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# BIOLOGICAL SCIENCES

## PHYSIOLOGY & MOLECULARBIOLOGY

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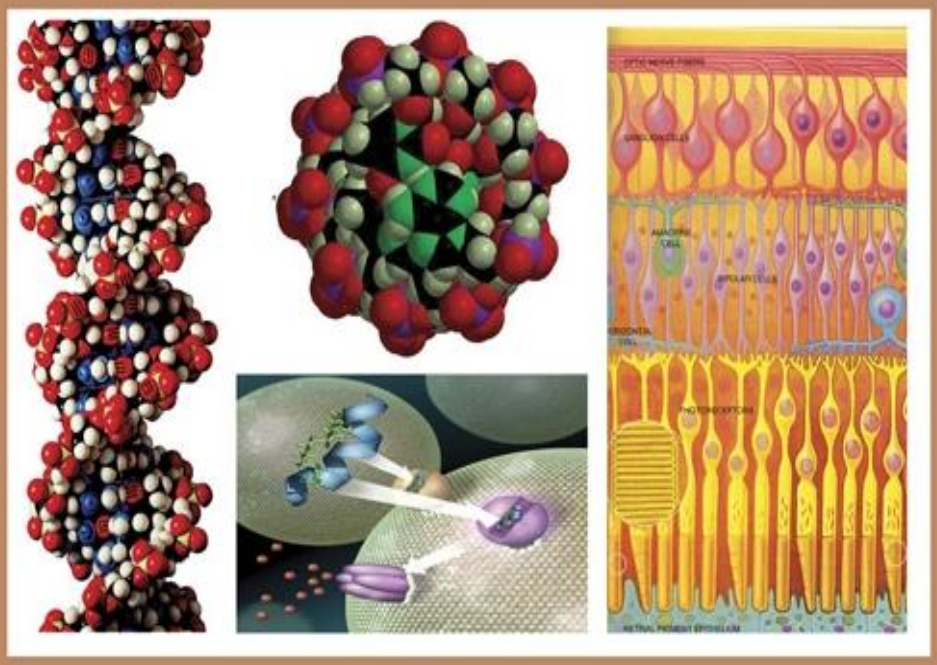

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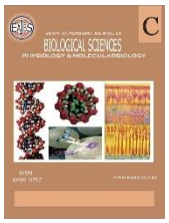

# Palmar Dermatoglyphics and Lip prints Morphological Patterns as Genetic Markers among Hypertensive Patients (A study on the Upper Egyptian Females Population at Assiut University Teaching Hospital)

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Dermatoglyphics, hypertension, lip prints, Upper Egypt.

**ABSTRACT**

**Background:** Both dermatoglyphics and lip prints/cheiloscopic patterns are genetically determined. Hypertension (HTN) is a major risk factor for cardiovascular disease and causes 17.9 million deaths worldwide each year. Hypertension is also known to have a genetic background as it runs in families.

**Objectives:** This study was conducted to recognize individuals with a genet predisposition to have hypertension and to determine significa dermatoglyphic parameters **a**nd lip print characters applicable to hypertension, als to assess their reliability and validity.

**Subjects and Methods:** 100 female hypertensive patients were taken as the te subjects from the Assiut University Hospital, and an equal number of health normotensive volunteers from the general population were utilized as control Fingerprint patterns of both groups were recorded using Cummin's method. The dermatoglyphic analysis was then performed on the prints. Lip impressions wer made using red or brown lipstick, A4 size white bond paper, and cellophane tap The types of grooves were categorized using Suzuki and Tsuchihashi's taxonom and the results were statistically examined.

**Results:** Significant dermatoglyphic and cheiloscopic results were detected in th hypertensive group compared to the normotensive control. The data revealed a high frequency of ulnar loop patterns in both normotensive and hypertensive followed b the whorl and arch fingerprint patterns. A significant decrease in the a-b ridge cou and 'atd' angle was declared in the hypertensive group compared to the contro Regarding the cheiloscopic patterns, the obtained data showed significantly high frequencies of lip-branched patterns and irregular/undifferentiated patterns in th hypertensive group in comparison to the normotensive one. **Conclusion:** Significa indicators of dermatoglyphic and cheiloscopic features were demonstrated in th hypertensive group compared to the control one. so, they might be employed as reliable genetic marker for the screening of hypertension.

## INTRODUCTION

Hypertension is a worldwide health problem and now even high normal blood pressure (HNBP) is associated with a 2- to 3-fold increased risk of developing high blood pressure. Cardiovascular disease (CVD) is independently associated with HNBP (Fares & Soliman, 2022).

Since 1990, the number of people with high blood pressure has doubled worldwide. This is according to extensive studies of the prevalence and treatment of the condition (Müller-Nurasyid, 2021; Zhou *et al.*, 2021).

Hypertension is a leading cause of the global burden of disease and death. A major medical advance is an ability to better determine in advance which people are at increased risk of developing high blood pressure in the future. (Sangeeth *et al.*, 2022.)

In support of this, several studies have revealed a correlation between certain dermatoglyphic indicators and hypertension. This association might be explained if there is a link between the risk of hypertension in adulthood and the fetal development of dermatoglyphics. If this hypothesis could be proven, it would be very beneficial from a therapeutic perspective since dermatoglyphic markers could then be utilized to screen out those who could be at a higher risk of developing hypertension. (Wijerathne *et al.*, 2015).

Dermatoglyphics is the science that deals with studying the epidermal ridges found on the surface of the palms, fingers, soles, and toes. (Cummins & Midlo, 1961, Akinola & Olawuyi, 2022)) . The fingerprints develop in relation to the volar pads which are fully developed during the third to the fifth month of the foetal life and once formed never change in the life of an individual. Any abnormalities due to genetic or other factors express their effect before the end of the fifth month of foetal development.

