

Lip Print Profiling of Tribes in Aceh Indonesia using the Suzuki-Tsuehachi Method

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Abstract

Lip prints or the arrangement of lines or grooves on human lips are stable, unique to each individual and do not change despite age. So the analysis of lip prints can be used as one of the evidence for identification purposes.

Objective to identify the lip print patterns of tribes in Aceh Indonesia.

The samples used were lip prints taken on each of 100 people per tribe (N=300) with the age of 25-35 years obtained from various regions in Aceh. Lip print samples were taken using the Suzuki and Tsuehachi techniques, then stored on a folder file, and brought to the Faculty of Dentistry Laboratory, Syiah Kuala University for computerization and analysis. In determining the types, the lips are divided into four quadrants and numbered 1-4 in clockwise order starting from the upper right corner of the lips. To get the characteristics of each character is done with ANOVA, while to determine the relationship of each character is done with Pearson analysis.

The Gayo tribe has a type II lip print pattern with the most number of grooves found in quadrant 2, namely 139 grooves. The Aceh tribe has a type II lip print and has 208 grooves that are mostly found in quadrant 1. The Malay tribe has the highest number of grooves for type IV, namely 143 which dominates quadrant 2. The mixed Gayo tribe has a type I' lip print with 54 grooves. The mixed Aceh tribe has type II lip prints that dominate quadrant 3 with as many as 200 with varying sizes. The mixed Malay tribe has a type II lip print that dominates quadrant 4 and has 93 grooves. Overall, except for the Mixed Gayo Tribe and the Malay Tribe, the lip prints of indigenous and mixed tribes in Aceh showed a predominance of Type II. Lip prints are known to have differences within the same tribe and sub-tribe, indicating lip prints could potentially be used for individual identification.

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Introduction

Identification is the determination and confirmation of the identity of a person, living or dead, from the characteristics of that person. The scope of identification in forensic dentistry is quite broad, not only for forensic issues but also for non-forensic issues. One of the identifications to support forensic dentistry is lip prints or *cheiloscopy*.¹ *Cheiloscopy* is a science used to

obtain the type of lip print, a description of the shape and pattern of lip prints, as well as a lip profile consisting of the average widest side of the lips and the average highest side of the lips.³ Lip prints or the arrangement of lines or grooves on human lips are stable, unique to each individual and do not change despite age. So that the analysis of lip prints can be used as one of the evidence for identification purposes.^{2,3,4}

Lip print capture and documentation methods have been developed over time since 1970. Suzuki and Tsuehachi developed a classification system that is widely used in research. Suzuki and Tsuehachi classified lip print patterns into six types, namely Type I, Type I', Type II, Type III, Type IV, and Type V.^{5,6}

Several studies have proven that lip print patterns can correctly identify a person's nation. From the results of research on lip print patterns

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in relation to nation, it is stated that there are significant differences between Malays, Chinese and Indians.^{7,8}

The Indonesian nation consists of various ethnic groups. In general, the largest ethnic group in Indonesia is the Malay Tribe. The Malay tribe is divided into Old Malay (Proto Malay) which consists of Dayak, Toraja, Mentawai, Nias and Papua and New Young Malay (Deutro Malay) which consists of Makassar, Java, Aceh, Sunda, Bugis, and Minang. One of the areas included in the Malay group is Aceh.⁸⁹ Aceh consists of indigenous and mixed tribes. The indigenous tribe in Aceh that belongs to the Old Malay (Proto Malay) is the Gayo Tribe. In the Young Malay group, the Acehnese are the dominant tribe living along the east and west coast of Aceh. The Young Malay tribe is known to be scattered throughout Aceh such as, Kluet, Aneuk Jamee, Tamiang Malay and surrounding areas. Mixed tribes are those who are not classified as Acehnese, nor were they born in Aceh (migrants). These migrants come from Java, Minangkabau, Batak, Bugis and others. They interact through trade, exchange knowledge and even establish marriage relationships with the Acehnese population.⁸ Currently there is still little research regarding Malay tribes including mixed tribes in Aceh with a lip print approach.

