Materials & Methods

Research is defined as scientific and diligent study, investigation or experimentation in order to establish facts and analyze their significance. The product of findings of a given research should be authentic and should add a piece of knowledge to the current mainstream.

Before the medical theories are accepted as practicable, they should be substantiated by practical experience. Mere theoretical argumentation based on inference signifies nothing. Observational studies are considered as one of the best tools to reach to a certain conclusion in the medical field.

MATERIAL AND METHODS:

Following materials were utilized for the study

1. Ten Fingerprint cards (TFC)
2. Forensic Fingerprint pads with black ink
3. Cotton Swab
4. Fingerprint card holders
5. Fingerprint Magnifier (Waltex Model 8X)
6. Fingerprint ridge counter
7. Measuring Ruler
8. Proforma for determination of Prakriti

The study was conducted on 3504 healthy subjects (1752 males and 1752 females). Collection of Utmost information regarding the history and present scenario of dactylography was studied under the guidance of experts.

1. The healthy subjects (1752 males and 1752 females) in the age group of 18-60 years were included in the study.
2. Prior written informed consent for the voluntary participation in the research work was obtained from the subjects.
3. Fingerprints of the study subjects were procured by rolling over method which provides an inflated area for the display of the more important ridge impression in each finger pattern. [87,88]
4. All obtained fingerprints were analyzed thoroughly in regards to their various ridge characteristics.
5. Prakriti of a Person was analyzed with the help of pre-validated prescribed proforma for Prakriti analysis & general examination.
6. Attempts were made to find out relationship between finger ridge characteristics of a person with his/her gender & Prakriti.

**Figure-11: Instruments & Equipments**

- **Forensic Fingerprint Pad**
- **TFC Card Holder**
- **Fingerprint Magnifier**
- **Ridge Counter**
- **Measuring Ruler**
- **Cotton Swab**
Materials & Methods

Figure-12: Process of Recording Fingerprints

Figure-13: Sample Fingerprint Card
INCLUSION CRITERIA: -

1. Healthy Subjects of either gender (Male & female) willing to participate in the study between the age group of 18 to 60 years

EXCLUSION CRITERIA: -

1. Subjects below 18 years & above 60 years of Age
2. Subjects with major deformity (congenital/accidental) on the upper extremity (Syndactyl, Polydactyl)
3. Gender Identity Disorder (GID)
4. Subjects with Leprosy affecting fingers.

ETHICAL CONSIDERATION:

The study was conducted after the approval of the Institutional Ethical committee of Tilak Maharashtra Vidyapeeth, Pune, formed according the ICMR guidelines by the Department of Health and Family Welfare. Present Study was also registered under Clinical Trials Registry- India (CTRI), National Institute of Medical Statistics (CTRI/2013/10/004054). Provisions were made to the volunteers for withdrawal from the study at any moment for reliable reason. Subjects were informed in local language about the survey and informed written consent was obtained before enrolling them in the study. All procedures in the study were carried out by maintaining strict confidentiality. Volunteers’ medical condition and data were not disclosed to or discussed with any third party.

PROCEDURE

1. The files of Ten-Fingerprint Cards (TFC) of males and females, 1752 each, aged between 18 and 60 years, were prepared.
2. The subjects were asked to clean their hand with tap water and soap and dry to remove all dirt.
3. For collection of fingerprint, the participant was asked to keep his arm relax and not to voluntarily roll the fingers to avoid smearing.
4. The finger bulbs were rolled on the Forensic Fingerprint pads in such a way that the ink will be applied to the tips evenly by rolling the thumbs towards the subject’s body and other fingers were rolled away from the body, i.e. thumb in fingers out method.
5. By the similar fashion of thumb in fingers out method the rolled impressions of each finger were obtained on the Ten Finger Cards (TFC) in the allotted space for the finger.

6. If smudging of the impression occurred, the procedure was repeated on new TFC.

7. Later on the subjects were asked to clean their hand and fingertips. In this way each and every individual’s fingerprints were obtained on TFC.

8. Prakriti analysis form was filled after obtaining the fingerprints.

**METHODOLOGY OF FINGERPRINT OBSERVATIONS:**
The fingerprint ridges and ridge characteristics of ten fingers on TFCs were observed under a Fingerprint magnifier of 8X magnifying power (Waltex model). The square of 5mm x 5mm (25 mm² - EFGH) [89,90] was drawn on a transparent sheet. Study parameters like ridge count and other minutiae structures were observed within this square only; whereas pattern of the fingerprints was observed on the basis of total impression.

