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ASSESSING IDEAL LIP ANATOMY THROUGH PHOTOGRAMMETRY: IMPLICATIONS FOR FACIAL RECONSTRUCTION IN INDONESIA

Gede Wara Samsarga[1*)], Shita Diwyani Sudarsa[1], Astrinita Lestari Suyata[1] , Bertha Kawilarang[2], Violetti Valentin[2], & Luh Putu Mettary Yasoda Gera[2]

1. *Division of Plastic Reconstructive and Aesthetic Surgery, Department of Surgery, Faculty of Medicine/ Udayana University Hospital, Bali, Indonesia*
2. *Resident of Plastic Reconstructive and Aesthetic Surgery, Faculty of Medicine Udayana University, Bali, Indonesia*

ABSTRACT

Background: Anthropometry is a non-invasive, inexpensive, and objective method for evaluating orofacial morphology. This method has clinical applications in myofunctional assessment and therapy. Photogrammetry is a reliable and accurate method for measuring certain facial dimensions. In Indonesia, to date there has been no research that has conducted a photogrammetric evaluation of lip anthropormetry.
Method : This study was conducted at the Faculty of Medicine, Udayana University which began in May to October 2024 with research subjects, namely 90 first-year undergraduate medical students, Faculty of Medicine, Udayana University. Data in the form of anthropometry, race, history of congenital abnormalities, facial trauma, siliconoma, age, gender and smoking were recorded and then analyzed.
Results : The results of the analysis of lip anthropometry based on gender showed a significant difference in lower lip height, where in women the average was 3.25 (0.36) and in men 3.01 (0.30), with a p value of 0.001. Likewise, the lower lip height was found to be significantly different with a p value = 0.003. Upper vermilion height in women was 1.51 (0.35) while in men it was 1.36 (0.25), these results were statistically significant (p value = 0.041). However, the comparison of lower vermillion did not show any significant difference between the two groups. Cutaneous lower lip and philtrum width were also significantly different with p values of 0.004 and 0.015, respectively.
Conclusion: The results of this study are expected to provide an overview of the analysis of anthropometric measurements of the lips using the photogrammetry method as basic data for measuring ideal lip anatomy in the field of facial reconstruction in Indonesia.

Keywords*: Anthropometric Measurement of The Lip; Photogrammetry; Facial Reconstruction*

Latar Belakang: Antropometri merupakan metode non-invasif, murah, dan objektif untuk mengevaluasi morfologi orofasial. Metode ini memiliki aplikasi klinis dalam asesmen serta terapi miofungsional. Fotogrametri adalah metode yang andal dan akurat dalam mengukur dimensi wajah tertentu. Di Indonesia, hingga saat ini belum terdapat penelitian yang melakukan evaluasi fotogrametri terhadap antropometri bibir.
Metode: Penelitian ini dilaksanakan di Fakultas Kedokteran Universitas Udayana pada bulan Mei hingga Oktober 2024 dengan subjek penelitian sebanyak 90 mahasiswa kedokteran tingkat pertama. Data yang dicatat meliputi antropometri, ras, riwayat kelainan kongenital, trauma wajah, silikonoma, usia, jenis kelamin, dan kebiasaan merokok, kemudian dianalisis secara statistik.
Hasil: Analisis antropometri bibir berdasarkan jenis kelamin menunjukkan perbedaan bermakna pada tinggi bibir bawah, dengan rata-rata pada perempuan sebesar 3,25 (0,36) dan pada laki-laki 3,01 (0,30), nilai p = 0,001. Tinggi bibir bawah juga menunjukkan perbedaan bermakna dengan nilai p = 0,003. Tinggi vermilion atas pada perempuan adalah 1,51 (0,35), sedangkan pada laki-laki 1,36 (0,25), hasil ini bermakna secara statistik (p = 0,041). Namun, perbandingan vermilion bawah tidak menunjukkan perbedaan signifikan antar kelompok. Lebar kulit bibir bawah dan lebar philtrum juga menunjukkan perbedaan signifikan dengan nilai p masing-masing 0,004 dan 0,015.
Kesimpulan: Hasil penelitian ini diharapkan dapat memberikan gambaran analisis pengukuran antropometri bibir menggunakan metode fotogrametri sebagai data dasar dalam menentukan anatomi bibir ideal pada bidang rekonstruksi wajah di Indonesia.