Based on the above description, researchers were interested in conducting research to see the diversity of lip print shapes and patterns in Gayo, Aceh, and Malay tribes according to Suzuki and Tsuchihashi classifications.

Materials and methods

Subject Selection

The samples used were lip prints taken on each of 100 people per tribe (N-300) aged 25-35 years obtained from various regions in Aceh. Lip print samples were taken using the Suzuki and Tsuchihashi techniques, then stored on a folder file, and brought to the Laboratory for computerization and analysis. This study collected research subjects who fit the inclusion criteria based on the *checklist* that had been filled in by the subject. Then the researcher asked the subject's willingness to fill out an *informed consent* sheet first before data collection.

Lip Print Check

The steps taken in the lip print examination consist of: cleaning all parts of the lips using

acudes, then given a red lipstick applied to the lips evenly on the lower and upper lips using a brush. The subject is asked to wipe both lips so that the lipstick becomes even. Next the lips are attached to the sticky part on a piece of tape, pressing all the way on the tape that has been attached to the subject's lips to ensure that the lip print pattern is recorded on the tape.¹⁰ Furthermore, the results of the pattern recorded on the tape will be glued to a white paper that has been given initials that match the subject. These results are then *scanned* to obtain digital data. The lip pattern will be analyzed using zoom out and zoom in in the *CorelDraw* program to determine the type based on Suzuki and Tsuchihashi's classification.

In determining the type, the lips are divided into four quadrants and numbered 1-4 in clockwise order starting from the upper right corner of the lips. Therefore, the upper lip is divided into right and left upper quadrants and the lower lip is divided into right and left lower quadrants. For each quadrant, there may be more than one type of lip mold pattern. This quadrant pattern is the most commonly used pattern in the literature.¹¹

Data Analysis

To obtain the characteristics of each character, ANOVA was conducted, while to determine the relationship between each character, Pearson analysis was conducted.

Results

Indigenous Tribes in Aceh

The results of the analysis of the width of the upper lip and lower lip in the Gayo tribe obtained a mean lower lip of 5.46 cm, for the upper lip 5.40 cm, which is 0.06 cm smaller than the mean lower lip. The mean height of the upper lip was 0.9 cm and 1.00 cm for the mean height of the lower lip. Analysis of the width of the upper lip and lower lip in the Aceh tribe obtained a mean lower lip of 5.24 cm for the upper lip of 5.17 cm, which is 0.07 cm smaller than the mean lower lip. The average height of the upper lip is 0.87 cm and 0.91 cm for the average height of the lower lip. The width of the upper lip and lower lip in the Malay Tribe obtained a mean lower lip of 5.31 cm for the upper lip of 5.28 cm, which is 0.03 cm smaller than the mean lower lip. The average height of the lower lip is 0.92 cm and 0.90 cm for the average height of the upper lip. The lip profile

of each tribe in Aceh can be seen in Table 1

Tribe Name	Width of Upper Lip	Width of Lower Lip	Height of Upper Lip	Height of Lower Lip
Gayo	5.40	5.46	0.96	1.00
Aceh	5.17	5.24	0.87	0.91
Melayu	5.28	5.31	0.9	0.92

Tabel 1. Lip Profile of Indigenous Tribes in Aceh.

The three tribes are known to have the widest average lip size with a value of 5.40 cm for the upper lip and 5.46 cm for the lower lip followed by the Malay Tribe which has an average upper lip width of 5.28 and lower lip of 5.31 cm. The smallest lip width is the Aceh Tribe with a value of 5.17 cm for the upper lip with a lower lip value of 5.24 cm.

The results of lip print identification based on the right side (quadrants I and IV) and the left side (quadrants II and III) found diversity in the number of grooves and types of lip prints of Gayo Tribe, Aceh Tribe, and Malay Tribe. In identifying, lip prints that have been glued to A4 paper are photographed then the photos are observed using *CorelDraw*. From the results of the analysis in each column, one or two different types of lip prints were found.

