

# Prevalence of Simonart's band in cleft children at a cleft center in Indonesia: A nine-year retrospective study

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of the article

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## Abstract

**Background.** Simonart's band is a soft tissue band that connects the cleft gap of the base of the nostril or the margin of the alveolus. While research on the prevalence of Simonart's band in cleft lip and palate cases has been carried out in various countries, research on Simonart's band in Indonesia has yet to be conducted.

**Objectives.** This study aimed to determine the prevalence of different types of Simonart's band at a cleft center in Indonesia.

**Material and methods.** The data of cleft patients were reviewed retrospectively over a 9-year period at the Cleft Lip and Palate Center Center, Harapan Kita Women and Children Hospital, Jakarta, Indonesia. The patients were divided based on the type of cleft and the type of Simonart's band. The results were analyzed by means of descriptive statistics.

**Results.** Out of 638 cleft patients from the period 2008–2016, 77 patients had Simonart's band. The lip-to-lip band was most commonly found (52 cases, 67.5%). The lip-to-alveolus band was found in 20 cases (26.0%) and the alveolus-to-alveolus band had the lowest prevalence of 5 cases (6.5%). Associations between the cleft type (unilateral cleft lip and palate (UCLP), unilateral cleft lip and alveolus (UCLA), and bilateral cleft lip and palate (BCLP)) and Simonart's band type were all significant ( $p = 0.001$ , according to Fisher's exact test), which indicates significant differences in the distribution of the bands with regard to different cleft types. There was a significant difference in the distribution of the bands between the UCLP and UCLA groups ( $p = 0.000$ ). On the other hand, the distribution of the bands in the UCLP group did not differ much from that in the BCLP group ( $p = 0.065$ ).

**Conclusions.** The prevalence of Simonart's band was significantly higher in the patients with the unilateral complete cleft of the primary and secondary palate than in the subjects with the cleft of the primary palate. In the UCLP group, most patients had the lip-to-lip band type. In the BCLP group, the majority also had the lip-to-lip band type. In contrast, in the UCLA group, the majority showed the lip-to-alveolus band type.

**Keywords:** cleft lip and palate, Simonart's band, soft-tissue band, cleft lip and alveolus

## Introduction

Cleft lip with or without cleft palate is the most common orofacial birth defect, with a prevalence of 1:700.<sup>1-5</sup> Cleft lip and palate occurs in males twice as often as in females and is more commonly unilateral on the left side.<sup>1,6</sup> In children, the disorder involves impaired masticatory and speech functions, and middle ear problems.<sup>5,7</sup>

The etiology of cleft lip and palate is multifactorial, with genetic and environmental factors, including maternal exposure to tobacco smoke, nutrition and access to medical care.<sup>1,2,8</sup> Approximately 30% of cleft lip cases are associated with more than 275 syndromes and are usually diagnosed as additional syndromes.<sup>2,9</sup> The most common syndrome is Van der Woude syndrome, which is an autosomal dominant disorder that is characterized by cleft lip and palate. Van der Woude syndrome accounts for about 2% of all cases of cleft lip and palate.<sup>2,9,10</sup>

In some patients with complete cleft lip and palate, soft tissue bands may be found; they connect the cleft gap of the base of the nostril or the margin of the alveolus.<sup>11</sup> These soft tissue bands are commonly known as Simonart's bands. The term "Simonart's band" was at first associated with Dr. Gustav Simon (1824–1876), a German surgeon renowned for treating urogenital fistulas and bilateral lip adhesion surgery. The word "Simonart" itself probably comes from "Simonarzt", a combination of Simon and "Arzt" – a German word for doctor.<sup>11-14</sup> Meanwhile, a Belgian obstetrician Dr. Pierre-Joseph Cécilien Simonart (1816–1846) described congenital bands in children, although he did not specifically describe the congenital band in the lip.<sup>11-13</sup> Yet, Simonart's band is more commonly known worldwide to indicate a soft tissue band in cleft lip and palate.<sup>11,15</sup> Kitamura postulates that soft tissue bands are formed by the portion of the lip or the alveolar region which escaped the post-fusion rupture.<sup>16</sup> On the other hand, Semb and Shaw suggest that soft tissue bands occur due to disharmony in cell proliferation between the lateral and medial nasal processes, or the impaired apoptosis of cells within the epithelial surfaces.<sup>17</sup> Moreover, Vermeij-Keers et al. presented a theory that the formation of Simonart's band is caused by fusion or differentiation defects.<sup>18</sup>