Dermatoglyphics is the science that studies the epidermal ridges on the surfaces of the palms, fingers, soles, and toes (Cummins & Midlo, 1961). Fingerprints are formed in relation to the volar pads, which are fully grown between the third to the fifth month of fetal development and never alter in an individual's life. Any anomalies caused by genetic or other reasons manifest before the end of the fifth month of foetal development and are reflected in the dermatoglyphic patterns (Agarwal *et al.*, 2018; Sehmi, 2018).

Moreover, apart from their considerable importance in forensics, and anthropology, they have numerous applications in medicine and dentistry to conjecture various systemic, oral, dental, and maxillofacial illnesses (Agarwal *et al.*, 2018; Kumar, 2021). This is because of the well-established link between fingerprint patterns and several systemic disorders, such as diabetes mellitus (Ramanathan et al., 2020; Umana, 2013), kidney diseases (Wijerathne *et al.*, 2020), hypertension (Akinola & Olawuyi, 2022), schizophrenia (Petrova *et al.*, 2022), cervix carcinoma (PrAvAllIKA *et al.*, 2022), and also, hereditary disorders (Crawford and Duggirala, 2014).

Cheiloscopy is the inspection of lip prints, which are typical lines and fissures in the shape of wrinkles and grooves present in the transition zone of the human lip between the inner labial mucosa and outer skin. It is unique to individuals, just like fingerprints. These patterns do not change under climatic conditions, minor trauma, ulcers, and herpes affection (Amith *et al.*, 2011; Shende & Jangam, 2019)

Dermatoglyphics has proven to be a highly useful tool for identifying numerous anomalies or diseases that are linked to genes. The same may be stated for lip prints, which, like dermatoglyphics, are unique to each person (Adamu, 2012) and have been proven to be extremely helpful genetic markers in some congenital and clinical disorders (Goud et al., 2022)

The fact that different populations differ in their dermatoglyphic and cheiloscopic characteristics stimulated many studies on normal upper Egyptian lip patterns (Fahmy, 1977) and those suffering from genetically controlled diseases. For example, talipus equinoverus (Ibrahim & Hassan, 1979) mental retardation (Ahmed, 1982), congenital heart diseases (Ahmed & Soliman, 1989), and cleft palate and lip prints (Saad *et al.*, 2005).

These studies were the impetus for the conduction of this work examining different dermatoglyphic features in

hypertensive individuals. To the best of our knowledge, this is the first study to look at the relationship between upper Egyptians' dermatoglyphics and lip prints and hypertension.

Taking in our consideration the seriousness of this disease and seeking for simple reliable, cost-effective, noninvasive test this study was devoted to a trial to establish dermatoglyphic characterization and lip prints characters applicable to hypertension in the upper Egyptian female population that could be genetic markers, helping in detection of individuals liable to develop the disease. This approach could be used as a screening tool for hypertension and hence reduce mortality and morbidity.

## MATERIALS AND METHODS

**Subjects:**

In the present study, 100 females aged 30-50 years clinically diagnosed as hypertensive cases were utilized. The patients were selected from those who attended the Outpatient Clinic of the Internal Medicine department, at Assiuţ University. A healthy normotensive volunteer control included 100 females from the general population belonging to the same range of age and demographic profile who also, corresponded for economic status and, lifestyle. The patients were included after the screening questionnaire.

From the whole number (100) either the healthier or the hypertensive; the palmar and fingerprints were taken. But the lip prints were taken from 60 hypertensive patients and 60 control.

**Ethical Approval**: It was obtained, as well as informed consent from both groups. The correspondents were given a validated questionnaire to fill out that contained patients' biodata such as name, age, marital status, clinical disorders, and occupation. The participants were given a detailed explanation of the study's protocol and goals before giving their written consent. The Assiut University faculty of medicine's institutional ethical committee gave its approval to all the study's procedures.

**Inclusion Criteria:**

1. Female patients diagnosed with Hypertension.
2. Upper Egyptians individuals.
3. Age from 30-50 years.

**Exclusion Criteria:**

1. Individuals with any personal or family history of congenital or chronic disorder that may be reflected on their print.
2. Possibilities of other inherited disorders.

**For Palmar Dermatoglyphics:**

I. Individuals suffering from any chronic skin illnesses such as eczema, leprosy, or chronic dermatitis

II. Individuals who are having scars, congenital or acquired anomalies because of trauma on fingers

**For Lip Prints:**

I. Individuals who have any signs of lip disease, injury, dry lips, cleft lip, inflammation, ulcer, pathology, deformity, or surgical scarring on the lips

II. Individuals allergic to cosmetics.

**Methodology:**

**A. Palmar and Finger Prints Collection:**

To remove any oil or filth, participants were encouraged to wash and dry their hands with soap and water. Cummin's approach, which included the use of an ink pad, was used to collect palmar and fingerprints. The ten fingers were pressed against a stamp pad and stamped on white duplicating paper; individuals were instructed to roll their finger pads from one side of the nail to the other to improve the quality of the impressions. Also, the palm of clean dried hands was smeared with the ink and pressed against the paper to exhibit palmar creases and the interdigital areas. The prints were captured on white duplicating paper and viewed with a magnifying lens (x5) and the loop; arch and whorl fingerprint patterns on each finger were observed and documented based on the ridges and furrows. (Cummins & Midlo, 1961; Deshpande *et al.*, 2019)

There will be no differentiation between the various whorl patterns

(Concentric design); also, a tented arch will be described simply as an arch (dermal ridges pass from one margin of the digit to the other with a gentle, distally bowed sweep). The loop was classified as either ulnar (opens to the ulnar margin) or radial (opens to the radial margin) (Figs.1&2) (Holt, 1961; Kahn *et al.*, 2001).

The palmar flexion creases were regarded aberrant if the proximal and distal transverse creases fused into a single transverse palmar crease, known as a Simian Crease, or if either of the transverse creases crossed the palm entirely, known as Sydney Crease.

According to (Livshits *et al.*, 1987), a straight line was drawn from the triradius at the base of the index finger to the triradius at the base of the middle finger (Fig. 2), and the number of intersecting ridges were counted. This is referred to as a - b ridge counts.