The Gayo tribe has its own characteristics, where the largest number of grooves is found on the left side with 139 type II grooves followed by 102 type I' grooves. The Aceh tribe has a type II lip print followed by type I', in contrast to the Gayo tribe, the Aceh tribe's lip print has a greater number of grooves. In the Aceh tribe, the most grooves formed are on the right side with 208 grooves for type II while type I' with 156 grooves. The Malay tribe has the highest number of grooves for type IV, namely 143 grooves on the left side of the lip which is then followed by type I' with 113 grooves. The identification results found the uniqueness of each type of lip print formed. Starting from the shape of the groove to the number of grooves that have no similarities between one another.

The Gayo tribe is unique in the shape and pattern of its lip prints. The Gayo tribe has lip prints with Type II and Type I' as the types formed in each quadrant. There are almost no Types IV and V, which are the least number of types. The shape and groove of Type II varies greatly, ranging from a groove like the letter "Y" to a straight shape at the end of which there is a slight branching that forms close to the vermilion border of the lips.

The Aceh tribe also has the same type of lip print as the Gayo tribe, which is Type II, which is dominated on the left side of the lips. In the Aceh tribe, the shape of the groove is different from the Gayo tribe. Type II lip prints in the Aceh tribe have their own characteristics, the grooves formed have a thickness that is so thick compared to the Gayo tribe. The branching of type II prints begins to form in the middle of the lips, not infrequently the branching starts from the bottom of the side of the lips to the center of the lips.

The shape and groove of Type IV lip prints according to Suzuki and Tsuchihashi's classification is owned by the Malay Tribe which also has its own characteristics, where in this tribe the groove formed initially starts from Type II and Type I which then connects to Type IV in each quadrant.

The Mixed Tribe in Aceh

The mixed Gayo tribe had the widest upper lip at 6.2 cm, while the widest lower lip was 6.0 cm. The highest upper lip measurement result for the mixed Gayo tribe is 1.0 cm, while the highest lower lip is 1.1 cm. The Mixed Aceh tribe has the widest upper lip is 6.7 cm, while the widest lower lip is 6.7 cm. The highest upper lip measurement result for the mixed Aceh tribe is 1.1 cm, while the highest lower lip is 1.4 cm. The mixed Malay tribe has the widest upper lip and lower lip at 6.0 cm. The highest upper lip and lower lip measurement result for the mixed Malay tribe is 1.1 cm. The lip profile of mixed tribes in Aceh can be seen in Table 2 below.

Tribes	Width of Upper Lip	Width of Lower Lip	Height of Upper Lip	Height of Lower Lip
Mixed Gayo	4.8-6.2 cm	4.5-6.0 cm	0.9-1.0 cm	0.7-1.1 cm
Mixed Aceh	4.3-6.7 cm	4.1-6.7 cm	0.7-1,1 cm	0.6-1.4 cm
Mixed Melayu	4.5-6.0 cm	4.4-6.0 cm	0.9-1.1 cm	0.8-1.1 cm

Tabel 2. Lip Profile of Gayo, Aceh, and Malay Mixed Tribes.

The mixed Gayo tribe has a type I' lip print with a distribution of mixed tribes including; Gayo-Batak, Gayo-Mandailing, Gayo-Javanese and Gayo- Minang. Type I' dominates in quadrant 2 and coexists with type II. Type II in mixed Gayo tribes is found in all quadrants but is still less dominant than type I' in all quadrants. The pair of type I' that is not found with a non-dominant number is type V. The number of dominant grooves in type I' is known to be 54 with varying sizes.

Mixed Acehnese tribes have type II lip prints with a distribution of mixed tribes including; Aceh-Batak, Aceh-Gayo, Aceh-Java, Aceh-Minang, Aceh-Arab, and Aceh-Malay. This type II dominates in quadrant 3 and adjoins type I'. Type II pairs that are not found with non-dominant numbers are types IV and V. The number of dominant grooves in type II is known to be 200 with varying sizes.

