OPEN ACCESS

Scholars International Journal of Law, Crime and Justice

Abbreviated Key Title: Sch Int J Law Crime Justice
ISSN 2616-7956 (Print) |ISSN 2617-3484 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Stature Estimation from Handprint Anthropometry among Indians from Klang Valley, Selangor State, Malaysia

T. Nataraja Moorthy[1]*, M. Kirubalani[2]

[1]Professor of Forensic Sciences, Faculty of Health and Life Sciences, Management and Science University, Shah Alam, Selangor, Malaysia. Former Assistant Director, Forensic Sciences Department, Government of Tamil Nadu, India
[2]Faculty of Health and Life Sciences, Management and Science University, Shah Alam, Selangor, Malaysia

DOI: https://doi.org/10.36348/sijlcj.2026.v09i06.005 | **Received:** 12.04.2026 | **Accepted:** 04.06.2026 | **Published:** 06.06.2026

***Corresponding author:** T. Nataraja Moorthy
Professor of Forensic Sciences, Faculty of Health and Life Sciences, Management and Science University, Shah Alam, Selangor, Malaysia. Former Assistant Director, Forensic Sciences Department, Government of Tamil Nadu, India

Abstract

Forensic science is a broad field that covers a variety of scientific disciplines used to investigate crimes through the examination of physical evidence found at the crime scenes. Evidence can determine if a crime has occurred or not. Evidence is a vital object in all crime scenes, which may exist in the form of solid, liquid or gas. Sometimes, it may be visible or invisible, and most of the impression evidence found at the scenes is visible. Some of the examples of impression evidence include fingerprints, handprints, footprints, tyre prints and so on. The first officer who visits the crime scene preserves the crime scene to avoid evidence damage until the police investigator arrives. At the initial stage of investigation, forensic officers give importance to estimating stature, gender and body weight from physical evidence left by the offenders through the anthropometric technique. Researchers have shown that impression evidence can be used to determine the above three components. But whenever dealing with stature estimation from impression evidence, ethnicity should be considered because impression evidence varies from one ethnicity to another. Hence, the present study was planned to investigate the relationship between stature and handprint among Indians living in the Klang Valley region in Selangor state, Malaysia. It is the maiden study conducted in the Klang Valley, one of the regions in Selangor state, Malaysia.

Keywords: Forensic Science, Stature, Handprint, Indian, Klang Valley, Malaysia.

INTRODUCTION

Forensic science is a multifaceted subject that exists at the intersection of science and criminal justice; it plays a key role in the process of investigating crimes and bringing victims or offenders to justice [1]. Forensic science works on physical evidence, and hence forensic investigators are looking for evidence at the crime scenes to link the crime and offenders [2]. Physical evidence may be either a microscopic or a massive item that is present at the crime scene, as a silent witness [3]. Evidence is vital in all crime scenes, which may be either in the form of solid [4], liquid [5] or gas [6]. Sometimes, the evidence may be invisible [7], and sometimes it may be visible [8]. Based on my crime scene investigation experience in India, most of the impression evidence is visible (9). Some of the examples of physical evidence include hair [10], handwriting [11], soil [4], fibre [12], charred materials [8], plastic bags [13], footprints [14], fingerprint [15], gait pattern [16], drugs [17], alcohol [18] and others. It is cumbersome to identify the culprit immediately, and thus at the initial stage of investigation, it is mandatory to find out the stature, gender and body weight based on physical evidence at the scene through the anthropometric technique. Literature review reveals that researchers are showing interest in determining stature from fingerprint, handprint and footprint anthropometry. Earlier studies have shown the existence of a strong correlation between one's stature and footprint or handprint measurements. Also, they confirmed that people from different regions of a country bear different morphological features, depending upon their food habits and geographical distribution and hence a single formula cannot represent all parts of that country. Hence, the present study was planned to investigate the relationship between stature and handprint among Indians living in the Klang Valley, Selangor state, Malaysia. It is the maiden study conducted in the Klang Valley, one of the important regions in Malaysia.