The presence of Simonart's band in cleft lip and palate subjects might be associated with less hypoplastic embryological processes in the maxillary process.<sup>19,20</sup> This condition may lead to a lower prevalence of maxillary lateral incisor agenesis distally to the cleft area.<sup>20</sup> In a Brazilian study using the panoramic radiographs of a sample of 121 non-syndromic cleft lip and palate children with and without Simonart's band, the most common condition in children with Simonart's band was the maxillary lateral incisors located on the distal side of the cleft (48.3%). Agenesis of maxillary lateral incisors was found in 35% of the cleft children with the band, followed by the teeth on the mesial and distal sides (10%),

and then the teeth on the mesial side of the cleft (6.7%).<sup>20</sup> Different conditions of maxillary lateral incisors were found in the cleft children without Simonart's band, with tooth agenesis being the most common (45.9%), followed by the teeth located on the distal side of the cleft (29.5%), the teeth located on the mesial and distal sides (13.1%), and the teeth located only on the mesial side of the cleft (11.5%). There were statistically significant differences between the groups in the prevalence of the maxillary lateral incisors located on the distal side of the cleft.<sup>20</sup> This result supported the previous theory that the maxillary process is less hypoplastic in patients with Simonart's band.

Naidoo and Bütow classified soft tissue bands into 3 categories: type 1 – a band that connects both sides of the lip (lip-to-lip); type 2 – a band that connects the lip with the alveolar process (lip-to-alveolus); and type 3 – a band that connects the medial and lateral alveolar processes (alveolus-to-alveolus) (Fig. 1).<sup>21</sup> The clinical appearance of these soft tissue bands has 2 variations: a band covered by the skin; or a band that consists only of mucosal tissue, known as the subclinical variant.<sup>11,15</sup>

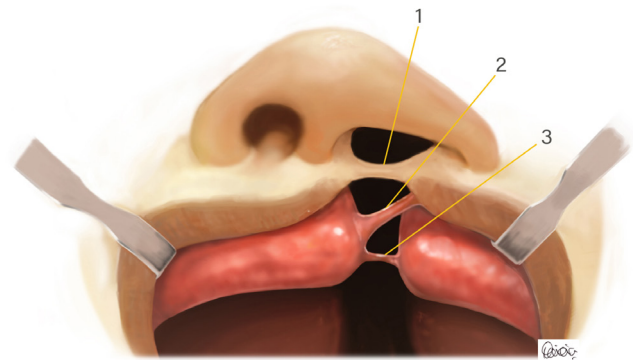


Fig. 1. Simonart's band types

1 – lip-to-lip; 2 – lip-to-alveolus; 3 – alveolus-to-alveolus.

Simonart's band has a favorable effect on the orofacial outcome after a cleft lip and palate repair. In addition, patients with Simonart's band usually require fewer secondary nose and lip repairs. Simonart's band affects the morphology of the maxillary dental arch and directs the anterior end of the non-cleft segment closer to the cleft segment. The condition may require a less traumatic lip and palate repair procedure.<sup>15,17</sup> As a summary of various studies regarding the influence of Simonart's band on the orofacial region, the following points can be mentioned: (1) Simonart's band does not interfere with the anatomical arrangement of the orbicularis oris muscle, which is separated at the cleft area; (2) Simonart's band has a minor positive effect on the final facial pattern in unilateral cleft lip and palate (UCLP) subjects; (3) Simonart's band could reduce the need for a secondary nose and lip repair; (4) Simonart's band has a long-term effect on the

morphology of the maxillary dental arch in unoperated unilateral cleft patients; and (5) patients with Simonart's band have a greater cranial base angle and a slightly better maxillomandibular relationship.<sup>5,15,22</sup>