Kata Kunci: *Pengukuran Antropometri Bibir; Fotogrametri; Rekonstruksi Wajah*

Conflicts of Interest Statement:
The author(s) listed in this manuscript declare the absence of any conflict of interest on the subject matter or materials discussed.

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INTRODUCTION

Beauty is defined as a state of harmony or balance regarding facial proportions, as well as a balanced relationship between the skeletal structure, teeth, and soft tissues. An attractive appearance has a strong influence on a person's daily life. Beautiful people are considered friendlier, more intelligent, more attractive, and more socially competent. The main factor that determines a person's attractiveness is their face, and lips are an important component of facial symmetry and aesthetics.[1] The shape, size, intactness, and symmetry of the lips are important components of attractiveness. Factors such as age, ethnicity, culture, fashion, and current trends influence the definition of ideal or perfect lips.[2] A survey of residents from China, Taiwan, Japan, Hong Kong, and South Korea showed that each country has its own expectations and preferences in terms of beauty.[3] Ideal lips are said to be intact with a defined vermilion border and balance between the upper and lower lips.[2]

Anthropometry is a non-invasive, inexpensive, and objective method for evaluating orofacial morphology. It has clinical applications in myofunctional assessment and therapy.[4] Computer-guided therapy methods should focus on functional and aesthetic outcomes. Photogrammetry is a reliable and accurate method for measuring certain facial dimensions, but validation and reliability studies should be conducted before using it in anthropometric determination[5]. Since natural-looking lips are the most desirable outcome, mathematical measurements in lip augmentation are essential for both clinical and aesthetic purposes.

The projection and relative size or anthropometry of the upper and lower lips are as important to lip aesthetics as the proportion of the lips to other facial structures.[4] Other important dimensions include the relative vertical length of the upper lip to the length of the philtrum. This is clearly demonstrated in the lips of the elderly, which are characterized by relative phitral excess and upper lip atrophy. In anterior view, the upper lip height should be smaller than the lower lip, and the upper lip should project about two millimeters above the lower lip.[6] Anthropometric studies have shown that adjusted for greater facial width and vermilion height, wider and fuller lips indicate female attractiveness.[2]

Previous studies on anatomical changes in the lips at various ages have been conducted on 169 women in China. The results showed that the width of the lips increased significantly with age, while the width of the philtrum did not appear to show any significant changes. The height of the upper and lower lip skin increased, lengthening the lips in the vertical dimension. The decrease in the height of the upper vermilion and changes in the angle indicate that the aging process shortens the upper vermilion and flattens the vermilion border.

Surface area also showed age-related changes. Age-related changes in several variables were significant between the ages of 40 and 50.[6] Meanwhile, a study conducted in Malaysia found significant differences between men and women between the dimensions of the nose and labia, especially between the height of the lateral lip and the width of the ala insertion. The analysis showed a significant relationship between the distance between the width of the nose and the height of the upper lip.[7] In Indonesia, until now there has been no study that has conducted a photogrammetric evaluation of lip anthropometry.

However, previous measurements of the ear auricle have been carried out in Sunda, and the results showed that the length, width, and base of the earlobe, as well as the length of the concha in men tended to be larger than in women. However, the length of the female lobule was longer than in men, while the width of the lobule and concha tended to be the same.[8]

Congenital abnormalities of the lip shape such as cleft lip or cleft lip, holoprosencephaly, fetal alcohol syndrome, and other defects, such as those that occur during tumor resection, are known as lip defects. Lip defects also include traumatic injuries and flattened lips related to age or facial paralysis. For this condition, redesign is necessary through an aesthetic and cosmetic approach.[9–11] Variations in skeletal convexity, soft tissue thickness, lip protrusion, and lower incisor position indicate different soft tissue profiles of the lower third of the face between individuals, so anthropometric determination is needed before lip reconstruction is carried out.[12] Therefore, the author is interested in discussing

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further regarding the determination of lip anthropometry using photogrammetry.

