

Prevalence of Torus Palatinus for Forensic Anthropological Identification

Dian Artanty¹, Myrtati Dyah Artaria^{2*}

¹Department of Dentistry Program Study, Dentistry Faculty, Universitas Muhammadiyah Surabaya, Jawa Timur, Indonesia

²Department of Physical Anthropology, Faculty of Social Science and Political Science, Universitas Airlangga, Surabaya, Indonesia.

*Corresponding Author: dian_artanty@fkg.um-surabaya.ac.id

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ORCID : Artanty D(0009-0003-5878-766X), Artaria MD (0000-0002-2414-5437)
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ABSTRACT

A torus palatinus is a bony prominence commonly located in the middle of the hard palate in the upper jaw. The prevalence of this phenomenon differs among various populations, which suggests that it could serve as a possible indicator for individual identification. This study aimed to examine the prevalence of torus palatinus in the Deuteromalayid and Protomalayid populations, encompassing individuals of both genders between the ages of 20 and 80 years. The research involved an observational non-metric analysis of 72 craniums obtained from the Department of Anatomy and Histology at Airlangga University. Out of the samples examined, a single skull (1.39%) from a 50-year-old male exhibited a torus palatinus.

Keywords: Torus palatinus; forensic identification; prevalence; osteoscopy; Deuteromalayid

ABSTRAK

Torus palatinus adalah tonjolan tulang yang biasanya terletak di tengah langit-langit keras rahang atas. Prevalensi fenomena ini berbeda-beda di antara berbagai populasi, sehingga menunjukkan bahwa fenomena ini dapat berfungsi sebagai indikator identifikasi individu. Penelitian ini bertujuan untuk mengetahui prevalensi torus palatinus pada populasi Deuteromalayid dan Protomalayid, yang mencakup individu baik jenis kelamin antara usia 20 dan 80 tahun. Penelitian ini melibatkan analisis observasional non-metrik terhadap 72 tengkorak yang diperoleh dari Departemen Anatomi dan Histologi Universitas Airlangga. Dari sampel yang diperiksa, satu tengkorak (1,39%) dari laki-laki berusia 50 tahun menunjukkan torus palatinus.

Kata Kunci: Torus palatinus; identifikasi forensik; prevalensi; osteoskopi; Deuteromalayid.

1. Introduction

Identification recognizes the ownership of a skeleton or corpse or an unknown item. To simplify the identification process, we know the term individualization, namely collecting or describing special characteristics or characters a person possesses. The torus palatinus is one of the unique characteristics of a person that can be used in the identification process because not everyone has their presence. The torus palatinus is a bony protrusion (exostosis) found on the ceiling of the upper jaw or at the position of the intermaxillary suture, typically covered by cartilage. Cartilage itself is cartilage or a type of connective tissue in the body.

Cartilage is made from chondrocyte cells and is strengthened by collagen and elastin fibers in the matrix. Cartilage functions as a cushion or support for other structures or body tissues without being complicated or stiff like bones. At ante-mortem, the torus palatinus will be covered by soft tissue. Soft tissues are muscles, tendons, ligaments, fascia, nerves, fibrous tissue, fat, blood vessels, and synovial membranes. In the antemortem, there is vascularization, or the process of blood vessel circulation, which indicates a biological process. At post-mortem, the torus palatinus appears as a protruding, single, or humped bone.

The shape of the torus palatinus is usually humped, looks prominent, and has no stem. Although the torus is not only found in the palatal area, it can also be found in the mandible. The shape of the torus depends on where the bone protrudes.^[1] The cause of the growth of this bony protrusion is not yet clearly known, but in some people, it is inherited in an autosomal dominant manner. It may be

due to the environment or high chewing pressure because several studies have found a significant relationship between abrasion of the teeth and the appearance of the torus palatinus.

The prevalence of Torus Palatinus holds significant implications for forensic anthropological identification. This bony protrusion, located in the center of the hard palate of the upper jaw, exhibits variability across different populations. Researchers can establish its utility as a distinctive anatomical marker by studying its occurrence in specific demographic groups, such as the Deuteromalayid and Protomalayid populations encompassing both genders aged 20 to 80 years.