In regards to atd' angle, it can be determined by drawing lines from the triradius 'a' in the first interdigital area to the axial triradius 't' and from this to the triradius 'd' of the fourth interdigital (Fig 3**).** Using a protractor, the numerical value of the "atd" angle was calculated.

**The Following Measurements Were Obtained in Hypertensive and Control Groups:**

1. Percentage Frequencies of palmar dermatoglyphics patterns in both hands.
2. Dermatoglyphic pattern distribution for each finger in both hands.
3. The a-b ridge count of both hands.
4. Palmar flexion creases that are abnormally detected, such as the Simian crease and the Sydney line.
5. Palmar atd angles in both hands.

The different digits will be labeled as follows: Thumb (I), Index finger (II), Middle finger (III), finger (IV), and little finger (V).

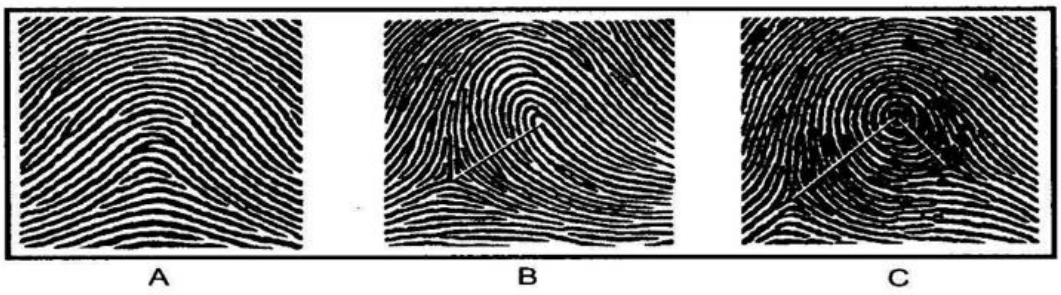


**Fig.1:** Fingertip patterns showing: an arch (panel A), loop (panel B), and whorl (panel C). Adopted from Holt (1961).

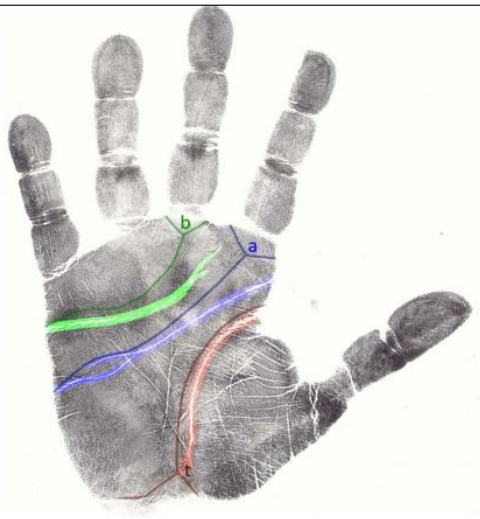


**Fig.2:** A photograph representation of palm of the right-hand representing a and b triridii.

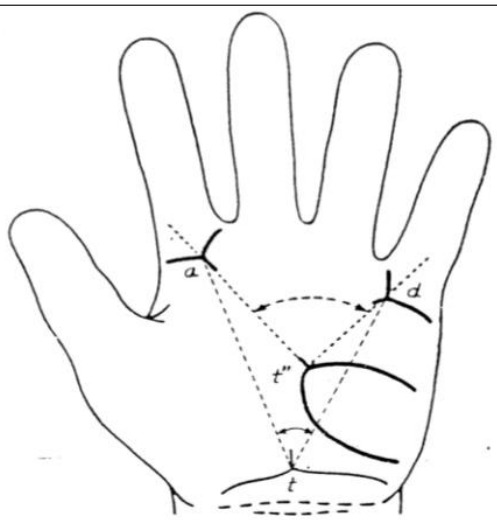


**Fig.3:** A diagrammatic representation of the left hand for the position of palm angles.

**B- Lip Print Collection:**

According to (Costa & Caldas, 2012) in order to get clear lip prints, red or brown, non-glossy, non-persistent, non-metallic lipstick was utilized Each participant was instructed to properly clean their lips for sanitary reasons. A single motion was used to uniformly apply lipstick to both the upper and lower lips. The participants were instructed to massage their upper and lower lips together to apply the lipstick evenly throughout all lip areas before letting it dry for two minutes. Each lip was individually imprinted using cellophane tape that was 2.4 cm wide.

Participants were instructed to gently open their mouths and maintain this position throughout the procedure. It takes a few seconds for the print to appear on the cellophane tape after the glued portion of the tape has been adhered to the lower lip and held in place. In order to prevent distortion on the impression recordings, participants were instructed not to move their lips during the procedure. In order to prevent the smearing of the print, the strip is then delicately lifted off the lips from one end to the other. After that, the tape is carefully placed onto an A4 sheet of white paper, taking care not to stretch or bend the tape in order to create a permanent record that can be examined at any convenient time.

Similarly, the upper lip was also recorded. To ensure that we had at least one complete, well-defined print for an accurate evaluation of the various parts of the lip and to prevent subjectively applying different pressure to the used paper, at least four prints were taken from each participant. The residual lipstick on the lips was wiped using makeup remover wipes after making sure that all parts of the lips were properly registered on paper. For usage by the following participant, the pencil lipstick's tip was then sharpened and disinfected by soaking it in povidone-iodine.

**Lip Print Analysis:**

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A Cannon Image Scanner with a resolution of 600 ppi was used to scan the lip prints, and Adobe® Photoshop® 7.0 was used to view them. The scanned photos were cropped, reversed to grayscale, and then divided into equal grids using the software's ruler before being saved as a PSD (Adobe Photoshop Image) file in a separate folder (Fig. 4).

