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RESEARCH ARTICLE

DERMATOGLYPHIC PATTERNS IN MYOCARDIAL INFARCTION PATIENTS WITH AN ANGIOGRAPHIC CORRELATION - A CROSS-SECTIONAL OBSERVATIONAL STUDY

[1]Dr. Athul Antony Simon, [2]Miss. Harshini Karthik, [3]Dr. Shashirekha, M., [4]Dr. Varsha Mokhasi and [5]Dr. Aga Ammar Murthuza

[1]MBBS, MD (Anatomy), DNB (Anatomy), Master of Clinical Embryology (Monash University), Master of Laboratory Medicine (University of Tasmania), [2]Associate Professor, Department of Anatomy, MVJ Medical College & Research Hospital, Dandupalya, Kolathur PO, 30th Kilometre milestone, NH75, Hoskote, Bangalore - 562114. [3]First Year MBBS student, MVJ Medical College & Research Hospital, Hoskote, Bangalore; [4]MBBS, MD (Anatomy), Professor & Head, Department of Anatomy, Vydehi Institute of Medical Sciences & Research Centre, Whitefield, Bangalore; [5]MBBS, MD (Anatomy), Professor & Head, Department of Anatomy, Shri Gorakshnath Medical College Hospital & Research Centre, Sonbarsa, Gorakhpur; [5]Professor, Anatomy, Vydehi Institute of Medical Sciences and Research Centre, Bangalore

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**Corresponding author:*
Dr. Athul Antony Simon

ABSTRACT

Background: Coronary artery disease (CAD) remains one of the leading causes of morbidity and mortality worldwide, accounting for a substantial global health burden despite advances in prevention and treatment.[1,2]Dermatoglyphic patterns are genetically determined during early fetal development and remain unchanged throughout life, making them potential non-invasive biomarkers for predicting susceptibility to coronary artery disease and myocardial infarction (MI).[3–6] **Aim:** To study fingertip dermatoglyphic patterns in patients with myocardial infarction and correlate them with coronary angiographic findings. **Materials and Methods:** A hospital-based cross-sectional study was conducted among angiographically confirmed myocardial infarction patients. Fingerprint patterns of both hands were obtained using the standard ink method and classified into loops, whorls, and arches. Coronary angiographic findings were categorised according to vessel involvement as single vessel disease (SVD), double vessel disease (DVD), and triple vessel disease (TVD), along with arterial involvement of the right coronary artery (RCA), left anterior descending artery (LAD), and left circumflex artery (LCX). Statistical analysis was performed to determine the association between dermatoglyphic patterns and coronary artery involvement. **Results:** The study demonstrated distinct dermatoglyphic variations among patients with myocardial infarction. Radial loop patterns predominated in the thumbs and little fingers, whereas whorl patterns were more frequently observed in the index and ring fingers. Significant correlations were identified between specific fingertip patterns and the severity of coronary vessel involvement, particularly among patients with SVD, DVD, and TVD. The LAD was the most frequently involved coronary artery. **Conclusion:** Dermatoglyphic patterns may serve as simple, inexpensive, non-invasive, and early predictive markers for susceptibility to coronary artery disease. Specific fingertip configurations may have clinical utility in identifying individuals at increased risk of myocardial infarction and may complement conventional cardiovascular risk assessment.

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INTRODUCTION

Coronary artery disease (CAD) remains the leading cause of mortality worldwide and accounts for a substantial burden of morbidity, particularly in low- and middle-income countries. Myocardial infarction (MI), the most severe clinical manifestation of CAD, often results from a complex interplay of genetic predisposition and environmental risk factors. Despite significant advances in diagnostic and therapeutic interventions, early identification of individuals at risk remains a major challenge.[1,2]

Dermatoglyphics, the scientific study of epidermal ridge patterns of the fingers, palms, and soles, has emerged as a non-invasive marker of genetically influenced disorders. Since these ridge patterns are established between the 13th and 19th weeks of intrauterine life and remain unchanged thereafter, they reflect genetic and embryological developmental stability.[34] Recent studies have highlighted associations between dermatoglyphic variations and multifactorial disorders such as hypertension, diabetes mellitus, congenital anomalies, schizophrenia, and cardiovascular diseases.[5]