METHOD

Study Design

This study used an analytical cross-sectional study design. The purpose of this study was to analyze lip anthropometry using the photogrammetry method. This study will be conducted at the Faculty of Medicine, Udayana University from May to November 2024. This study is within the scope of Reconstructive Plastic Surgery and Aesthetics. Total 90 samples with consecutive sampling technique were included in this study with the inclusion criteria of male / female students aged ≥ 18 years in the Medical Education Study Program, Faculty of Medicine, Udayana University and patients were willing to participate in the study. Exclusion criteria: history of facial fracture or trauma to the facial bones, under orthodontic treatment, history of cleft lip and palate abnormalities, history of complex craniofacial, and history of having undergone surgery, either reconstruction due to previous trauma or operative or non-operative aesthetic procedures.

Research Instruments

The tools and materials that will be used for this study are: Questionnaires to determine the identity, characteristics of patients, subjective complaints, objective physical examinations, past medical history (history of surgery, metabolic diseases such as diabetes mellitus, heart disease), Canon EOS 4000D 18 Megapixel (MP) digital SLR camera, camera tripod, laptop, and Image J 1.48 software (v 1.48 Java 1.6 0_20 64 bits) which has been registered on the laptop.

Research Procedure

The research was conducted after obtaining permission from the Dean, Vice Dean, and Coordinator of the Medical Education Study Program, Faculty of Medicine, Udayana University. Then the research will be continued if it has been declared ethically feasible by the Research and Development Unit of the Faculty of Medicine, Udayana University. All students of the Medical Education Study Program, Faculty of Medicine, Udayana University will be screened whether they are willing to be research samples. If they are willing, patients are asked to sign an informed consent before being adjusted. All students who agree will be given anamnesis, physical examination, and facial photos.

Statistical Analaysis

Data analysis was carried out in several stages: (1) descriptive analysis aims to describe the characteristics of the research subjects in the form of tables. Data on a numerical scale will be presented in the form of mean ± standard deviation. Data on a categorical scale will be presented in the form of a frequency distribution. The distribution of the data set was tested for normality analytically with the Kolmogorov-Smirnov normality test. (2) Bivariate analysis aims to describe the difference in anthropometry with History of congenital abnormalities, History of siliconoma, History of facial trauma. The adjusted test used is the adjusted test or Mann Whitney test. (3) Multivariate analysis (multiple logistic regression test) this analysis aims to assess anthropometry on the lips after controlling for confounding variables analytically consisting of age, gender, and smoking history. Multivariate analysis was carried out with adjusted regression test analysis.

The measure of association used to assess the relationship is the adjusted odds ratio. The generalization process is based on 95% confidence intervals. The entire analysis process above uses SPSS 24.0 software.

RESULTS

This study involved 90 participants with an average age of 19.01 ±0.69 years. Most participants were women (68.4%). Based on maternal ethnicity, Balinese and Javanese were the most ethnic (43.5% and 25.3%).

The average BMI of participants was 23.28 ±4.25 kg/m². A total of 6 participants (6.3%) had a history of illness including appendicitis (n=1), GERD (n=1), asthma (n=3), and kidney stones (n=1). A total of 3 participants (3.2%) were active smokers (Table 1).