Research on the prevalence of Simonart's band in cleft lip and palate cases has been carried out in various countries. Semb and Shaw reported that from among 257 UCLP subjects in Norway, 80 (31.1%) had Simonart's band.<sup>17</sup> In these 80 subjects, 68 patients (85.0%) had Simonart's band located at the base of the nostrils and covered by the skin, while in the rest of patients, Simonart's band was composed of the mucosa only and was located at the alveolar process.<sup>17</sup> Silva Filho et al. revealed that from among 2,014 Brazilian Caucasian UCLP patients, 394 (19.6%) had Simonart's band, regardless of the cleft side and the patient's gender.<sup>11</sup> Most of the 394 patients had Simonart's band that was covered by the skin (94.9%). The remaining 5.1% of Simonart's bands were considered a subclinical variant due to a smaller size and not being covered by the skin.<sup>11</sup> In another study, which examined 407 complete cleft lip and alveolus and complete cleft lip and palate patients, Simonart's band was found in 127 patients (31.2%).<sup>15</sup> This soft-tissue bridge occurred slightly more commonly in unilateral cleft patients (92 (31.7%) out of 290) than in bilateral cleft subjects (35 (29.9%) out of 117). The prevalence was higher in the primary palate cleft subjects with unilateral cleft lip and alveolus (UCLA) (48 (64.8%)) and bilateral cleft lip and alveolus (BCLA) (5 (45.5%)) than in the UCLP subjects (44 (20.3%)) and bilateral cleft lip and palate (BCLP) subjects (30 (28.3%)).<sup>15</sup> On the other hand, Acharya et al. reported that among 260 Indian UCLP patients, there were 90 patients (34.6%) with Simonart's band.<sup>22</sup>

Having the abovementioned research in mind, an investigation on Simonart's band in Indonesia has yet to be conducted. Thus, the objective of this study was to determine the prevalence of different types of Simonart's band in unoperated Indonesian cleft lip and palate patients. The research was conducted at the Cleft Lip and Palate Center, Harapan Kita Women and Children Hospital, Jakarta, Indonesia.

## Material and methods

The present research was approved by the Dental Research Ethics Committee at the Faculty of Dentistry of the University of Indonesia, Jakarta, Indonesia (No. 36/Ethical Approval/FKGUI/IX/2020). This retrospective study was conducted based on the medical records from January 2008 to December 2016 obtained from the Cleft Lip and Palate Center. The type of cleft, the type of Simonart's band and the variations of Simonart's band were evaluated, taking into account the medical records as well as the standardized extraoral and intraoral preoperative photographs of the subjects. The inclusion crite-

ria was the complete clinical preoperative photograph of the subject. The research subjects were divided into 4 groups as follows: UCLP; UCLA; BCLP; and BCLA. All clinical photographs were reviewed and re-evaluated by the cleft surgeon who operated on all cleft patients and has more than 20 years of clinical experience (MSH). Syndromic patients were excluded from the study. The data was analyzed with the  $\chi^2$  test and Fisher's exact test, with the level of significance set at 5% ( $p < 0.05$ ).

## Results

Over the 9-year period from January 2008 to December 2016, a total of 638 cleft patients attended the Cleft Lip and Palate Center. Out of the 638 cases, UCLP was the type of cleft with the highest prevalence of 411 cases (64.4%), followed by BCLP with 130 cases (20.4%), UCLA with 90 cases (14.1%), and finally BCLA with 7 cases (1.1%). In the unilateral cleft cases, more cleft cases were found on the left side than on the right side. In the UCLP cleft type there were 263 cleft cases on the left side (41.2%) and 148 cleft cases on the right side (23.2%). In the UCLA cleft type there were 62 cleft cases on the left side (9.7%) and 28 cleft cases on the right side (4.4%) (Table 1).

Table 1. Distribution of the cleft patients over the 9-year period according to the type of cleft

Type of cleft		n (%)	Total n (%)
UCLP	left	263 (41.2)	411 (64.4)
	right	148 (23.2)	
UCLA	left	62 (9.7)	90 (14.1)
	right	28 (4.4)	
BCLP		130 (20.4)	
BCLA		7 (1.1)	
Total n (%)		638 (100)	

UCLP – unilateral cleft lip and palate; UCLA – unilateral cleft lip and alveolus; BCLP – bilateral cleft lip and palate; BCLA – bilateral cleft lip and alveolus.

