History of Medicine, 2025, 11(1): 186-194

DOI: 10.48047/HM. V11.I1.2025.186 -194

Finger Nail Plate shape a Tool for Gender Identification: A study on Kanpur population

Authors:

Dr Vishal Mehrotra
Professor and HOD
Department of Oral Medicine and Radiology,
Rama Dental College, Kanpur
Email id: vishal4march@rediffmail.com
Mobile no. +919956575812

Dr Kriti Garg
Reader
Department of Oral Medicine and Radiology,
Rama Dental College, Kanpur
Email id: drkritigarg@gmail.com
Mobile no. +919936434177

Dr Rahul Srivastava
Professor and HOD
Department of Oral Medicine and Radiology,
Rama Dental College, Kanpur
Email id: drrahul_osmf@yahoo.com
Mobile no. +919450326179

Dr Shazia Aslam
Senior Lecturer
Department of Oral Medicine and Radiology,
Rama Dental College, Kanpur
Email id: shaz23.aslam@gmail.com
Mobile no. +919838727635

Dr Sachin Kushwah
Reader
Department of Oral Medicine and Radiology,
Rama Dental College, Kanpur
Email id: drsachinkushwah15@gmail.com
Mobile no. +918318828989

Dr Vinayak Rai
Postgraduate Student
Department of Oral Medicine and Radiology,
Rama Dental College, Kanpur
Email id: vr9vinayak@gmail.com
Mobile no. +919411052121

History of Medicine, 2025, 11(1): 186-194

DOI: 10.48047/HM. V11.I1.2025.186 -194

Dr Sarkia Umrao
Postgraduate Student
Department of Oral Medicine and Radiology,
Rama Dental College, Kanpur
Email id: umraosarika15@gmail.com
Mobile no. +918318627523

Corresponding Author:
Dr Vishal Mehrotra
Professor and HOD
Department of Oral Medicine and Radiology,
Rama Dental College, Kanpur
Email id: vishal4march@rediffmail.com
Mobile no. +919956575812

Abstract:

The distinctive and unique pattern of finger nail plate has gained an overwhelming importance in field of forensics and is being utilized as a method of identification.

Objective:

Due to the enormous potential of the distinctive fingerprints and the nail plate pattern as an efficacious method of identification, this study is conducted to explore and investigate the different finger nail plate pattern in Kanpur population.

Methodology:

The present study was conducted on 1000 subjects above age group of 18years. Fingernail shape were examined and recorded.

Result:

The result obtained from the fingernail analysis, shows that males and females nails have greater tendency to have rectangular pattern in thumb, the triangular pattern in index, middle and ring

DOI: 10.48047/HM. V11.I1.2025.186 -194

finger whereas in case of little finger the pattern varies. The nail patterns on right hand repeats in left hand of an individual or vice versa.

Conclusion:

As fingerprints play an important role in identification, the fingernail plate shapes of hands also shows diversities and thus can be utilized as a tool for identification.

Introduction:

In the recent times there has been amplification in the interest in context to the study of the nails in health and also in forensic sciences.[1] Nails play a useful an important role in diagnosis and as a marker of systemic disease. Due to the unique features of the finger nails and also the well documented nail anatomy in Onychology which defines that the nail plate is the only anatomical part of nail which has power of regeneration as the new cells are made and the spacing between the grooves of the nail bed remains constant over the entire life of the individual.[2] Thus in contrary to the facial characteristics of an individual which changes as the age progress, the attribute of the nail bed emulated on the nail plate can be invaluable for identification over the lifetime of an individual.[2]

No two fingers have thesame fingerprints. Similarly no two fingers had the same nail plate shape and size. The departure from perfect geometric shapes accounts for the uniqueness. The fingerprints on

fingers of one hand are different from those of the second pair; this is similar for nail finger shapes in a pair ofhands. The fingernail plates because of their sizes relative to fingerprints that require study and assessment under a magnifying glass should offer a swifter way of identification.[3]

The nail is defined as a horn-like envelope made of keratin, covering the tips of the fingers and toes in humans, most non-human primates, and a few other mammals.[4,5]

The nail is made of six parts: Nail Root, Nail Bed, Nail Plate, Eponychium (cuticle), Perionychium, and Hyponychium.[6]

The nail plate is the translucent keratinized actual fingernail which due appears pink due to the color imparted from the blood vessels underneath the nail. The grooved underneath surface of the nail plate helps it to anchor the nail to the nail bed. The fingernail shape is classified into: Rectangle, Round/oval, Triangle and Square.[2]

There has been a scarcity of knowledge and also lack of available scientific information on the shapes of the clinically healthy fingernail in various books and journals. Thus this study was conducted to look into and scrutinize the various finger nail plate pattern in Kanpur population.

Methodology:

The present study was conducted on 1000 subjects 500 males and 500 females all above age group of 18years. The subjects with any deformity, injury or infection in relation to fingernail or nail bed and those wearing an artificial nail were excluded from the study.

The study subjects were instructed to properly cut the nails and vigorously clean hands before the recording of their nail plate shapes. Initially a small amount of thumb impression ink (black) was placed on glass slab followed by evenly application of ink on nails and its edges using cotton bud. Once the ink was evenly applied a small strip of adhesive tape was cut and placed

over the nail. This was followed by even pressure application on the nail surface and then the tape was lifted and nail plate shape thus obtained was placed over the slip.[2] The length and width was then measured with the help of a digital vernier caliper. The length was measured from the highest point on the free margin of the nail plate to the cuticle and the width was measured from the widest point on the lateral walls of nail plate on either side.