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Table 1. Characteristics of research subjects

Variables	N(%)	Mean (SD)	Range
Usia		19.01 (0.69)	18-21
Jenis kelamin			
Laki-laki	30 (31.6)		
Perempuan	65 (68.4)		
Etnis ibu			
Bali	41 (43.5)		
Batak	8 (8.4)		
Betawi	2 (2.1)		
Jawa	24 (24.3)		
Madura	1 (1.1)		
Makasar	1 (1.1)		
Sumbawa	1 (1.1)		
Tionghua	16 (16.9)		
Toraja	1 (1.1)		
IMT		23.28 (4.25)	16.9-36.3
Riwayat penyakit	6 (6.3)		
Merokok	3 (3.2)		

Table 2 shows the results of the anthropometric analysis of the lips based on gender. There is a significant difference in lower lip height, where in women the average is 3.25 (0.36) and in men 3.01 (0.30), with a p value of 0.001. Likewise, the lower lip height is found to be significantly different with a p value = 0.003. The upper vermilion height in women is 1.51 (0.35) while in men it is 1.36 (0.25), these results are statistically significantly different (p value = 0.041). However, the comparison of the lower vermillion does not show a significant difference between the two groups. Cutaneous lower lip and philtrum width are also found to be significantly different with p values 0.004 and 0.015, respectively.

Table 2. Comparison of lip anthropometry by gender

Parameters	Gender		P Value
	Male (30)	Female(65)	
Lower lip height (st-sl)			0.001*
Mean (SD)	3.25 (0.36)	3.01 (0.30)	
Range	2.47-3.96	2.15-3.65	
Upper lip height (sn-st)			
Mean (SD)	3.86 (0.41)	3.58 (0.34)	0.003**
Range	3.12-4.60	2.56-4.25	
Philtrum length (sn-ls)			
Mean (SD)	2.32 (0.49)	2.24 (0.39)	
Range	1.17-3.35	1.42-3.75	0.380
Upper vermillion height (ls-st)			
Mean (SD)	1.51 (0.35)	1.36 (0.25)	0.041*
Range	0.88-2.03	0.85-1.88	
Cutaneous lower lip (li-sl)			
Mean (SD)	1.48 (0.30)	1.31 (0.25)	0.004*
Range	0.85-2.11	0.85-1.85	
Lower vermillion height (li-st)			
Mean (SD)	1.85 (0.35)	1.81 (0.28)	0.473
Range	1.15-2.52	1.17-2.42	
Philtrum width (cp-cp)			
Mean (SD)	2.21 (0.32)	2.06 (0.25)	0.015**
Range	1.42-2.90	1.55-2.67	
Mouth width (ch-ch)			
Mean (SD)	8.28 (0.89)	8.21 (0.74)	0.707
Range	6.19-9.68	6.55-10.14	

*Independent T test
**Mann Whitney U Test

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DISCUSSION

Lips are an important part of appearance in life. Lips affect the shape of the face, where an attractive face is associated with health, prosperity, and good social skills.[13] Not a few patients undergo lip repair through surgical or non-surgical methods to get the ideal face shape according to the patient. However, aesthetic standards are often subjective and cannot be measured.[14] The definition of beauty can vary according to race, ethnicity, current trends, and age. Normal and healthy lip morphometry is important for planning lip reconstruction in patients, performing orthognathic surgery, evaluating surgical outcomes and the interests of a specific ethnic forensic database.[15] The parameters measured in this study have been examined in many different ethnicities, such as Turkey, Korea, Malaysia, Japan, Persia, Iran, India, African-American, Anatolia and Caucasian.[16]