The present study showed that out of 638 cleft lip and palate patients, 77 had Simonart's band. The most common was the lip-to-lip band type (Fig. 2), with 52 cases (67.5%) – 26 cases were on the left side, 23 cases were on the right side and 3 cases were on both sides (i.e., BCLP). The lip-to-alveolus band type (Fig. 3) was found in 20 cases (26.0%) – 12 cases were on the left side, 7 on the right side and 1 on both sides (i.e., BCLP). The alveolus-to-alveolus band type (Fig. 4) had the lowest prevalence of 5 cases (6.5%) – 4 cases on the left side and 1 case on the right side (Table 2). Regarding the gender of the subjects, Simonart's band was found more frequently in males than in females, but this difference failed to meet our statistical threshold (Table 3).



Fig. 2. Complete unilateral cleft lip and palate patient with a lip-to-lip band on the right side

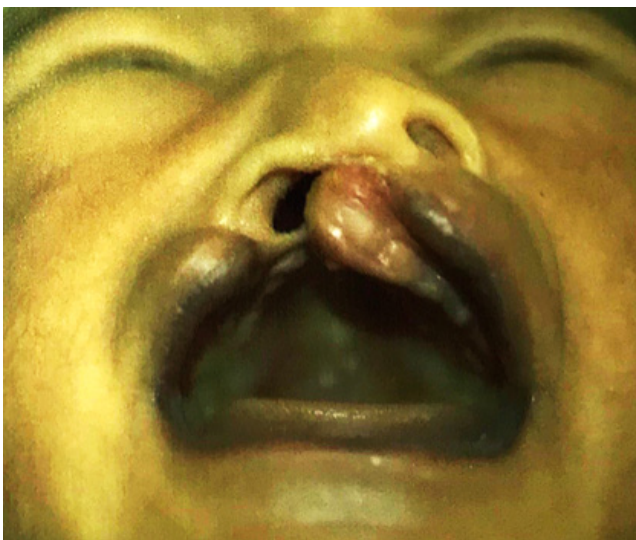


Fig. 3. Complete unilateral cleft lip and palate patient with a lip-to-alveolus band on the right side

In terms of Simonart's band variations, the skin-covered band was more frequent than the subclinical variant (the mucosal-only band) in both unilateral and bilateral clefts (Table 4). The skin-covered variant was observed in 51 (82.3%) out of 62 unilateral cleft patients with the band, while the mucosal-only band was observed in 11 (17.7%) unilateral cleft patients. In bilateral cleft subjects, the skin-covered band was observed in 12 patients (80.0%) and the mucosal-only band only in 3 patients (20.0%).



Fig. 4. Complete unilateral cleft lip and palate patient with an alveolus-to-alveolus band on the left side

Table 3. Presence of Simonart's band according to gender

Gender	With Simonart's band <i>n</i> (%)	Without Simonart's band <i>n</i> (%)	Total
Male	49 (12.7)	338 (87.3)	387
Female	28 (11.2)	223 (88.8)	251
Total	77	561	638

$\chi^2$  test ( $p = 0.620; p > 0.05$ ).

Table 4. Distribution of Simonart's band variations according to unilateral or bilateral clefts

Cleft	Skin-covered band	Mucosal-only band	Total <i>n</i> (%)
Unilateral	51	11	62 (80.5)
Bilateral	12	3	15 (19.5)
Total <i>n</i> (%)	63 (81.8)	14 (18.2)	77 (100)

$\chi^2$  test ( $p = 1.000; p > 0.05$ ).

Associations between the cleft type (UCLP, UCLA and BCLP) and Simonart's band type (lip-to-lip, lip-to-alveolus and alveolus-to-alveolus) were also investigated. of the 52 patients who had Simonart's band in the UCLP group, 80.8% had a lip-to-lip band, 13.5%

Table 2. Distribution of Simonart's band types in the cleft patients according to the cleft type

Cleft type	Simonart's band type									<i>n</i> (%)
	lip-to-lip			lip-to-alveolus			alveolus-to-alveolus			
	left	right	bilateral	left	right	bilateral	left	right	bilateral	
UCLP	24	18	–	4	3	–	3	0	–	52 (67.5)
UCLA	0	2	–	5	2	–	1	0	–	10 (13.0)
BCLP	2	3	3	3	2	1	0	1	0	15 (19.5)
BCLA	0	0	0	0	0	0	0	0	0	0 (0)
Total	26	23	3	12	7	1	4	1	0	77 (100)

had a lip-to-alveolus band and 5.8% had an alveolus-to-alveolus band. of the 10 patients who had Simonart's band in the UCLA group, 20.0% had a lip-to-lip band, 70.0% had a lip-to-alveolus band and 10.0% had an alveolus-to-alveolus band. Moreover, from among the 15 patients who had Simonart's band in the BCLP group, 53.3% had a lip-to-lip band, 40.0% had a lip-to-alveolus band and 6.7% had an alveolus-to-alveolus band.