As the lip prints were divided into six sextants (three areas in each lip), the investigation is carried out by drawing two lines perpendicular to the transverse line and passing the two highest points of the philtrum on the right upper lip (RUL), middle-upper lip (MUL), left upper lip (LUL), left lower lip (LLL), middle lower lip (MLL), and right lower lip (RLL) (Moshfeghi *et al.*, 2016).

The classification proposed by (Suzuki and Tsuchihashi, 1970) (Fig.4, 5) was used to analyze the records because it is the most commonly used classification worldwide (Devi *et al.,* 2015; Jeergal *et al.*, 2016). Each lip record was blindly examined by two trained observers twice on two different days to assess the validity and reliability of the analysis process.

According to the classification system established by(Suzuki & Tsuchihashi, 1970) lip prints can be divided into the following types: Type I: incompletely vertical lip print patterns; Type I': incompletely vertical lip print patterns; Type II: "Y" or branching pattern; Type III: criss-cross pattern; Type IV: reticular lip pattern; and Type V: irregular or irregular/ undifferentiated pattern. These lip prints are unique to an individual because they don't match any of the other lip patterns. It should be mentioned that in this study we considered Type I and I’ were considered as one type vertical.

The study design was an Observational descriptive study. The obtained data from dermatoglyphic and chelioscopic examinations were subjected to statistical analysis

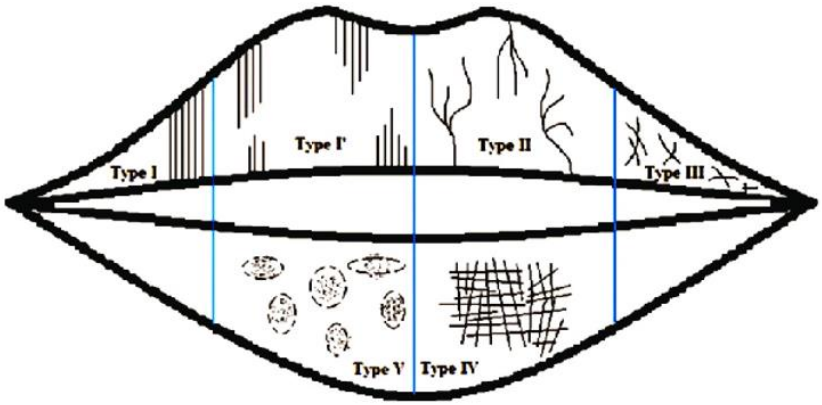



**Fig. 4:** Suzuki and Tsuchihashi classification as modified from (Jeergal et al. 2016).

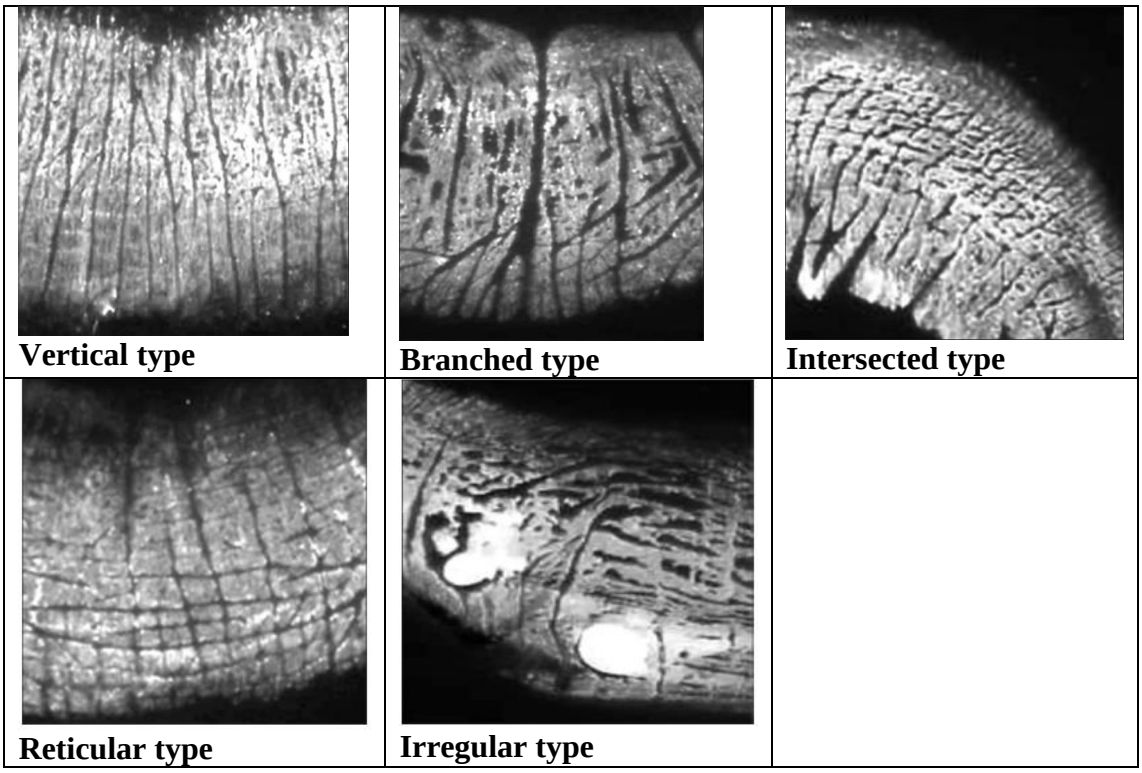



**Fig. 5:** Different shapes of lip prints, from (Jeergal *et al.* 2016).

**Statistical Analysis:**

To analyze the data the Statistical Package for the Social Sciences (SPSS) version 21 (IBM Business Corporation, Chicago, IL, USA) was used. This step comes after the study observations were entered into Microsoft Excel workbooks. Chi-square and the student's test were used for statistical analysis. All the parameters were subjected to statistical comparison. After analyzing the data, $P < 0.05$ was determined to be statistically significant

## RESULTS

The results of the present study are shown in tables (1-10) and histograms (1-10).