2. Material and Methods

This research uses non-metric visual analytical observation methods. The research material is from the cranium collection of the Department of Anatomy and Histology, Airlangga University. Figure 1 (A) is an example of a cranium without a torus palatinus. That is, there is no bony prominence on the palatal. In Figure 1 (B), it is clear that there is a torus palatinus, namely a bony protrusion in the intermaxillary suture area.

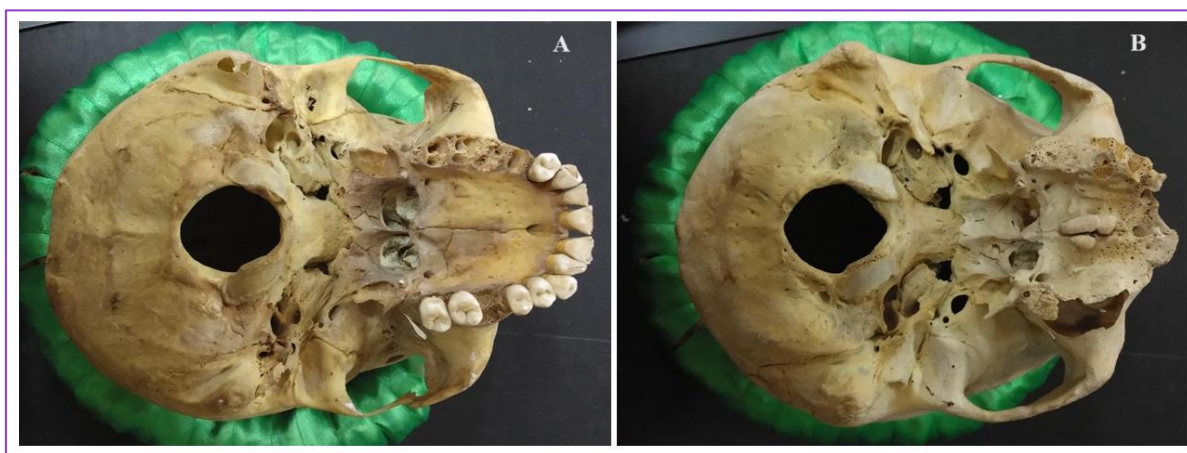


Figure 1. (A) palate without a torus palatinus and (B) palate with torus palatinus

3. Results and Discussion

Based on observations from the Department of Anatomy and Histology at Airlangga University, out of 72 cranium samples examined, one cranium (1.39%) was identified with a torus palatinus. This particular cranium belonged to a 50-year-old male of Deuteromalayid descent. The prevalence of torus palatinus varies significantly across populations, genders, and ages. Research by Kiwah Andani (2014) explored torus palatinus frequency among Mongoloid populations within and outside Java. They found a prevalence of 77.4% among 212 samples, with characteristics predominantly small (<3mm) in 50.5% and primarily single (90.6%).

Torus palatinus was more prevalent in populations originating from Java and Sumatra, with a ratio of 1.2:1.2:1 for Java, Sumatra, and mixed populations. Aree Jankittivong noted that torus palatinus occurrence is more common in Mongoloid races compared to Caucasians, supported by Nery EB et al. (1977), who reported the highest prevalence (47.2%) in Oceanian-Asian (Mongoloid) populations and the lowest (25%) in Africans. Additionally, Belsky et al. (2003) researched torus palatinus presence across Sub-Saharan Africa, West Eurasia, Sino America, Sunda Pacific, and Sahul Pacific populations. They found the highest incidence in West Eurasia, followed by Sino-American, Sub-Saharan Africa, Sunda Pacific, and Sahul Pacific populations.

From the explanation above, it can be concluded that the Mongoloid race ranks above the prevalence of finding torus palatinus. This may be due to hereditary factors and environmental factors related to the food eaten which triggers bone protrusion in the palatal area. Nery EB [8] found a very close relationship between dental attrition and the appearance of the torus palatinus in Thai people. A diet containing hard foods in someone with torus palatinus genetics has a high chance of attrition.