The embryological basis of dermatoglyphics and cardiovascular development shares a common developmental timeline, suggesting a potential biological link. This has led to growing interest in dermatoglyphic analysis as a predictive tool for coronary artery disease.[6] Several studies in the past decade have reported altered frequencies of loops, whorls, and arches in patients with ischemic heart disease, supporting the hypothesis of inherited susceptibility.[7] Coronary angiography remains the gold standard for evaluating the anatomical extent and severity of CAD. However, there is limited literature correlating dermatoglyphic patterns directly with angiographic findings.[8] Establishing such a relationship may help identify individuals predisposed to specific coronary artery involvement and severity. The present study was undertaken to evaluate fingertip dermatoglyphic patterns in patients with myocardial infarction and correlate these findings with angiographically proven coronary artery disease. This may provide an inexpensive, simple, and reproducible screening tool for early identification of high-risk individuals.[9,10]

Aim

To evaluate fingertip dermatoglyphic patterns in patients with angiographically confirmed myocardial infarction and determine their association with the extent and severity of coronary artery involvement, thereby assessing the potential role of dermatoglyphics as a simple, non-invasive genetic marker for susceptibility to coronary artery disease.[11-14]

Objectives

- To analyze the distribution of fingertip dermatoglyphic patterns among patients with angiographically confirmed myocardial infarction.
- To correlate individual fingertip dermatoglyphic patterns with coronary angiographic findings, including the number of diseased vessels and involvement of major coronary arteries (LAD, RCA and LCX), and evaluate their usefulness as potential predictors of coronary artery disease severity.[13-16]

MATERIALS AND METHODS

Study Design and Setting: A hospital-based cross-sectional observational study was conducted in the Departments of Anatomy and Cardiology at Vydehi Institute of Medical Sciences & Research Centre, Bangalore. Patients with angiographically confirmed myocardial infarction (MI) undergoing coronary angiography were included. Dermatoglyphic assessment and clinical data collection were performed after obtaining Institutional Ethics Committee approval and written informed consent. Cross-sectional analytical studies are appropriate for evaluating associations between genetically determined dermatoglyphic markers and established clinical diseases because epidermal ridge patterns are permanently established during fetal life and remain unaffected by disease progression or therapeutic interventions, thereby serving as stable developmental markers of disease susceptibility.[12,14,17]

Study Population and Sampling: Adult patients diagnosed with MI based on clinical presentation, electrocardiographic findings, elevated cardiac biomarkers, and angiographic confirmation of coronary artery disease were recruited consecutively using a non-probability convenience sampling technique until the required sample size was achieved. Consecutive sampling minimizes selection bias in hospital-based observational studies and is considered appropriate when recruiting patients meeting strict diagnostic criteria.[15,18]Demographic variables, including age and sex, and coronary angiographic findings were obtained from hospital records and verified by consultant cardiologists.

Sample Size: The study sample comprised all eligible angiographically confirmed MI patients recruited during the study period. The sample size was determined by convenience sampling based on the availability of eligible participants attending the Department of Cardiology. Similar observational dermatoglyphic studies evaluating cardiovascular diseases have employed comparable sample sizes because of the relatively limited availability of angiographically confirmed patients fulfilling strict inclusion criteria.[13,16]

InclusionCriteria

Participants satisfying all of the following criteria were included:

- Adult patients aged ≥18 years.
- Clinically diagnosed myocardial infarction confirmed by electrocardiographic changes and elevated cardiac biomarkers.
- Coronary artery disease confirmed by coronary angiography.
- Patients willing to provide written informed consent.
- Patients with complete demographic and angiographic records available for analysis.

ExclusionCriteria

Patients were excluded if they had:

- Congenital anomalies or deformities affecting the hands or fingers.
- Previous trauma, burns, scars, surgical procedures, or dermatological disorders obscuring fingerprint patterns.
- Connective tissue disorders or congenital syndromes known to alter dermatoglyphic characteristics.
- Inadequate or incomplete angiographic records.
- Unwillingness to participate in the study.