There were significant differences in the distribution of the bands with regard to different cleft types ( $p = 0.001$ ) (Table 5). Furthermore, to investigate significant differences between the groups, Fisher's exact test was performed for each of the 2 groups of a particular cleft type. There was a significant difference in the distribution of the bands between the UCLP and UCLA groups, with  $p = 0.000$  (Table 6), whereas the UCLP and BCLP groups did not differ significantly in terms of distribution of the bands ( $p = 0.065$ ) (Table 7).

Associations between the cleft type (UCLP, UCLA and BCLP) and Simonart's band variations (skin-covered band or mucosal-only band) were investigated as well. In all cleft types, the majority had skin bands (86.5% in UCLP, 60.0% in UCLA and 80.0% in BCLP), and the  $p$ -value of Fisher's exact test was  $p = 0.143$  (Table 8).

Table 5. Distribution of Simonart's band types according to the cleft type

Cleft type	Simonart's band type			Total
	lip-to-lip	lip-to-alveolus	alveolus-to-alveolus	
UCLP	42 (80.8)	7 (13.5)	3 (5.8)	52 (67.5)
UCLA	2 (20.0)	7 (70.0)	1 (10.0)	10 (13.0)
BCLP	8 (53.3)	6 (40.0)	1 (6.7)	15 (19.5)
Total	52 (67.5)	20 (26.0)	5 (6.5)	77 (100)

Data presented as number (percentage) ( $n$  (%)). Fisher's exact test ( $p = 0.001$ ;  $p < 0.05$ ).

Table 6. Distribution of Simonart's band types in the UCLP and UCLA groups

Cleft type group	Simonart's band type			Total
	lip-to-lip	lip-to-alveolus	alveolus-to-alveolus	
UCLP	42 (80.8)	7 (13.5)	3 (5.8)	52 (83.9)
UCLA	2 (20.0)	7 (70.0)	1 (10.0)	10 (16.1)
Total	44 (71.0)	14 (22.6)	4 (6.5)	62 (100)

Data presented as  $n$  (%). Fisher's exact test ( $p = 0.000$ ;  $p < 0.05$ ).

Table 7. Distribution of Simonart's band types in the UCLP and BCLP groups

Cleft type group	Simonart's band type			Total
	lip-to-lip	lip-to-alveolus	alveolus-to-alveolus	
UCLP	42 (80.8)	7 (13.5)	3 (5.8)	52 (77.6)
UCLA	8 (53.3)	6 (40.0)	1 (6.7)	10 (22.4)
Total	50 (74.6)	13 (19.4)	4 (6.0)	67 (100)

Data presented as  $n$  (%). Fisher's exact test ( $p = 0.065$ ;  $p > 0.05$ ).

Table 8. Distribution of Simonart's band variations according to the cleft type

Cleft type	Simonart's band type		Total
	skin-covered band	mucosal-only band	
UCLP	45 (86.5)	7 (13.5)	52 (67.5)
UCLA	6 (60.0)	4 (40.0)	10 (13.0)
BCLP	12 (80.0)	3 (20.0)	15 (19.5)
Total	63 (81.8)	14 (18.2)	77 (100)

Data presented as  $n$  (%). Fisher's exact test ( $p = 0.143$ ;  $p > 0.05$ ).

## Discussion

There are still differences of opinion among cleft surgeons regarding the type of cleft and the presence of Simonart's band, and whether it is incomplete or complete cleft lip. Naran et al. conducted a survey on 373 respondents who were members of the American Cleft Palate-Craniofacial Association (ACPA).<sup>12</sup> As many as 87.1% of them agreed that the presence of Simonart's band was a condition that existed in cases of complete cleft lip. The authors suggested that if the soft-tissue band is at or above the line from the alar-facial groove to the columellar-philtral junction, the condition is classified as complete cleft lip, whereas if the soft-tissue band is below the abovementioned line, the condition is classified as incomplete cleft lip.<sup>12</sup> In this regard, several articles that classify cleft lip cases with a soft-tissue band as complete cleft lip have been published. Among them, there are studies by Carvalho Carrara et al.,<sup>23</sup> Elsherbiny and Mazeed,<sup>24</sup> and Reddy et al.<sup>25</sup> Other studies, i.e., those conducted by Nollet et al.,<sup>26</sup> Jorge et al.,<sup>27</sup> Akarsu-Guven et al.,<sup>28</sup> and Vandersluis et al.,<sup>29</sup> excluded cases of complete cleft lip in the presence of Simonart's band, since it affected the maxillary arch.