**Fingerprint Patterns:**

**A.Right-Hand Fingerprint Patterns:**

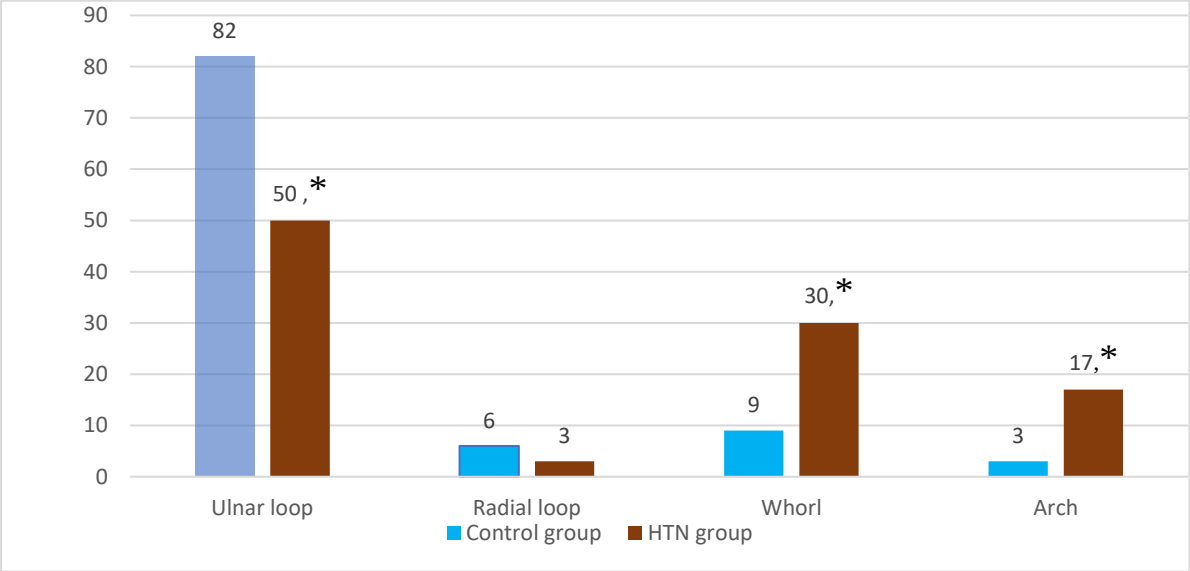
As regards the fingerprint patterns of the right hand of the studied control group, the ulnar loop was the most frequent pattern (82%) followed by the whorl (9%), radial loop (6%), and arch (3%), respectively. As regards the fingerprint patterns of the right hand of the studied hypertensive group, it was noticed that the ulnar loop was also the most frequent type (50%) followed by the whorl (30%), the arch (17%), and the radial loop (3%) (Table 1, Histogram 1).

The present study declared that the ulnar loop pattern was significantly decreased among the right-hand fingerprint patterns of the hypertensive group in comparison to those of the control group (p-value = 0.000). The whorl and the arch patterns were significantly increased among the hypertensive group in comparison to the control one (p = 0.000, 0.001), respectively The radial loop pattern was insignificantly decreased among the hypertensive group in comparison to those of the control group (p = 0.498). (Table 1, Histogram 1).

**Table 1**: Fingerprint pattern frequencies of the right hands in the hypertensive and control groups**.**

| Fingerprint pattern | Control (n= 100) | | HTN (n= 100) | | p-value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Ulnar loop | 82 | 82.0 | 50 | 50.0 | 0.000* |
| Radial loop | 6 | 6.0 | 3 | 3.0 | 0.498 |
| Whorl | 9 | 9.0 | 30 | 30.0 | 0.000* |
| Arch | 3 | 3.0 | 17 | 17.0 | 0.001* |

Data expressed as frequency (percentage) - P-value was significant if < 0.05
HTN: hypertension - * Significant




**Histogram 1:** Right-hand fingerprint pattern percentage in the hypertensive and control groups.

**b. Left-Hand Fingerprints Patterns:**

The patterns of the fingerprints of the left hand of the control group of the present study showed that the ulnar loop was the most frequent pattern (91%) followed by the arch (4%), the radial loop (3%), and the whorl (2%), respectively. The most frequent pattern of the fingerprints of the left hand of the hypertensive group of the present study was the ulnar loop (51%) followed by the whorl (27%), the arch (20%), and the radial loop (2%), respectively (Table 2, Histogram 2).

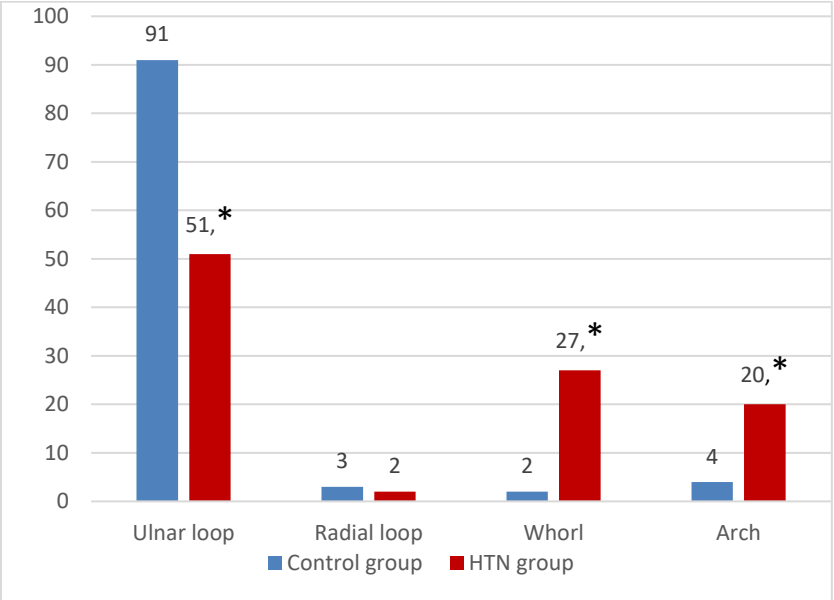
The present study declared that the ulnar loop pattern was significantly decreased among the left-hand fingerprint patterns of the hypertensive group in comparison to those of the control group (p-value = 0.000). The whorl and the arch patterns were significantly increased among the hypertensive group in comparison to the control one (p = 0.000, 0.000), respectively. The radial loop pattern

was insignificantly decreased among the hypertensive group in comparison to those of the control group (p = 1.000). (Table 2, Histogram 2).