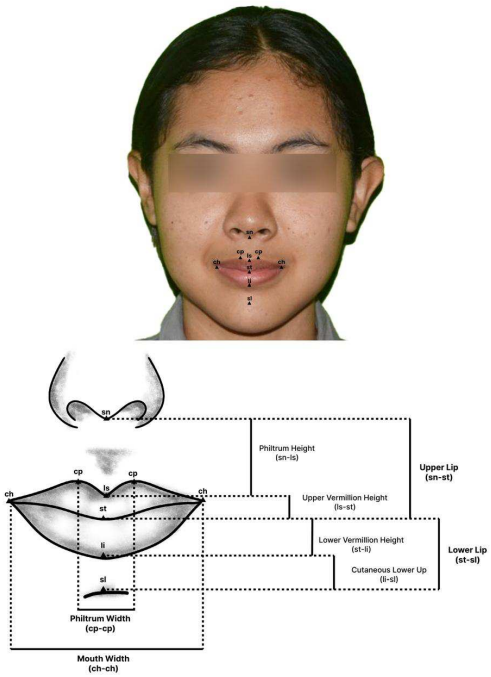

Figure 1. Parameters of lip anthropometry

In this study, lip anthropometric measurements were carried out on participants and analyzed univariately and bivariately. Univariate analysis of the characteristics of the study participants included age, maternal ethnicity, BMI, previous medical history and smoking. Based on age characteristics, most participants were women (68.4%). Based on maternal ethnicity, Balinese and Javanese were the most numerous (43.5% and 25.3%). The average BMI of participants was 23.28 ± 4.25 kg/m^2. A total of 6 participants (6.3%) had a history of diseases including appendicitis (n = 1), GERD (n = 1), asthma (n = 3), and kidney stones (n = 1). A total of 3 participants (3.2%) were active smokers.

Bivariate analysis in this study showed the results of anthropometric analysis of the lips based on gender. There was a significant difference in lower lip height, where in women the average was 3.25 (0.36) and in men 3.01 (0.30), with a p value of 0.001. Likewise, the lower lip height was found to be significantly different with a p value = 0.003. The upper vermilion height in women was 1.51 (0.35) while in men it was 1.36 (0.25), these results were statistically significantly different (p value = 0.041). However, the comparison of the lower vermillion did not show a significant difference between the two groups (p = 0.473). Cutaneous lower lip and philtrum width were also found to be significantly different with p values 0.004 and 0.015, respectively. Philtrum length in men and women did not show any significant difference (p=0.380), as did mouth width, the results of which did not show any statistically significant difference with a p value of 0.707.

In general, most of the measurement results were greater in men than women, except for the mouth width measurement. The results of this study were almost similar to the study conducted by Hasibuan, et al.,[16] where most of the measurements showed greater results in men than women, except for the upper vermillion height and mouth width measurements, the study by Hasibuan showed higher results in women than men. This finding was also observed in the study by Bahsi, et al.[17] Almost all linear measurements were statistically significant and greater in men than women, including upper lip height (sn-st), lower lip height (st-sl), philtrum length (sn-ls) and lower lip skin height (li-sl) (p value <0.05).[17] A study conducted in Japan also showed that the results of anthropometric measurements of the lips were mostly greater in men than in women except for vermillion height, which tended to be approximately the same. In addition, the lip width in the study was 48.17 ± 6.26 mm in men and 49.24 ± 6.06 mm in women. This is an important examination because reduced mouth width greatly affects the aesthetics of the lower third of the face.[16]

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Farkas et al. published an anthropometric study on the Caucasian population. When compared with Caucasian measurements, the philtrum length and lower vermillion height in males were similar in Caucasians and Indonesians. Interestingly, a comparison between the results of female lip anthropometry showed that the upper lip height measurements were greater in the Indonesian race, but the results of upper vermillion height, lower vermillion height and mouth width measurements were smaller in the Indonesian female population compared to Caucasians.[18]

Another study in Indonesia that examined the analysis of anthropometric lips, namely the study by Hasibuan, et al.,[16] showed several similar measurements. Measurements of lower lip height and upper lip height were the same as this study, having significant differences between men and women. Philtrum length in the study by Hasibuan had a significant difference ($p < 0.001$) but in this study the philtrum length measurement was not statistically significantly different ($p = 0.380$). Upper vermillion height in the study by Hasibuan did not differ significantly (0.631), while in this study there was a significant difference ($p = 0.041$). Lower vermillion height in the study by Hasibuan and this study had the same results, namely there was no significant difference between men and women with P values 0.564 and 0.473 respectively. Philtrum width in the study by Hasibuan did not show a significant difference ($p = 0.502$), while in this study there was a significant difference, namely $p = 0.015$. Mouth width in both studies by Hasibuan and this study had the same results, namely there was no significant difference between men and women ($p = 0.390$ and $p = 7.707$). The study by Hasibuan mostly came from the Javanese population (n = 35), followed by the Sundanese population (n = 31) and Malay (n = 12). Some other populations include Bali, Batak, Bugis, Minahasa and Minang. Meanwhile, in this study, most of the ethnic groups of the mothers included were Balinese (43.5%) and Javanese (25.3%). According to the 2010 census, the largest ethnic groups include Javanese, Sundanese, Batak, Sulawesi, Madurese and Betawi.[19]