The prevalence of Simonart's band in cleft patients varies among different populations. The present study aimed to determine the prevalence of different types of Simonart's band in cleft lip and palate children at the Cleft Lip and Palate Center, Harapan Kita Women and Children Hospital, Jakarta, Indonesia. This study has several limitations, including the incompleteness of the patients' medical records. Some clinical data was incomplete, including incomplete clinical photographs.

Out of the 638 cleft lip and palate patients from the 9-year period (2008–2016), there were 411 UCLP patients, with 52 (12.7%) having Simonart's band. This number was lower than those presented in previous studies. A study conducted in Stockholm, Sweden, reported that out of a total of 85 UCLP patients, there were 19 patients (22.4%) with Simonart's band.<sup>30</sup> A Brazilian study reported 394 such patients (19.6%) out of a total of 2014,<sup>11</sup> and another study with 72 UCLP subjects from Oslo, Norway, and Bristol, UK, reported a percentage of 22.2%.<sup>31</sup> Furthermore, our study also found fewer UCLP subjects with Simonart's band than a study conducted in Norway, which reported 80 patients with Simonart's band (31.1%) out of a total of 257 UCLP subjects.<sup>17</sup> A study conducted

in Bhubaneswar, India, also reported a higher incidence than that observed in our study.<sup>22</sup>

We found 15 subjects with Simonart's band (11.5%) out of 130 BCLP patients. This result was similar to that found in a previous study conducted in Stockholm, Sweden, where the number of individuals with BCLP and Simonart's band was 2 out of 19 subjects (10.5%).<sup>30</sup> Regarding gender, 49 (12.7%) male cleft patients had Simonart's band out of a total of 387 subjects, whereas in females, the proportion was 28 (11.2%) cleft patients with the band out of 251 female subjects. These results were lower than those previously reported in a Brazilian study (20.2% in males and 18.5% in females, respectively).<sup>11</sup>

In our study, the prevalence of Simonart's band was significantly higher in the patients with the unilateral complete cleft of the primary and secondary palate than in the subjects with the cleft of the primary palate. These results are in disagreement with previous results from a study conducted in Brazil, which revealed that the prevalence of Simonart's band in the unilateral clefts of the primary palate was higher than in the complete unilateral clefts of the primary and secondary palate.<sup>15</sup> In the UCLP cleft type, most individuals had the lip-to-lip band type. In the BCLP group, the majority also had the lip-to-lip band type. In contrast, in the UCLA group, the majority had the lip-to-alveolus band type. There was a significant difference in the distribution of different types of bands between the UCLP and UCLA groups. Differences in the type of Simonart's band may be explained by the theory of fusion or differentiation defects in early embryonic development. The skin-covered band is formed by the fusion of the medial and lateral nasal processes, and is categorized as a differentiation defect. The mucosal-only band is considered a submucous cleft of the alveolar processes caused by the insufficient outgrowth of the premaxilla and maxilla bone centers. The condition can be categorized as a differentiation defect of the alveolus combined with a fusion defect of the lip.<sup>18,31,32</sup>

## Conclusions

This study found that the prevalence of Simonart's band was significantly higher in the patients with the unilateral complete cleft of the primary and secondary palate than in the subjects with the cleft of the primary palate. In the UCLP group, most patients had the lip-to-lip band type. In the BCLP group, the majority also had the lip-to-lip band type. In contrast, in the UCLA group, the majority showed the lip-to-alveolus band type.

## Ethics approval and consent to participate

The present research was approved by the Dental Research Ethics Committee at the Faculty of Dentistry of the University of Indonesia, Jakarta, Indonesia (No. 36/Ethical Approval/FKGUI/IX/2020).








## Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Consent for publication

Not applicable.

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