**Table 2:** Fingerprints pattern frequencies of the left hands in the hypertensive and control groups.

| Fingerprint pattern | Control (n= 100) | | HTN (n= 100) | | p-value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Ulnar loop | 91 | 91.0 | 51 | 51.0 | 0.000* |
| Radial loop | 3 | 3.0 | 2 | 2.0 | 1.000 |
| Whorl | 2 | 2.0 | 27 | 27.0 | 0.000* |
| Arch | 4 | 4.0 | 20 | 20.0 | 0.000* |

Data expressed as frequency (percentage) - P-value was significant if < 0.05
HTN: hypertension - *Significant




**Histogram 2:** Left-hand pattern fingerprints pattern percentage in the hypertensive and control groups**.**

**c. Distribution of Dermatoglyphic Patterns for Each Finger of The Right Hand:**

The frequency distribution of dermatoglyphic patterns for each finger of the right hand of both control and hypertensive cases is shown in (Table 3/Histogram 3). The results revealed that a lower frequency of ulnar loops in HTN cases was seen in all digits as compared to controls. A higher frequency of whorls and arches in HTN cases as compared to controls. It was a quietly clear absence of the radial loop pattern on the thumb and index in the hypertensive group and the absence of the arch pattern on the index, middle, and ring fingers in the control one in comparison to the other one (Table 3, Histogram 3).

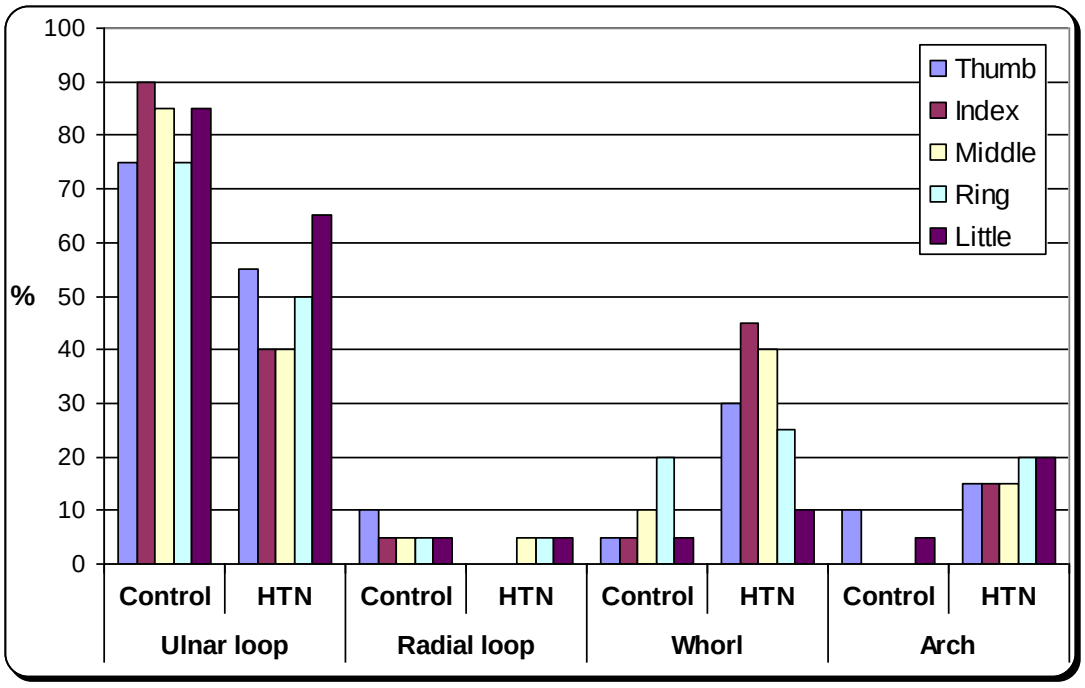
The ulnar loop pattern gained the highest distribution on the thumb for both hypertensive patients and control groups (55%, and 75%) respectively. The ulnar loop pattern was highly increased in the index of control (90%) while the whorl pattern was the highest increased pattern in the index of the hypertensive group (45%). The radial loop pattern was equally distributed on the index, middle, ring, and little fingers of the control and the middle, ring, and little fingers of the hypertensive group.

The whorl pattern was equally distributed on the thumb, index, and little

fingers of the control group. However, the arch pattern was equally distributed on the thumb, index, and middle fingers of the hypertensive group (Table 3, Histogram 3).

**Table 3**: Distribution of dermatoglyphic patterns for each finger in the right hand in the hypertensive and control groups.

| | Ulnar loop | | | | Radial loop | | | | Whorl | | | | Arch | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Control | | HTN | | Control | | HTN | | Control | | HTN | | Control | | HTN | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Thumb | 15 | 75.0 | 11 | 55.0 | 2 | 10.0 | 0 | 0.0 | 1 | 5.0 | 6 | 30.0 | 2 | 10.0 | 3 | 15.0 |
| Index | 18 | 90.0 | 8 | 40.0 | 1 | 5.0 | 0 | 0.0 | 1 | 5.0 | 9 | 45.0 | 0 | 0.0 | 3 | 15.0 |
| Middle | 17 | 85.0 | 8 | 40.0 | 1 | 5.0 | 1 | 5.0 | 2 | 10.0 | 8 | 40.0 | 0 | 0.0 | 3 | 15.0 |
| Ring | 15 | 75.0 | 10 | 50.0 | 1 | 5.0 | 1 | 5.0 | 4 | 20.0 | 5 | 25.0 | 0 | 0.0 | 4 | 20.0 |
| Little | 17 | 85.0 | 13 | 65.0 | 1 | 5.0 | 1 | 5.0 | 1 | 5.0 | 2 | 10.0 | 1 | 5.0 | 4 | 20.0 |




**Histogram 3:** Distribution of dermatoglyphic patterns for each finger in the right hand in the hypertensive and control groups.