RESEARCH METHODOLOGY

Based on a sample size calculation, 150 indians, 75 males and 75 females who were born and living in the Klang Valley, Selangor state, Malaysia, were recruited in this study. The 150 volunteers were assembled and informed about the research. The age of the volunteers ranged from 18 years to 60 years, and subjects with apparent hand-related diseases or disorders were excluded from this study. The stature of each subject was measured (in cm) to the nearest 0.5 cm, without foot and head wear, using a portable stadiometer. Following the standard procedure adopted by the corresponding author, Professor Nataraja Moorthy, the handprints were also collected based on the inking technique [19]. On a clean A5-size glass plate, fingerprint ink was slightly applied and rolled with a fingerprint roller to form a thin layer of black ink on the plate. A volunteer with a clean left hand was placed on the black-inked plate with mild pressure. Then the inked hand was lifted slowly and impressed on an A4-size white paper kept aside; thus, the left handprint of the volunteer was transferred onto the white paper. The procedure was continued for the right hand of the volunteer and then for all volunteers. From each left handprint of an individual, five length measurements and five measurements in the right handprint were taken. Handprint length is the straight distance between the metacarpal-phalangeal crease in the wrist and the most anterior tip of the fingers.

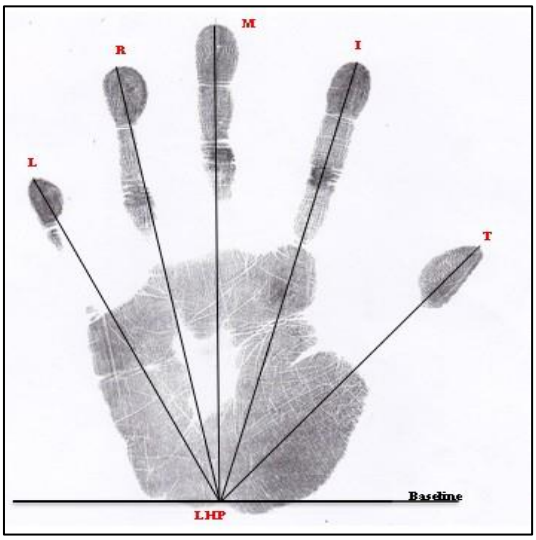

Figure 1: Landmarks in left handprint lengths in an Indian from Klang Valley, Selangor state

Figure 1 shows the illustrative example of landmarks and various handprint lengths in the left hand of an Indian from Klang Valley, Selangor state, Malaysia. The handprint length with thumb is the distance between the metacarpal-phalangeal crease in the wrist (LHP) and the anterior tip of the thumb (T), as abbreviated by LHPT. The index handprint length is abbreviated as LHPI, middle handprint length as LHPM, ring handprint length as LHPR and little handprint length as LHPL. The five right handprint lengths were indicated as RHPT, RHPI, RHPM, RHPR, RHPL. The data were analysed statistically, and regression formulae were developed to determine stature from handprint anthropometry among Malaysian Indians in Klang Valley, Selangor state, Malaysia.

RESULTS

Table 1 presents the descriptive statistics of stature in Malaysian Indians in Klang Valley.

Table 1: Descriptive statistics of stature (in cm) among Malaysian Indians in Klang Valley

Gender	N	Min	Max	Mean	SD
Male	75	160	185	172.47	5.18
Female	75	145	175	164.63	6.83

N: Sample size., Min: Minimum., Max: Maximum., SD: Standard deviation

In males, the stature ranges from 160 to 185 cm with a mean value of 172.47 cm. In females, the stature ranges from 145 to 175 cm with a mean stature of 164.63 cm. The result indicated that mean stature is found to be significantly higher in males than in females.

Table 2: Various mean left and right handprint lengths (in cm) of Malaysian Indians in Klang Valley

Gender	RHPT	RHPI	RHPM	RHPR	RHPL	LHPT	LHPI	LHPM	LHPR	LHPL
Male	12.457	17.093	18.047	16.994	14.859	12.415	17.184	18.068	17.102	14.604
Female	11.051	15.661	16.552	15.643	13.616	11.019	15.557	16.485	15.684	13.539

Table 2 shows the descriptive statistics of various handprint lengths, i.e. diagonal length between the rear metacarpophalangeal crease in the wrist and the anterior tip of each finger in both left and right hands of males and females. The mean left handprint lengths and mean right handprint lengths are not the same, thus showing the bilateral asymmetry. The middle handprint is the longest, and the little handprint is the shortest on both left and right sides.