Another variable that influences the prevalence of torus palatinus is gender. Aree Jainkittivong [1] conducted research with a sample size of 258 consisting of 161 men and 97 women. The results showed that ten men (6.21%) had a torus palatinus and 10 (10.30%) women had a torus palatinus. Ashish Kumar Singh (2017) also conducted research on 2666 samples consisting of 1419 women and 1247 men, with the results that 34.9% of women had a torus palatinus, while 20.4% of men had a torus palatinus.

Table 1. Several Studies by Garcia-García, et al. (2010)

Researcher/year	Population	Total sample	Female	Male
Reichart et al /1988	German	1317	20.8 %	21.1 %
Reichart et al /1988	Thai	947	24.4 %	35.5 %
Haugen /1992	Norwegia	5000	12,3 5 %	7.02 %
Eggen et al / 1994	Norwegia	1181	50.7 %	38.9 %
Nair et al / 1996	Vietnam	550	334 %	216 %
Kerdpon et al/ 1999	Thailand	609	67.6 %	48.1 %

From the data above, it can be seen that the prevalence of torus palatinus is highest in women, this can be caused by women's hormonal conditions, which are sometimes unstable. Belsky, J. L (2003) [4] conducted research and concluded that bone mineral density is directly proportional to the incidence of torus palatinus in women experiencing menopause. Age is another variable that can be used to determine the prevalence of torus palatinus [6]

Tabel 2. Summarizes research on the discovery of the torus palatinus based on age

Researcher/year	year	age	Total sample	Prevalence of torus palatinus
Reinchart et al /german	1988	31-40	90	21.1
		11-20	149	20.8
Reinchart et al /thailand	1988	31-40	49	24.4
		31-40	68	35.2
Haugen / norwegia	1992	35-65	726	7.02
		35-65	854	12.3
Eggen et al /norwegia	1994	20-29	167	38.9
		40-49	73	50.7
Kerdpon et al /thailand	1999	31-40	141	66.7
Al bayaty et al / afrika india	2001	11-20	98	8.2
Bruce et al / ghana	2004	40-49	176	5.68

Table 3. Research on the prevalence of torus palatinus in the population in Malaysia conducted based on age [2]

Age	Total sample	The incidence of torus palatinus
11-20	142 (100)	102 (71.8)
21-30	372 (100)	225 (60.5)
31-40	98 (100)	60 (61.2)
41-50	110 (100)	79 (71.8)
51-60	90 (100)	59 (65.6)
61-70	53 (100)	40 (75.5)
71-80	13 (100)	7 (53.8)
81-90	4 (100)	2 (50)
Total	882 (100)	574 (65.1)

Based on the two datasets, it's evident that torus palatinus is prevalent, particularly among middle-aged individuals. This could be attributed to its etiology, which involves hereditary factors influenced by environmental conditions. The ecological factor in question is the exposure to chewing forces that stimulate the formation of bone protrusions. Middle-aged and older individuals likely have had more prolonged exposure to such chewing forces, increasing the likelihood of developing torus palatinus.

4. Conclusion

Based on the results of observations on the palatal bones in the Anatomy and Histology Laboratory, Airlangga University, individualization characteristics were found in the form of a torus palatinus, namely a bony protrusion or exostosis which is generally found in the midline of the palatal bones. Torus palatinus is an epigenetic anatomical characteristic, namely the incidence rate, which is influenced by the environment and connects three variables: race, gender, and age. In this sample, we found it in one person out of 72 people who were observed

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Authors Contribution

Contribution	Artanty D	Artaria MD
Concepts or ideas	√	√
Design	√	√
Definition of intellectual content	√	√
Literature search	√	√
Experimental studies	√	√
Data acquisition	√	
Data analysis	√	√
Statistical analysis	√	
Manuscript preparation	√	√
Manuscript editing	√	√
Manuscript review		√



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