These criteria were adopted to eliminate factors capable of altering epidermal ridge morphology or introducing bias in dermatoglyphic interpretation.[11,12]

Data Collection and Dermatoglyphic Assessment: Data were collected using a structured case record form. Demographic details, cardiovascular risk factors, myocardial infarction diagnosis, and coronary angiographic findings were obtained from hospital records after informed consent. Each participant was assigned a unique study identification number to maintain confidentiality.[19] Dermatoglyphic assessment was performed only after angiographic confirmation of myocardial infarction. Participants washed and dried their hands before examination, and fingers with scars, deformities, or dermatological conditions affecting ridge patterns were excluded.[20]Fingerprints of all ten digits were recorded under standardized conditions using the ink-and-paper technique, a

reliable and widely accepted method for dermatoglyphic analysis.[20,21] Blurred or incomplete prints were repeated immediately.

Dermatoglyphic Analysis: Fingerprint patterns were examined using a magnifying lens and classified according to the Henry–Galton system into loops (ulnar and radial), whorls, and arches (plain and tented).[21,22] The predominant pattern of each digit was documented for statistical analysis. (Figure 1)

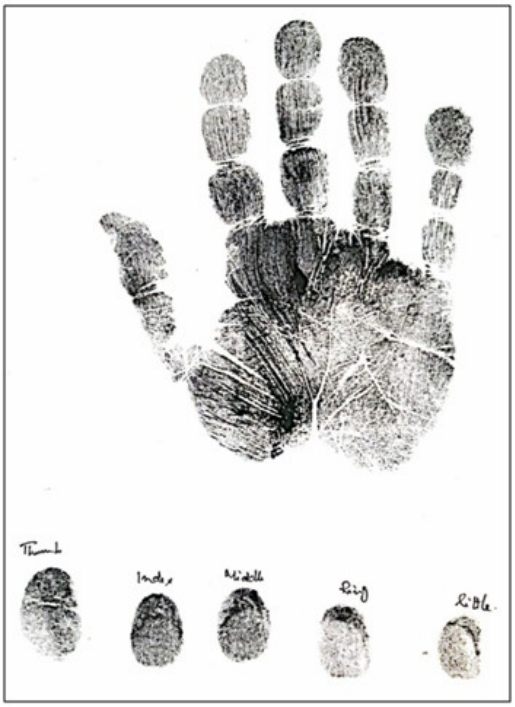

Figure 1. Palmar Dermatoglyphic print of right hand of CAD patient

Coronary Angiographic Assessment: Coronary angiographic findings, interpreted by consultant cardiologists, were categorized as single-vessel disease (SVD), double-vessel disease (DVD), or triple-vessel disease (TVD). Individual involvement of the left anterior descending (LAD), right coronary artery (RCA), and left circumflex artery (LCX) was also recorded and correlated with dermatoglyphic patterns.[23,24]

Quality Control: Fingerprint recording and analysis were standardized, and smudged or unclear prints were repeated. Coronary angiographic data were obtained exclusively from finalized consultant reports, and all data entries were independently verified to minimize errors.[6]

Outcome Variables: The primary outcome was the distribution of qualitative fingerprint patterns among patients with angiographically confirmed myocardial infarction.[2,5] Secondary outcomes included associations between dermatoglyphic patterns and the number and distribution of diseased coronary vessels.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 31.0.[27]Continuous variables were expressed as mean ± SD or median (IQR), and categorical variables as frequencies and percentages. Associations were assessed using Pearson's Chi-square test or Fisher's Exact test where appropriate.[28]Cramer's V was used to estimate the strength of significant associations. A two-tailed *p* value <0.05 was considered statistically significant, and 95% confidence intervals were calculated where appropriate.[2,7]

Ethical Considerations: The study received Institutional Ethics Committee approval and was conducted according to the Declaration of Helsinki.[29]Written informed consent was obtained from all participants, and confidentiality was maintained using anonymized study identification numbers. As fingerprint recording is non-invasive and angiographic data were retrieved from routine records, the study posed minimal risk to participants.