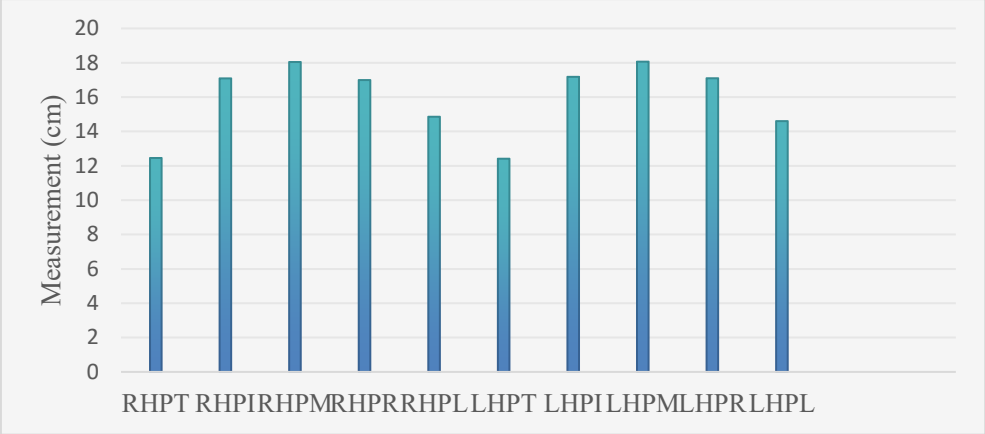

Figure 2: Handprint length measurements among the Male Indians in Klang Valley

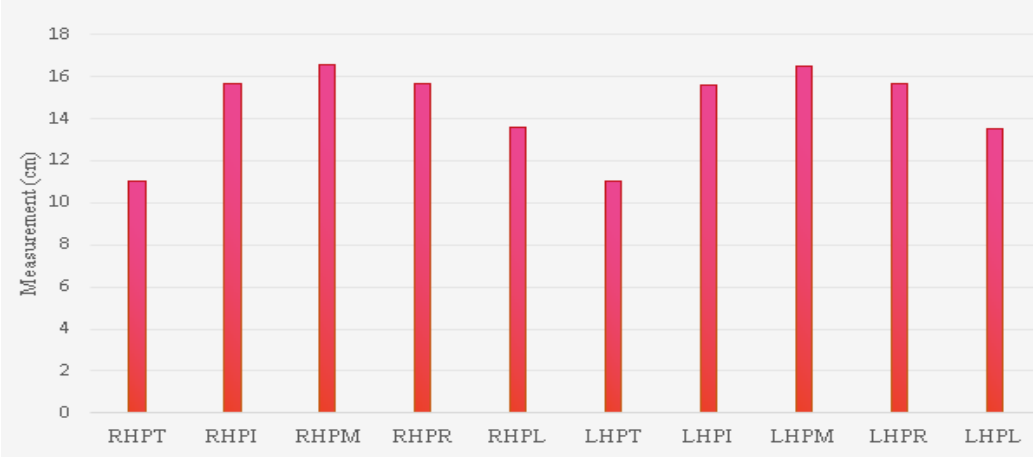

Figure 3: Handprint length measurements among the Female Indians in Klang Valley

Table 2 shows the descriptive statistics of various handprint lengths, i.e. diagonal length between the rear metacarpophalangeal crease in the wrist and the anterior points of each finger in both left and right hands of males and females. The mean left handprint lengths and mean right handprint lengths are not the same, thus showing the bilateral asymmetry. Figure 2 presents the various handprint lengths among male Indians, while Figure 3 shows the various handprint measurements among female Indians in the form of bar graphs for better understanding.

Table 3: Linear regression formulae to determine stature from handprint lengths among pooled samples of Malaysian Indians in Klang Valley

Variable	Linear regression formulae	R	SEE
RHPT	S = 116.854 + 4.398 x RHPT	0.373	5.726
RHPI	S = 126.438 + 3.664 x RHPI	0.350	5.834
RHPM	S = 105.423 + 3.649 x RHPM	0.351	5.828
RHPR	S = 105.838 + 3.843 x RHPR	0.323	5.951
RHPL	S = 112.636 + 3.927 x RHPL	0.306	6.026
LHPT	S = 117.350 + 4.370 x LHPT	0.358	5.796
LHPI	S = 107.284 + 3.742 x LHPI	0.363	5.774
LHPM	S = 106.822 + 3.573 x LHPM	0.332	5.912
LHPR	S = 107.065 + 3.751 x LHPR	0.318	5.971
LHPL	S = 143.383 + 3.788 x LHPL	0.352	6.661