Mixed Malay tribes have type II lip prints with a distribution of mixed tribes including; Malay-Betawi, Malay-Gayo, Malay-Java, Malay-Minang, Malay-Aceh, and Malay-Chinese. This type II dominates in quadrant 4 and adjoins type I'. Type II pairs that are not found with non-dominant numbers are types III and V. The number of dominant grooves in type II is known to be 93 with varying sizes.

Discussion

Cheiloscopy is one of the methods used in determining personal identity and in forensic medicine. Intact lips have prints that can provide invaluable legal evidence and findings from lip prints can be powerful evidence to solve crimes. Lip prints vary in different parts of the lips, which establishes that each individual has a unique lip print and if ante-mortem records are prepared they can be compared with post-mortem records for personal identification.^{2,3}

From the results of research that has been conducted on the indigenous Gayo, Aceh, and Malay tribes, it shows that the Gayo Tribe has the widest lip size and has more than two different lip print patterns in each quadrant. Type II is a lip print for the Gayo tribe that has a total of 224 grooves in all quadrants with a thin groove shape.

The results of the research for the Aceh Tribe which has the smallest lip width and height compared to the Gayo Tribe and the Malay Tribe with an average upper lip width of 5.17 cm and 5.24 cm for the lower lip. The results of this study also show that the type of lip prints in the Aceh Tribe is type II according to Suzuki and Tsuchihashi's classification, where in this tribe the shape of the groove is very thick which is different from the shape of the groove in the Gayo Tribe. The dominant groove formed on the lips starts at the center of the lips, not infrequently the branching starts from the bottom of the side of the lips to the center of the lips.

The Malay tribe has a type IV lip print, namely a reticular pattern that is dominated on the right side of the lips. The grooves formed on the lips have similarities in each individual, where the average reticular groove always coexists with *branched* grooves and *vertical* grooves although there are no grooves that are the same between one individual and another. The width and height of this lip is the most moderate part of the lip when compared to the lips of the Gayo Tribe and the Aceh Tribe.

The results of the above research, the Gayo Tribe (Proto-Malay) has type II lip prints and the Malay Tribe (Deutro-Malay) which is supported by Rafiuddin et al research which states that type II were the dominant lip print patterns for Malays.¹² The Malay tribe has type IV of lip print classification. Some previous studies have also stated that each individual does not have the same lip shape and pattern from one individual to another, but there are more than two types of lip print patterns with different shapes and grooves in each quadrant.¹¹

Overall, except for the Gayo Mixed Tribe and the Malay Tribe, the average lip prints of indigenous and mixed tribes in Aceh show Type II dominance. This research is different from the results of research conducted by Xu et.al who conducted research on the Malay Tribe in Malaysia. The Malays in Malaysia have type I 'lip prints'. Chinese and Malays have a close relationship with Aceh and Malay tribes.¹³ This is because the Aceh and Malay tribes are included in the Deutro-Malay which is a young tribe or immigrant people after the existence of Proto-Malay. In addition, Aceh and Malay are also one race with Chinese, Malaya, and India, namely the Mongoloid Race. Proto-Malays are the old tribe or people who first inhabited the Aceh area. The Gayo tribe belongs to the Proto-Malays. These results confirm that lip prints have the potential to be used for individual identification.¹ This potential is certainly very useful in the development of forensic cases that have been used to solve murder cases, identify age, gender, ethnicity, and race.^{14,15}

As is known, lips are one of the important elements of the face as they play a role in facial expression, phonation, sensation, mastication, physical attractiveness, and intimacy. The lip area extends from the base of the nose to the tip of the chin, and forms almost one-third of the lower face.^{16,17} Moreover, lip prints are rarely

used in forensic identification, and their use is still not widely known, especially in Indonesia. In fact, the use of lip prints as an identification method is very simple, cheap, and practical to use to determine a person's identity.⁷

People of Aceh are also associated with the Indians who used to live in Aceh. In general, the Indians who came, originated from Gujarat and Tamil. The influence of the Old Hindus can still be seen through the facial appearance, food variations and culture of the Acehnese people. Because of their geographical proximity, Indian descendants are quite dominant and spread throughout Aceh.