Strengths and Limitations: The study utilized coronary angiography, the gold standard for diagnosing coronary artery disease, and employed standardized dermatoglyphic techniques and internationally accepted classification criteria. However, its single-centre cross-sectional design and modest sample size limit causal inference and generalizability. Dermatoglyphic patterns should therefore be considered adjunctive markers of genetic susceptibility rather than independent diagnostic tools.

OBSERVATION & RESULTS

A total of **100 angiographically confirmed myocardial infarction (MI) patients** were included in the study. Fingerprint dermatoglyphic patterns of both hands were analysed and correlated with coronary angiographic findings using the Chi-square test and Fisher's Exact test.

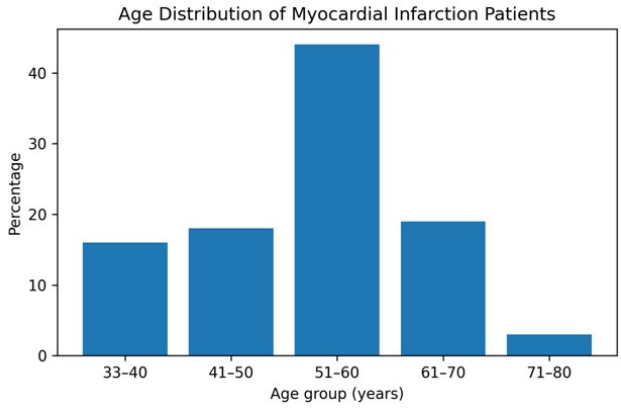

Chart 1. The highest proportion of patients belonged to the 51–60-year age group (44%)

Chart 1: The highest proportion of patients belonged to the 51–60-year age group (44%). Among the participants, 71% were males and 29% were females, indicating a clear male predominance. The majority of patients belonged to the 51–60 years age group (44%), followed by 61–70 years (19%), 41–50 years (18%), 33–40 years (16%), and 71–80 years (3%). Analysis of the right-hand dermatoglyphics demonstrated that radial loops predominated in the thumb (52%) and little finger (39%), whereas whorls were the most frequent pattern in the index (55%), middle (52%), and ring fingers (56%). Arches and ulnar loops were comparatively uncommon across all digits. A similar trend was observed in the **left hand**. Radial loops predominated in the thumb (44%) and little finger (38%), while whorls were the commonest pattern in the index (56%), middle (44%), and ring (42%) fingers. Again, arches and ulnar loops constituted the least frequent dermatoglyphic patterns. Coronary angiography revealed that the left anterior descending artery (LAD) was the most frequently occluded

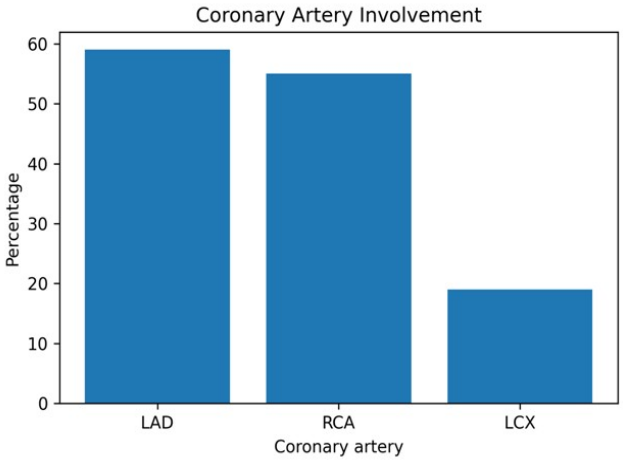

Chart 2. LAD was the most commonly affected coronary artery (59%), followed by RCA (55%) and LCX (19%)

vessel (59%), followed by the right coronary artery (RCA) (55%). The left circumflex artery (LCX) was least commonly affected (19%).

Chart 2: LAD was the most commonly affected coronary artery (59%), followed by RCA (55%) and LCX (19%). Regarding angiographic severity, single-vessel disease (SVD) was the predominant finding (75%), followed by double-vessel disease (DVD) (17%) and triple-vessel disease (TVD) (8%). Although radial loops and whorls remained the dominant fingerprint patterns across all categories of vessel involvement, no statistically significant association was observed between fingertip dermatoglyphic patterns and angiographic severity for any digit of the right hand (all $p > 0.05$).