Researchers have shown that linear regression formulae are developed from the analysis of handprint lengths and stature for males and females. In real crime scenarios, it is cumbersome to know if the handprints are caused by male or female offenders. Hence, regression formulae are derived by analysing the combined data of males and females, known as a pooled sample. These derived pooled regression formulae can be used to determine stature from the crime scene handprints for identification [20]. Table 3 depicts the linear regression formulae among the pooled sample to determine stature from various handprint lengths of Malaysian Indians in Klang Valley. Correlation coefficient values (R) show a significant relationship between stature and handprint lengths. The standard error of estimate (SEE) values are acceptable for stature determination for both males and females.

DISCUSSION

Malaysia is a multi-ethnic and multi-religious country, mostly with Malays, Chinese, and Indian people born and living in West Malaysia, and other ethnic groups like Iban, Bidayuh, Melanau, and Lun Bawang are living in East Malaysia. By 2023, Malays population made up 69.9%, Chinese 22.8%, and Indians 6.6%. The Indians in Malaysia consist of full or partial Indian paternal descent, particularly Tamil Dravidians who were born in or immigrated to Malaysia from Tamil Nadu state, India [21]. Selangor is the richest state in Malaysia due to its status as the nation's premier industrial and commercial hub. Among the Indian population in Malaysia, around 14% of Indians live in Klang Valley, Selangor state [22]. The research is based on the forensic finding that a relationship exists between each part of the body and the whole body [23]. The study proved the fact that a relationship exists between stature and handprint anthropometry among Indians living in the Klang Valley, Selangor state.

Table 4: Variations in Stature and Handprint Lengths between Indians from Klang Valley and Malaysia

Klang Valley Indian Handprint Lengths and Stature (in cm)											
Gender	**RHPT**	**RHPI**	**RHPM**	**RHPR**	**RHPL**	**LHPT**	**LHPI**	**LHPM**	**LHPR**	**LHPL**	**Stature**
Male	12.45	17.09	18.04	16.99	14.86	12.42	17.18	18.06	17.10	14.60	172.47
Female	11.05	15.66	16.55	15.64	13.62	11.02	15.56	16.48	15.68	13.54	164.63
Malaysian Indians Handprint Lengths and Stature (in cm)											
Male	12.02	16.77	17.69	16.73	14.58	12.27	16.92	17.82	16.90	14,64	171.43
Female	11.12	15.71	16.56	15.59	13.46	11.14	15.66	16.51	15.54	13.36	159.39

Professor Nataraja Moorthy had conducted similar research relating handprint and stature by including Indians from all the regions of Malaysia [22], that is, integrated Indians in Malaysia. On the contrary, this present study included only Indians from the Klang Valley, but shows variation in stature and handprint anthropometry. Table 4 shows the variations in handprint lengths and stature between Indians living in the Klang Valley and Indians living in the integrated regions of Malaysia. This regional study relating handprint and stature in the Klang Valley provided a novel finding indicating regional variation in the human body of Indians from a forensic perspective.

CONCLUSION

Like a footprint, a handprint is also used for person identification, which is an emerging biometric technique. The study used all ten handprint lengths with stature and developed regression formulae for stature estimation and hence can be used whenever complete or partial handprints are found at the crime scene. The Police Officer is the first person to enter the crime scene who needs to understand the importance of handprint evidence and preserve the crime scene until the arrival of a Forensic Science Expert.

Acknowledgement: The authors are thankful to all Indians in Klang Valley who voluntarily provided samples for this research to complete successfully.

Funding: No specific funding was allotted for this research.

REFERENCES

1. Vaishali Abrol. (2024). Forensic Science: Revealing the clues. *Peer-reviewed book chapter*. DOI: 10.5772//intech.open.1003870.
2. Henry, C. Lee, Elaine, M.P. (2013). Forensic evidence and crime scene investigation. *Journal of Forensic Investigation.* 1(2):1-5.
3. James, W.O. (1969). The evaluation of physical evidence in criminalistics: Subjective or objective process? *The Journal of Criminal Law, Criminology and Police Science. 60(1): 97-101*.
4. Nataraja Moorthy, T., Josua, E. (2018). Forensic subsoil profile investigation in Taman Rakyat Recreation Park, Klang, Selangor, Malaysia. *International Journal of Medical Toxicology & Legal Medicine*. 21(3):171-174.
5. Nataraja Moorthy T, Hidayatul Hazwani H, Cheah Chaw P. (2012). Identification of Fuel Oil in Absorbent and Non-absorbent Surfaces in a Site of Ammonium Nitrate-Fuel Oil (ANFO) Blast. *Malaysian Journal of Forensic Sciences*. 3(10):26-35.
6. Huijie Yang and *et al.,*(2025). Natural gas explosion characteristics and structural failures in typical residence under different ignition positions. *Energy.* 336: 138603.