Although sometimes in few individuals ridge characteristic were consisting more than one type but it was counted as one category. For example in Short ridge falling in the area of 25 mm², which consists of one short ridge and two ridges endings at the end ridge, it was counted as only one short ridge. For spur, that looks like a bifurcation that has one short ridge invigorating off the long ridge, was counted as one spur. While Lake and bridge shows two bifurcations but while counting it was considered as one lake and one bridge, respectively. Bifurcation, ridge ending and dot were considered as a bifurcation, ridge ending and dot, respectively.

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**Fig-14: Square area used for counting the right fingerprint ridges and the ridge characteristics**

**Fig-15: Square area used for counting the left fingerprint ridges and the ridge characteristics**
Materials & Methods

Fingerprint Impression Technique:
Before starting the present study, two methods were tried for recording fingerprints on pilot basis; the conventional glass slab method and the other is by using forensic ink pad.

1. **Glass Slab Method:** In this method for the collection of fingerprint, a plain glass plate of 12 × 12 inches was cleaned and evenly smeared with a thin layer of black printers ink by using the inking roller. The subjects were asked to clean and dry their hands and later on asked to roll their fingertips by thumb in fingers out method. Afterwards rolled impressions of each finger were collected on the proforma in the allotted space for each finger.

2. **Forensic Ink Pad:** In this method, instead of ink, patented solutions are utilized for smearing on the fingertips to obtain the ridge impressions which also appear black on paper. Other method is similar like glass slab method but the use of forensic fingerprint pad avoid lengthy and untidy process of obtaining fingerprints as it happens in former method. Other details are provided under “PROCEDURE” in this chapter.

It was found that using forensic ink pad gave better results than that of the glass slab technique. The forensic inking pad method helped to avoid smudging of the fingerprints, as it frequently happened with the glass slab method. The forensic ink pad is also easy to carry and use. It is also convenient for multiple uses which are difficult with the glass slab method. Other method suggested by few scholars is the Pre-inked strips, which were also claimed to be better in recording the fingerprints. Other drawbacks of using glass slab for recording fingerprints were as follows -

1. The procedure of using glass slab was awkward, untidy and time consuming.
2. Lopsided smearing of the ink on the glass slab was responsible for poor quality prints.
3. Smudging of fingerprints was observed several times.

Therefore, it was decided to use forensic ink pads rather than conventional methods of glass slab for recording the fingerprints of the participants in the present study.
**METHODOLOGY OF PRAKRITI ANALYSIS:**
Prakriti of individual participant was analyzed with the help of proforma designed on the basis of Prakriti Vichay Software developed by C-DAC (Centre for Development of Advance Computing) which is validated tool through multi-centric national level trials for Prakriti analysis & general examination. After filling the proforma of individual (n=3504) designed for the analysis of Prakriti, the physical, physiological and psychological characters of each individuals were examined to determine their respective Prakriti with predominance of Dosha. In total 146 characters of Vata Prakriti, 122 characters of Pitta Prakriti and 128 characters of Kapha Prakriti were included while designing the proforma by referring major classics of Ayurveda i.e. Brihattrayi. Later on the characters representing particular dosha were observed in the individual participant and materialized in the form of percentage by following formula -

\[
\text{Percentage of Dosha Characters} = \frac{\text{Number of Character Present}}{\text{Total Number of Characters}} \times 100
\]

Individual showing the maximum percentage of particular Dosha characters was included in the group of predominance of respective Dosha. Even though there may be presence of other two Dosha characters but obviously in lower percentage. In other words it can be said that Dosha Anubandha was not taken in to consideration while dividing the subjects in three major groups.

**OBSERVATIONS, ANALYSIS AND RESULTS:**
The data obtained during the study was analyzed concerning specific comparisons of means and calculations were performed. Observations and results were deduced from the study conducted. The data collected was subjected to the analysis using SPSS Windows version 17.0. & Microsoft Excel 2007. Statistical significance was considered at p-value <0.05. T-test was conducted to compare fingerprint ridge density and ridge characteristics for gender variations (Male & Female) while ANOVA was used to analyze the significance of difference in three groups of Prakrati viz. Vata Pradhana, Pitta Pradhana and Kapha Pradhana. Likelihood ratios were also calculated to find the costiveness of the data collected.

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