**d. Distribution of Dermatoglyphic Patterns for Each Finger of The Left Hand:**

The frequency distribution of dermatoglyphic patterns for each finger of the left hand of both control and hypertensive cases is shown in (Table 4/Histogram 4). The results revealed that a lower frequency of ulnar loops in HTN cases was seen in all digits as compared to controls. A higher frequency of whorls and arches in HTN cases as compared to controls.

At the same time, there was an absence of the radial loop pattern on the middle and ring fingers, an absence of the whorl pattern on the thumb, index, and middle fingers and an absence of the arch pattern on the middle, ring and little fingers in the control group.

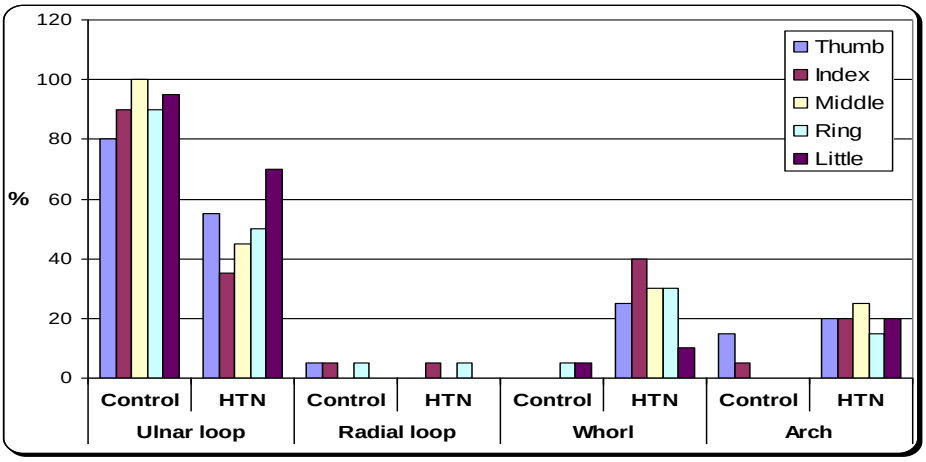
The ulnar loop pattern gained the highest distribution on the thumb, middle, ring, and little fingers for both the hypertensive patients and the control groups. The ulnar loop pattern was highly increased in the index of control (90%) while the whorl pattern was the highest increased pattern in the index of the hypertensive group (40%). The radial loop pattern was equally

distributed on the thumb, index, and ring fingers of the control and the index and ring fingers of the hypertensive group.

The whorl pattern was equally distributed on the ring and little fingers of the control group and the middle and ring fingers of the hypertensive group. It was noticed that the arch pattern was equally distributed on the thumb, index, and little fingers of the hypertensive group.

**Table 4:** Distribution of dermatoglyphic patterns for each finger in the left hand in the hypertensive and control groups.

| | Ulnar loop | | | | Radial loop | | | | Whorl | | | | Arch | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Control | | HTN | | Control | | HTN | | Control | | HTN | | Control | | HTN | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Thumb | 16 | 80.0 | 11 | 55.0 | 1 | 5.0 | 0 | 0.0 | 0 | 0.0 | 5 | 25.0 | 3 | 15.0 | 4 | 20.0 |
| Index | 18 | 90.0 | 7 | 35.0 | 1 | 5.0 | 1 | 5.0 | 0 | 0.0 | 8 | 40.0 | 1 | 5.0 | 4 | 20.0 |
| Middle | 20 | 100.0 | 9 | 45.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 6 | 30.0 | 0 | 0.0 | 5 | 25.0 |
| Ring | 18 | 90.0 | 10 | 50.0 | 1 | 5.0 | 1 | 5.0 | 1 | 5.0 | 6 | 30.0 | 0 | 0.0 | 3 | 15.0 |
| Little | 19 | 95.0 | 14 | 70.0 | 0 | 0.0 | 0 | 0.0 | 1 | 5.0 | 2 | 10.0 | 0 | 0.0 | 4 | 20.0 |




**Histogram 4:** Distribution of dermatoglyphic patterns for each finger in the left hand in the hypertensive and control groups**.**

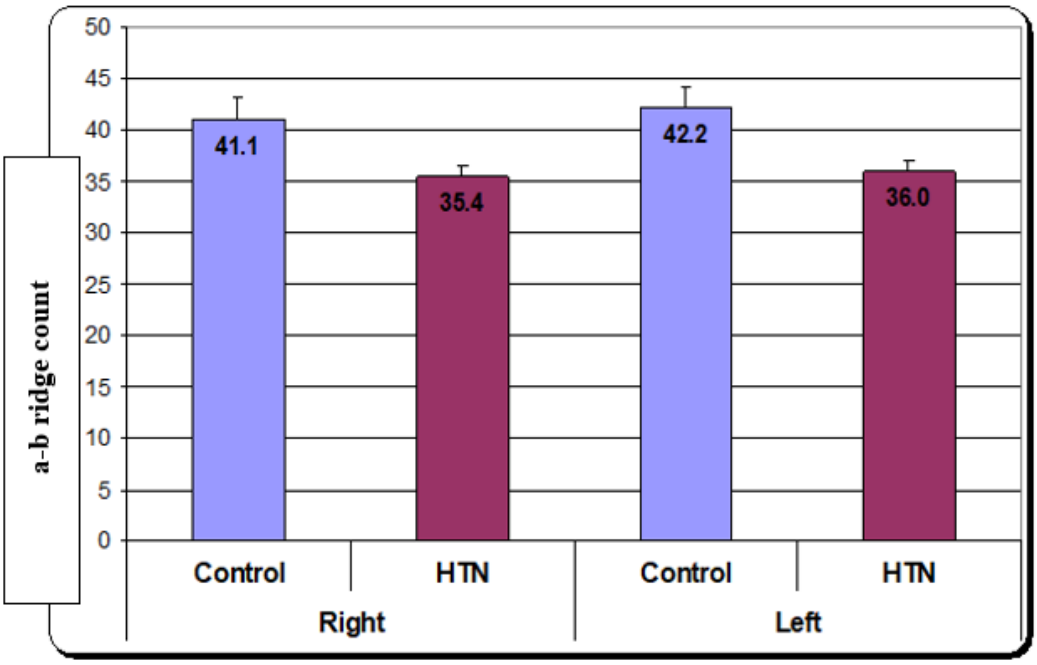
**1-The a-b Ridge Count of The Palmar Dermatoglyphics:**