The population of Indonesia reached approximately 260 million, consisting of 360 tribes. Each tribe has its special characteristics to a certain tribe, so it cannot be used as a standard for other tribes.¹⁸ Regarding anthropology, the physical characteristics of the Malay tribe are generally brownish skin, straight hair and slightly slanted eyes. The different characteristics between the Proto-Malay and Deutro-Malay tribes are generally found in the shape of the head. The Proto-Malays have a long head shape (*dolichocephalis*) while the Deutro-Malays have a short head shape (*brachicephalis*).¹⁹

In general, facial morphology is influenced by head shape, gender, and age. The face shape for the Mongoloid Race is round. However, there are different variations of the round face shape. Although everyone's face shape is different, one is able to recognize thousands of faces because

there are unique combinations of nasal contours, lips, jaws, and so on that make it easy for one to recognize one another. The parts that are considered to influence the face are the cheekbones, nose, upper jaw, lower jaw, mouth, chin, eyes, and forehead. In addition, differences in head shape are also influenced by mixed marriages which also affect the type of lip print.

According to Aggrawal²⁰, differences in the type and size of lip prints are influenced by genetics carried by parents and mixed marriages. This was also seen in Suzuki's study in Japan, which examined 18 pairs of twins with mixed-marriage parents, some of whom had different lip prints with different sizes. Thus, within one race, there are still differences in lip prints. Moreover, the type of lip prints on each individual must be different.

Conclusions

Overall, with the exception of the Gayo Mixed Tribe and the Malay Tribe, the lip prints of indigenous and mixed tribes in Aceh show Type II dominance. Lip prints are known to have differences within the same tribe and sub-tribe, indicating lip prints have the potential to be used for individual identification.

Declaration of Interest

The authors report no conflict of interest.

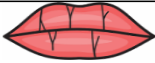
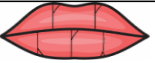
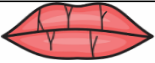

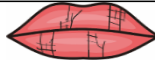

Description	Gayo	Mixed Gayo	Aceh	Mixed Aceh	Malay	Mixed Malay
Domiciles	Aceh Tenggara, Bener Meriah, Gayo Lues	Gayo-Batak, Gayo-Mandailing, Gayo-Java and Gayo-Minang	Aceh Timur, Abdya, Aceh Selatan, Simeulue, Langsa, Aceh Singkil	Aceh-Batak, Aceh-Gayo, Aceh-Java, Aceh-Minang, Aceh-Arab, dan Aceh-Malay	Banda Aceh, Bireuen, Kota Lhokseumawe, Pidie, Aceh Besar, Pidie Jaya, Aceh Selatan	Malay-Betawi, Malay-Gayo, Malay-Jawa, Malay-Minang, Malay-Aceh, dan Malay-China
Suzuki-Tsuchihachi Classification	Type II	Type I'	Type II	Type II	Type IV	Type II
Dominant of Quadrant	2	2	1	3	2	4
Dominant pattern						
Amount of Grooves	139	54	208	200	143	93
Upper lip	Tipe II	Tipe I'	Tipe II	Tipe II	Tipe IV	Tipe I
Lower lip	Tipe II	Tipe II	Tipe II	tipe I'	Tipe III	tipe I'

Table 3. Lip Print of Tribe in Aceh.