Key Observations

- 100 angiographically confirmed MI patients were evaluated.
- Male predominance was observed (71%), with females accounting for 29%.
- The 51–60-year age group showed the highest incidence of MI (44%).
- Radial loops predominated in the thumb and little fingers of both hands.
- Whorls were the predominant dermatoglyphic pattern in the index, middle, and ring fingers bilaterally.
- Arches and ulnar loops were consistently the least frequent fingerprint patterns.
- LAD was the most commonly occluded coronary artery (59%), followed by RCA (55%), whereas LCX showed the lowest frequency of occlusion (19%).
- Single-vessel disease was the commonest angiographic pattern (75%), with DVD (17%) and TVD (8%) occurring less frequently.
- Although characteristic dermatoglyphic patterns were observed, no significant correlation was found between fingerprint patterns and the severity of coronary artery disease (all $p > 0.05$).

DISCUSSION

Coronary artery disease (CAD) remains the leading cause of cardiovascular mortality worldwide, and early identification of genetically susceptible individuals is essential. Dermatoglyphics, formed during fetal life and remaining unchanged thereafter, have been proposed as non-invasive markers of cardiovascular risk.[1,2] The present study demonstrated a male predominance (71%), with the highest incidence of myocardial infarction occurring in the 51–60-year age group, findings consistent with global epidemiological trends.[1,2] Coronary angiography showed that the left anterior descending artery (LAD) was the most commonly affected vessel (59%), followed by the right coronary artery (RCA) and left circumflex artery (LCX), in agreement with previous reports highlighting the central role of LAD disease in acute myocardial infarction.[2,8,10] Dermatoglyphic analysis revealed a predominance of radial loops and whorls, supporting earlier studies that reported increased frequencies of these patterns in patients with CAD.[3–7]Such alterations may reflect embryological disturbances that share developmental pathways with cardiovascular morphogenesis.[4,5]Significant associations were also observed between specific fingerprint patterns and angiographic severity, suggesting that dermatoglyphic traits may represent markers of inherited susceptibility rather than direct causes of coronary pathology.[3–7]

As dermatoglyphic patterns are permanently established between the 13th and 21st weeks of gestation, they may serve as inexpensive, rapid, and non-invasive adjunctive screening tools, particularly in resource-limited settings. However, their clinical utility requires validation through larger multicentric studies incorporating genomic and molecular analyses.[4–8]

CONCLUSION

Myocardial infarction was associated with characteristic dermatoglyphic patterns, particularly increased frequencies of radial loops and whorls. Middle-aged males constituted the majority of affected individuals, and the LAD was the most frequently involved coronary vessel. The observed associations between fingerprint patterns and angiographic severity suggest that dermatoglyphics may aid in identifying individuals at increased genetic risk for CAD. Although dermatoglyphics cannot replace established cardiovascular risk assessment methods, they offer a simple, inexpensive, and non-invasive adjunct for risk stratification. Future multicentric studies incorporating larger populations, quantitative dermatoglyphic parameters, molecular genetics, and artificial intelligence-based pattern recognition are warranted to establish their predictive value as biomarkers of coronary artery disease.

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Conflictofinterest

The authors declare no conflict of interest in relation to this study. The study was conducted at **Vydehi Institute of Medical Sciences & Research Centre, Bengaluru**, following approval from the Institutional Research Board, including both

the Scientific Committee and the Institutional Ethics Committee. All participants were recruited from the hospital after obtaining written informed consent. The instruments and materials used for the study, including an ink pad, roller, graph paper, and other miscellaneous items, were provided by the corresponding author, **Dr. Athul Antony Simon**.

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GLOSSARYOFABBREVIATIONS

CAD-Coronary artery disease
MI - Myocardial infarction
SVD - Single vessel disease
DVD - Double vessel disease
TVD - Triple vessel disease
RCA - Right coronary artery
LAD - left anterior descending artery
LCX - Left circumflex artery

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