7. Francisco MG, et al.(2023). Study of latent fingerprints – A review. *Forensic Chemistry.* 35: 100525.
8. Nataraja Moorthy, T., Hasyir, F. (2018). A preliminary study on charring rate of selected Malaysian timbers for fire investigation. *International Journal of Medical Toxicology & Legal Medicine*. 21(3):130-132.
9. Nataraja Moorthy T, Murty OP (2019). Suspicious death – Crime scene evidence indicated the cause of death: An interesting multiple death case report. *International Journal of Medical Toxicology & Legal Medicine.* 22(2): 5-7.
10. Nataraja Moorthy, T., Nor Amalina, A.H, G. (2018). Study on hair morphology to discriminate the dominant ethnic groups in Malaysian Borneo. *International Journal of Medical Toxicology & Legal Medicine*. 21(3):205-207.
11. Nataraja Moorthy, T., Khaja, M (2019). Robber's handwriting on the wall solved the mystery: A rare case report. *Journal of South India Medico-Legal Association.* 11(2):119-123.
12. Laurent, L., Kyra, L., Krist, D.W. (2020). Interpol review of fibres and textiles 2016-2019. *Forensic Science International. 2: 481-488.*
13. Nataraja Moorthy, T., Mohd Hadzri Y. (2010). The study on the microscopic characteristics in heat seals in plastic bags and its stability for application during forensic comparison. *Journal of Indian Academy of Forensic Sciences*. 42(1&2):19-26.
14. Nataraja Moorthy, T., Ahmad, M.M., Boominathan, N., Raman, N. (2014). Stature estimation from footprint measurements in Indian Tamils by regression analysis. *Egyptian Journal of Forensic Sciences. 4: 7-16.*
15. Nataraja Moorthy, T., Povaneswari, G (2018). Inheritance of fingerprint pattern among Indian family members. *International Journal of Medical Toxicology & Legal Medicine*. 21(3):119-121.
16. Nataraja Moorthy, T., Sharmila Devi, S., Eva Tan, LY(2018). Footprint-based gait pattern analysis among Malaysian Indians for person identification from a forensic science perspective. Journal of Management & Science. 16 (1): 53-61.
17. David, JN., Gordon, MC.(2020). Natural Products as Sources of New Drugs over the Nearly Four Decades from 01/1981 to 09/2019. *Journal of Natural Products.* 83: 770-803.
18. Jessica, AM., Randall, B., Michael, RL.(2025). Is there a safe limit for consumption of alcohol? *Journal of Hepatology*. 83(3): 535-540.
19. Nataraja Moorthy T, Rajathi S.(2020). Sexual dimorphism from palm print ridge density among Malaysian Tamils for person identification. *Journal of Krishna Institute of Medical Sciences University.* .9 (1): 51-57.
20. Nataraja Moorthy, T., Khairulmazidah, M., Mohammad Hadzri, Y., Jayaprakash, PT (2011). Estimation of stature based on foot length of Malays in Malaysia. *Australian Journal of Forensic Sciences.* 43: 13-26.
21. Arokiam S, Sundararaja S. (2019), Path dependent development of Indian plantation labourers in Malaysia: Unfolding the historical events in understanding their socioeconomic problems. *Institutions and Economics.* 11(4):79-102.
22. Philip, TA (1990). Formulae for establishing stature from foot size by regression method. *Journal of Indian Academy of Forensic Medicine.* 12: 57-62.
23. Nataraja Moorthy, T., Yugavin, R., Sharan, K., Rus Dina, R. (2023). Determination of stature from handprint anthropometry among Malaysian Indians for person identification. *GAP Indian Journal of Forensics and Behavioural Sciences.* IV(I): 6-11.