The upper 10 shapes were taken individually starting from right hand i.e. thumb, index, middle, ring, and little fingers of each hand in the order named. Once the nail plate shape was recorded subjects nails were wiped with cotton soaked in acetone and later the subjects were advised to wash their hands again with soap and water. Once the whole procedure is completed the slips were properly preserved for observation.

Nail plate size measurement was done by measuring the distance between eponychium to distal edge of lateral nail fold is measured (an imaginary parallel line is considered between distal edges of lateral nail fold to midpoint of eponychium).

Results:

The present study was conducted over 1000 subjects, 500 males and 500 females.

It was observed that the length and width of finger nail in male was more as compared to female subjects. (Table1)

The results obtained from the present study also shows that thumb in males (68%) and females (70%) have higher prevalence of rectangular pattern, the index finger, middle finger, ring finger and little finger in males(69%,72%,78% respectively) and females(62%,73%,62%respectively) have higher prevalence of triangle pattern.(Table 2)

It was also observed that the nail patterns on right hand repeats in left hand of an individual or vice versa.

History of Medicine, 2025, 11(1): 186-194

DOI: 10.48047/HM. V11.I1.2025.186 -194

Gender	Length	Width
Male	< 0.9	1 to 2.2
Female	< 0.5	0.8 to 1.9

Table 1: Nail plate size in males and females

Category	Finger	Rectangle %	Triangle %	Oval/ Round %	Square %
Male	Thumb	68	27	3	2
Female	Thumb	70	22	5	3
Male	Index	2	69	13	16
Female	Index	9	62	24	5
Male	Middle	19	72	5	4
Female	Middle	17	73	4	6
Male	Ring	17	68	7	8
Female	Ring	23	62	6	9
Male	Little	14	60	12	14
Female	Little	16	59	15	10

Table2: Finger nail pattern in males and females

DOI: 10.48047/HM. V11.I1.2025.186 -194

Discussion:

Nail, a small mirror that shows body health, is the affiliated organ as well as the extension of the skin.[7] In the recent times study of nails or onychology has gain a significant importance in field of forensics and medicine. Till date very few studies have been conducted on the shape of finger nail in any population.

One of a study on finger nail plate shape was conducted by Kottadiyil DV[2] on Indian population, which comprised of as sample size of 100 subjects. The result of the study shows that males and females tend to have greater tendency of rectangular pattern in thumb. On index, middle and ring finger, triangular pattern dominates in both males as well as females whereas in case of little finger the pattern varies. They also reported the length and width of the finger nail was more in males as compared to females

In our study the sample size of 1000 subjects were included and the result in context to thumb showed similar tendency of rectangular pattern and in index middle ring and little fingers showed greater tendency of triangular pattern of the nail plate, and males have a greater length and width of nail plates compared to females. The only difference seen in our study was in shape of finger nail of little finger which showed higher tendency of triangular pattern.

In the present study it was also observed that the finger nail size is larger in length and width in males as compared to females which is in accordance to results obtained in the study conducted by Kottadiyil DV[2]

As gender identification of an individual is a very important aspect of criminal investigation. Corpus delicti also clearly explains the importance of positive identification in the criminal justice system. This study proves that the anthropology of the nail can therefore become a very important tool for identification.[9]

Limitations of the study are related to the relatively small study sample, composed by adult men and women. Another limitation is that we did not consider patients with manual work that may impact on the nail structure.[10] In future more studies should be performed with larger sample sizes, to reach to an inference.

Conclusion:

The power of regeneration of the nail plate as the new cells are formed and the persistent spacing between the grooves which remain constant throughout entire life of an individual, makes the nail plate shape as a useful way for identification over the entire lifespan of an individual. Thus nails may play as a valuable diagnostic tool in field of forensics as they are easy to retrieve, without causing significant discomfort.[8] It is believed that like finger printing the method of personal identification using fingernail plate shape and size would also rise. Even based on nail plate size we can narrow done the search to a particular gender. Currently finger nail recognition has been applied to identify criminals and is being used for personal identification as a supportive biometric. In the upcoming years it is likely to see more researches in field of study of nails and expansion of knowledge in this field. Very few studies have been reported in literature regarding the use of nail plate in gender identification therefore more studies with larger sample size should be conducted in the near future to substantiate and also signify the importance of finger nail plate in Forensics.

References:

1. Grover C, Bansal S. The nail as an investigative tool in medicine: What a dermatologist ought to know. Indian Journal of Dermatology, Venereology, and Leprology 2017; 83(6):635-643.

2. Kottadiyil DV. A Relative Study of Finger nail plate Shape among Indian Population. Int. J. of Multidisciplinary and Current research 2017; 5: 352-355.
3. George AO. Finger nails plate shape and size for personal identification-a possible low technology method for the developing countries. Preliminary report. Afr J Health Sci. 2005; 12:13-20.
4. Medical Dictionary for the Health Professions and Nursing © Farlex 2012.
5. Onumah, Neh; Scher, Richard K. (May 2009) Nail Sugery eMedicine.
6. Jarmine Daena; December 2015 Nail Growth and nail structure.
7. Lee E, Kim E S. A Study on the Nail Size Measurement of Korean Adult Women -Focused on women in their 20s, 30s and 40s. Journal of Fashion Business 2016; 22(3):67-74.
8. Bahreini M, Ashrafkhani B, Tavassoli SH. Discrimination of patients with diabetes mellitus and healthy subjects based on laser induced breakdown spectroscopy of their fingernails. J Biomed Opt 2013; 18:107006.
9. Bellinato F et al. Systematic study on nail plate assessment: differences in nail plate shape, thickness, power Doppler signal and scanning approach. Archives of Dermatological Research 2023; 315:593–600.
10. Pavanchand HS et al. Effect of dexterity and gender on fingernail configuration in medical students. Journal of Forensic Medicine and Toxicology 2023; 40(2):37-40.