References

1. Abdul N, Alotaibi S, Almughalliq F, Alamri MD, Aishahrani RA, Almujailli AI. A Questionnaire-Based Study to Assess Knowledge and Awareness Regarding Cheiloscopy as a Forensic Odontology Diagnostic Tool Among Dental Professionals. *Cureus*. 2022;14(11):e31188
2. Ahmed S.A., Salem H, Fawzy M. Forensic dissection of lip print as an investigative tool in a mixed Egyptian population. *Alexandria Journal of Medicine*. 2018;54:235-239
3. Veselinović SI, Zigic SD, Veljovic TJ, Maletin A. Lip Print Pattern Variations in Vojvodina Province, Serbia Pilot Study. *Med Pregl*. 2018.71(5-6):162-166
4. Timsinha S, Kar SM. A study on distribution and gender wise predilection of lip print pattern. *Asian Journal of Medical Sciences*. 2019;10(4):61–65.
5. Suzuki K, Tsuchihashi Y. A New attempt of personal identification by means of lip print. *J Indian Dent Assoc*. 1970;42:8-9
6. Vaishnavi P and Nirmal K. Personal Identification through Lip Prints. *International Journal of Forensic Sciences*. 2022;7(4):000279:p1-5
7. Thakur B, Ghosh B, Puri N, Bansal R, Sharma RK. A comparative study of lip print patterns in monozygotic and dizygotic twins. *International Journal of Research in Medical Sciences*. 2017;5:2144-2149
8. Basheer S, Gopinath D, Shameena PM, Sudha S, Lakshmi JD, Litha. Correlation of lip patterns, gender, and blood group in North Kerala population: A study of over 800 individuals. *Journal of Forensic Dental Sciences*. 2017;9:73-77
9. Goosjen AJ. A Demographic History of The Indonesian Archipelago. 2nd ed. Netherlands: Koninklijk Institute, 1999. p.83-86
10. Yadav S. Lip Print Examination: A Tool Used In Investigation. *Academic Journal of Anthropological Studies*. 2020;03(01):25-29
11. Adamu LH, Taura MG. Lip Prints: An Emerging Tool for Personal Identification. *Bayero J Biomed Sci*. 2016;1(1):78-87
12. Rafiuddin W, Ahmad W, Sri PA, Hamzah A. Sex Differentiation by Lip Print Analysis in Malay: Lipstick-Cellophane Tape Techniques. *ARC Journal of Forensic Science*. 2018;3(1):18-21.
13. Hamzah N, Osman K, Xu NX, Sri PA. Lip Prints in Sex and Race Determination. *JSKM*. 2012;10 (1):29-33.
14. Thermadam TP, Chatra L, Ahsan A. Cheiloscopy in gender determination: A study on 2112 individuals. *Journal of Family Medicine and Primary Care*. 2020;9:1386-1390
15. Bano AM, Prabu M.D. Knowledge and Awareness of Lip Prints in Personal Identification and Criminalization among Dental Undergraduates. *Annals of the Romanian Society for Cell Biology*. 2021;25(6):6463-6472
16. Abbas HH, Hicks Y, Zhurov A, Marshall D, Claes P, Wilson-Nagrani C, et al. An automatic approach for classification and categorization of lip morphological traits. *PLoS ONE*. 2019;14(10):e0221197
17. Mamun M.A., Sato S., Naru E, Sakata O., Hoshikawa E., Suzuki A., et al. Higher Accumulation of Docosa-hexaenoic Acid in the Vermilion of the Human Lip than in the Skin. *International Journal of Molecular Sciences*. 2020;21(8):e2807:1-10.
18. Mudjari S, Erwansjah E, Damayanti R, Ardani GWA, Nurdiansyah R. Three Smile Components on Different Facial Types of Young Adult Population in Makassar. *J Int Dent Med Res* 2023; 16(1): 219-223.
19. Tandale UE, Dange SP, Khalikar AN. Biometric relationships between intercanthal dimension and widths of maxillary anterior teeth. *The Journal of Indian Prosthodontic Society*, 2007;7(3): 123-125
20. Agarwal A, Dwivedi N, Khare P. Latent Lip Prints: A New Possibility. *Indian Journal of Forensic Science*. 2013; 6 (1):19-24