- Rusydiana F, Oscandar F, Sam B. Identifikasi usia berdasarkan metode Al Qahtani melalui radiograf panoramik di RSGM FKG UNPAD Age identification based on Al Qahtani method through panoramic radiograph at the Dental Hospital of Universitas Padjadjaran. *Jurnal Kedokteran Gigi Universitas Padjadjaran* 2016; 28(3): 166-171. Doi:10.24198/jkg.v28i3.18695
- Kurniawan A, Agitha S, Chusida A, Rizky B, Prakoeswa B, Nailah S, et al. Accuracy of Tooth Development as an Indicator of Dental Age Estimation for Children in Indonesia. *e-GiGi* 2022; 10(1): 144. Doi: 10.35790/eg.v10i1.39553
- Sharma P, Wadhwan V. Comparison of accuracy of age estimation in Indian children by measurement of open apices in teeth with the London Atlas of tooth development. *The Journal of forensic odonto-stomatology* 2020; 38(1): 39–47.
- Swastirani A, Utomo H, MAR MS. Estimasi usia dengan orthopantomogram pada pasien Rumah Sakit Gigi Dan Mulut Pendidikan Universitas Airlangga. *E-Prodentia Journal of Dentistry* 2018; 2(1): 124–9. Doi: 10.21776/ub.eprodenta.2018.002.01.4
- Kusumadewi S, Kristanto R, Nurrahmadhanti D. Tingkat akurasi penentuan usia kronologis dan usia gigi menggunakan metode Cameriere pada anak usia 5-15 tahun di Bali. *JMU* 2023; 12(5): 81. Doi:10.24843/mu.2023.v12.i05.p12
- Prakoeswa BFWR, Kurniawan A, Chusida A, Rizky BN, Darmawan AI, Aisyah AKN, et al. Using the Demirjian method for estimating the dental age of children in Surabaya, Indonesia. *Dental Journal* 2023; 56(2): 87–91. Doi: 10.20473/j.djmg.v56.i2.p87-91
- Sosiawan A, Chusida A, Prakoeswa BFWR, Kurniawan A, Marini MI, Rizky BN, et al. Estimation of children's age based on dentition via panoramic radiography in Surabaya, Indonesia. *Dental Journal* 2022; 55: 161–4. Doi: 10.20473/j.djmg.v55.i3.p161-164