

Table 1. Characteristics of included studies

Author and Year	Study design	Study sample	Age group	Classification system used	Inclusion and exclusion criteria	Methodology	Results	Conclusion	Summary
Surekha et al., 2012 [8]	Cross sectional study	60 maxillary study models inclusive of 30 males & 30 females.	17-23 years	Thomas and Kotze.	Subjects belonging to North East (Manipur) and South West of India (Kerala).	Palatal rugae were analyzed based on right & left sides for total number, length & shape.	SHAPE: wavy>curved>straight>circular NUMBER: Females>males left>right side	Manipuri population showed predominantly curved shaped rugae. Kerala population showed predominantly wavy shaped rugae	Palatal rugae are distinctive to an individual and can be therefore used as an aid to identification.
Chandra et al., 2016 [9]	Cross sectional study	200 maxillary study models inclusive of 100 males & 100 females.	15-30 years	Thomas and Kotze.	Healthy individuals from Patna & Ranchi free from congenital & palatal abnormalities, trauma, inflammation, and orthodontic treatment, not wearing a denture, and no history of surgery	Palatal rugae were analyzed based on total number, length & shape.	SHAPE: curved>wavy>straight>diverged>circular. NUMBER: Females >males LENGTH: Primary rugae>secondary rugae in both males & females.	No significant gender discrimination was observed based on length while the predominant shape observed was the wavy pattern.	Pattern of rugae is extremely unique to humans as the fingerprints but it showed no significant gender discrimination based on the length of rugae pattern.
Paliwal et al., 2010 [10]	Cross sectional study	60 maxillary study models inclusive of 30 males & 30 females.	17-23 years	Thomas and Kotze.	The population of Madhya Pradesh and Kerala were analyzed.	Palatal rugae were analyzed based on total number, length & shape.	SHAPE: Wavy>curved>straight>unification>circular. NUMBER: Right side>left side	Straight type was predominant in Madhya Pradesh population while wavy type was predominant in Kerala population in males and females.	A subtle association in the rugae shape existed between the 2 populations. This requires further extensive study for establishing its significance in personal and racial identification.

Bharath et al., 2011 [1]	Cross sectional study	100 maxillary study models inclusive of 50 males & 50 females.	15-30 years	Thomas and Kotze.	Healthy individuals free from congenital abnormalities, inflammation, trauma & orthodontic treatment were included.	Palatal rugae were analyzed based on total number, length & shape.	Total number of the rugae was not significantly different between the sexes. Association between rugae length and shape with sex determination was computed using discriminant analysis which enabled sex differentiation in this population with an accuracy of 78%.	Difference in unification pattern was statistically significant between genders. The total number was not significantly different	Palatal rugae revealed a specific pattern in unification among males and females of the coastal Andhra population. Discriminant function analysis enabled sex determination of individuals.
Dwivedi and Nagarajappa 2016 [7]	Cross sectional study on Central Indian population.	500 maxillary study models inclusive of 250 males & 250 females.	17-25 years	Thomas and Kotze &	Subjects with any palatal abnormalities, soft tissue protrusions, trauma, and orthodontic treatment were excluded.	Palatal rugae were analyzed based on primary rugae, number, direction & pattern	NUMBER: Males > females PATTERN: In Males: Wavy>straight>curved>circular In Females: Straight>wavy>curved>circular	In this study, males had more rugae than females.	This study showed that there was a significant relationship between palatoscopy, human identification and sex determination.
Harchandani et al., 2015 [6]	Cross sectional study	100 maxillary study models. 50 each from the populations in west & north India.	18-30 years	Thomas and Kotze & Kapali classification for shape of the rugae.	Completely dentulous, domicile by birth, absence of intraoral lesions, absence of congenital abnormalities, non-orthodontic participants were included.	<u>Palatal rugae were analyzed based on number, type & pattern.</u>	NUMBER: Males > females PATTERN: Wavy pattern was more common in males of west & north India. Females had straight rugae in western India while curved in North.	The palatal rugae patterns and the number of rugae on the palate differed in both the Western and north Indian populations.	The uniqueness of palatal rugae pattern can be utilized when combined with other methods for forensic identification.

Balgi et al., 2014 [11]	Cross sectional study	50 maxillary study models inclusive of 25 males & 25 females	30-50 years	Thomas and Kotze.	Individuals free from congenital abnormalities, inflammation, trauma & orthodontic treatment were included.	Palatal rugae were analyzed based on length, number, and shape.	<p><u>LENGTH:</u> Males > females</p> <p><u>PATTERN:</u> Straight pattern was predominant in females than males.</p> <p><u>NUMBER:</u> Males > females</p>	<p>Most commonly seen rugae pattern in both males and females was of the straight variety and males showed more rugae in length and in number than females.</p> <p>As the analysis showed a significant difference with length and shape of rugae patterns in males and females, rugoscopy, could be used as a tool for identification.</p>
Alani et al., 2016 [12]	Cross sectional study	82 maxillary study models inclusive of 40 males & 42 females	16-25 years	Thomas and Kotze.	Individuals with congenital abnormalities, inflammation, trauma and orthodontic treatment were excluded.	Palatal rugae were analyzed based on the pattern and length.	<p><u>PATTERN:</u> Males – curved Females – straight</p> <p><u>LENGTH:</u> Males > females.</p>	<p>Despite the controversy about the stability of the characteristics of rugae and the extent of differences between genders, palatal rugae have been recognized as a potential source of identity.</p> <p>There was no significant statistical difference between genders in relation to the rugae pattern although there was predominance of the curved pattern in males and straight pattern in females.</p>