CONCLUSION

Based on the data mentioned above, the results of this study can be applied to the Indonesian population. Data from the results of lip anthropometry measurements in this study can be used as a reference for planning lip reconstruction in patients, performing orthognathic surgery, evaluating surgical results and forensic database interests. However, there are shortcomings in this study, namely the absence of ratio measurements, where the ratio may be more useful considering the variation between races and ages. In addition, future research requires a larger sample size so that the results obtained are more representative considering that Indonesia consists of a diverse society.

Correspondence regarding this article should be addressed to:
Gede Wara Samsarga.
Department of Plastic Reconstructive and Aesthetic Surgery, Udayana University Hospital, Bali, Indonesia, Denpasar, 80114, Indonesia. E-Mail: warasamsarga@unud.ac.id

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REFERENCES

1. de Queiroz Hernandez PM, Cotrin P, Valarelli FP, de Oliveira RCG, Bispo CGC, Freitas KMS, et al. Evaluation of the attractiveness of lips with different volumes after filling with hyaluronic acid. Sci Rep [Internet]. 2023 Dec 1 [cited 2025 Mar 5];13(1):4589. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC10030776/
2. Arian H, Alroudan D, Alkandari Q, Shuaib A. Cosmetic Surgery and the Diversity of Cultural and Ethnic Perceptions of Facial, Breast, and Gluteal Aesthetics in Women: A Comprehensive Review. Clin Cosmet Investig Dermatol [Internet]. 2023 [cited 2025 Mar 5];16:1443–56. Available from: https://pubmed.ncbi.nlm.nih.gov/37313510/
3. Kwon SH, Lao WWK, Lee CH, Hsu ATW, Koide S, Chen HY, et al. Experiences and attitudes toward aesthetic procedures in East Asia: a cross-sectional survey of five geographical regions. Arch Plast Surg [Internet]. 2021 [cited 2025 Mar 5];48(6):660. Available from:

P-ISSN 2089-6492; E-ISSN 2089-9734 | DOI: 10.14228/jprjournal.v12i2.31

https://pmc.ncbi.nlm.nih.gov/articles/PMC8627936/
4. Kibadi AK, Madiya BT, Kibadi AK, Madiya BT. Anthropometric Characteristics of Beautiful Lips in a Population of Young Negroid Students: Pilot Survey. Open Access Library Journal [Internet]. 2023 Jun 6 [cited 2025 Mar 5];10(6):1–8. Available from: https://www.scirp.org/journal/paperinformation?paperid=125470
5. Lim YC, Abdul Shakor AS ad, Shaharudin R. Reliability and Accuracy of 2D Photogrammetry: A Comparison With Direct Measurement. Front Public Health [Internet]. 2022 Jan 25 [cited 2025 Mar 5];9:813058. Available from: www.frontiersin.org
6. Chong Y, Dong R, Liu X, Wang X, Yu N, Long X. Stereophotogrammetry to reveal age-related changes of labial morphology among Chinese women aging from 20 to 60. Skin Research and Technology [Internet]. 2020 Jan 1 [cited 2025 Mar 5];27(1):41. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC7984336/
7. Al-Khatib AR, Rajion ZA, Masudi SM, Hassan R, Anderson PJ, Townsend GC. Stereophotogrammetric analysis of nasolabial morphology among Asian Malays: influence of age and sex. Cleft Palate Craniofac J [Internet]. 2012 [cited 2025 Mar 5];49(4):463–71. Available from: https://pubmed.ncbi.nlm.nih.gov/22236217/
8. Boesoirie SF, Handayani R, Gatera VA, Boesoirie TS, Aroeman NA. Determination of the Difference Between Men and Women Anthropometry Auricles Using Photogrammetric Method in Sundanese Ethnic Group. Clin Cosmet Investig Dermatol [Internet]. 2022 [cited 2025 Mar 5];15:2133–41. Available from: https://pubmed.ncbi.nlm.nih.gov/36217409/
9. de Queiroz Hernandez PM, Cotrin P, Valarelli FP, de Oliveira RCG, Bispo CGC, Freitas KMS, et al. Evaluation of the attractiveness of lips with different volumes after filling with hyaluronic acid. Sci Rep [Internet]. 2023 Dec 1 [cited 2025 Mar 5];13(1). Available from: https://pubmed.ncbi.nlm.nih.gov/36944639/
10. Skomina Z, Verdenik M, Hren NI. Effect of aging and body characteristics on facial sexual dimorphism in the Caucasian Population. PLoS One [Internet]. 2020 May 1 [cited 2025 Mar 5];15(5):e0231983. Available from: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0231983
11. Bertucci V, Nikolis A, Solish N, Lane V, Hicks J. Subject and partner satisfaction with lip and perioral enhancement using flexible hyaluronic acid fillers. J Cosmet Dermatol [Internet]. 2021 May 1 [cited 2025 Mar 5];20(5):1499–504. Available from: https://pubmed.ncbi.nlm.nih.gov/33522714/
12. Kale B, Buyukcavus MH. Comparison of three-dimensional soft-tissue evaluations between skeletal and pseudo-class III malocclusions. Scientific Reports 2020 10:1 [Internet]. 2020 Sep 7 [cited 2025 Mar 5];10(1):1–11. Available from: https://www.nature.com/articles/s41598-020-71772-7
13. Yong Kim S, Bayome M, Hyun Park J, Kook YA, Hee Kang J, Hyuk Kim K, et al. Evaluation of the facial dimensions of young adult women with a preferred facial appearance. Korean J Orthod [Internet]. 2015 Sep 1 [cited 2025 Mar 5];45(5):253. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC4593870/
14. Hwang K, Kim YS, Kim H. Perceptions of Attractive and Healthy-Looking Lips. J Craniofac Surg [Internet]. 2019 Mar 1 [cited 2025 Mar 5];30(2):596–603. Available from: https://pubmed.ncbi.nlm.nih.gov/30550445/
15. Sforza C, Grandi G, Binelli M, Dolci C, De Menezes M, Ferrario VF. Age- and sex-related changes in three-dimensional lip morphology. Forensic Sci Int [Internet]. 2010 [cited 2025 Mar 5];200(1–3):182.e1-182.e7. Available from: https://pubmed.ncbi.nlm.nih.gov/20570070/
16. Hasibuan LY, Prasetyo AT, Pramono GNTW. Enhancing Aesthetic Harmony: Comprehensive Anthropometric Lip Measurements in Youthful and Attractive Indonesian Adults for Precision Cosmetic Procedures. JPRAS Open [Internet]. 2023 Mar 1 [cited 2025 Mar 5];39:198–206. Available from:

P-ISSN 2089-6492; E-ISSN 2089-9734 | DOI: 10.14228/jprjournal.v12i2.31

https://pubmed.ncbi.nlm.nih.gov/38293286/
17. Bahşi I, Orhan M, Kervancioğlu P, Uçar H, Karatepe Ş, Sayin S. Lip Anthropometry of Healthy Turkish Young Adults. J Craniofac Surg [Internet]. 2022 Mar 1 [cited 2025 Mar 5];33(2):696–700. Available from: https://pubmed.ncbi.nlm.nih.gov/34310423/
18. Farkas LG. Anthropometry of the head and face. 1994 [cited 2025 Mar 5];405. Available from: https://search.worldcat.org/title/29793741
19. A New Classification of Indonesia's Ethnic Groups (Based on the 2010 Population Census). [cited 2025 Mar 5]; Available from: www.iseas.edu.sg

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