In the present study, the mean a-b ridge count of the right hand of the control group was (41.05 ± 2.04) versus (35.40 ± 0.99) among the hypertensive group. The mean a-b ridge count of the left hand of the control group was (42.15 ± 1.90) versus (35.95 ± 1.05) among the hypertensive group. The hypertensive group had a significantly lower a-b ridge count in comparison to the control group either that of the right hand or the left hand (p=0.000, 0.000), respectively (Table 5, Histogram 5).

**Table 5:** The a-b ridge count means in the hypertensive and control groups.

| a-b ridge | Right hand (n= 20) | | Left hand (n= 20) | |
|---|---|---|---|---|
| | Control | HTN | Control | HTN |
| | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD |
| Mean ± SD | 41.05 ± 2.04 | 35.40 ± 0.99 | 42.15 ± 1.90 | 35.95 ± 1.05 |
| P-value | 0.000* | | 0.000* | |

Data expressed as mean ± SD. -P-value significant if < 0.05
HTN: hypertension - *Significant.




**Histogram 5:** The a-b ridge count means in the hypertensive and control groups.

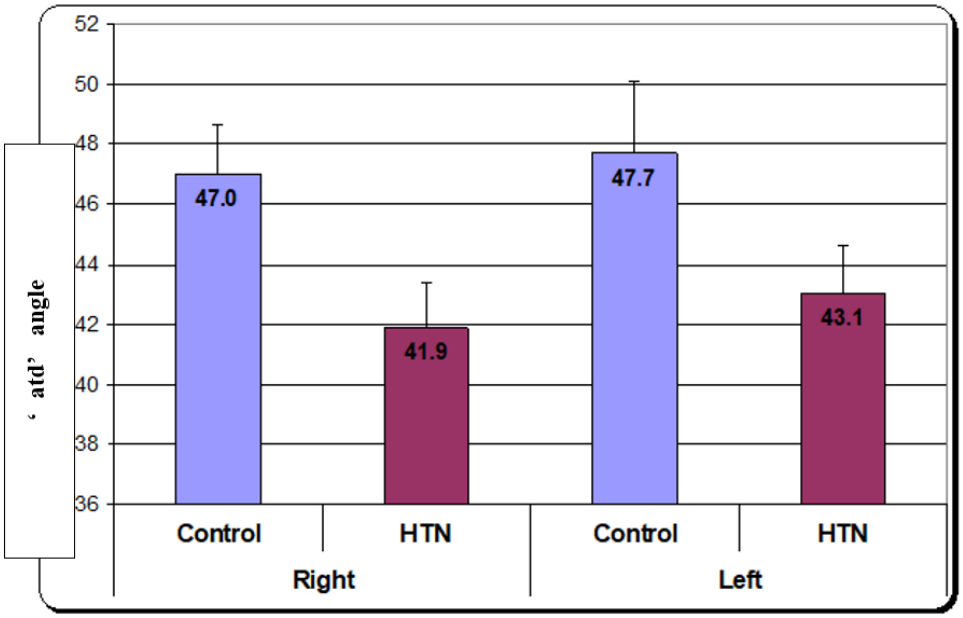
**2-The 'atd' angle of the palmar dermatoglyphics:**

The mean 'atd' angle of the right hand of the control group of the present study was (47.00 ± 1.65) versus (41.85 ± 1.53) among the hypertensive group. The mean 'atd' angle of the left hand of the control group was (47.70 ± 2.39) versus (43.05 ± 1.57) among the hypertensive group. The hypertensive group had a significantly lower 'atd' angle mean in comparison to the control group either that of the right hand or the left hand (p=0.000, 0.000) respectively **(**Table 6, Histogram 6).

**Table 6:** The 'atd' angle means in in the hypertensive and control groups.

| 'atd' angle | Right (n= 20) | | Left (n= 20) | |
|---|---|---|---|---|
| | Control | HTN | Control | HTN |
| | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD |
| Mean ± SD | 47.00 ± 1.65 | 41.85 ± 1.53 | 47.70 ± 2.39 | 43.05 ± 1.57 |
| P-value | 0.000* | | 0.000* | |

Data expressed as mean ±SD
P-value significant if < 0.05
HTN: hypertension




**Histogram 6:** 'atd' angle means among the studied groups.

**3-The Frequency (presence) of the Simian Crease:**

The present study declared that the Simian crease appeared once in the right hand of the control group versus (3) in the right hand of the hypertensive group. The Simian crease frequency of the left hand of the control group was (1) versus (2) among the left hand of the hypertensive group (Table 7).

In the present study, the hypertensive group had an insignificantly higher Simian crease frequency of the right hand in comparison to the control group (p= 0.291). The hypertensive group had insignificantly higher Simian crease frequency in the left hand in comparison to the control group (p=0.548) (Table 7).

**Table 7:** Frequencies of Simian crease in hypertensive patients and control groups.

| Simian crease | Right hand | | Left hand | |
|---|---|---|---|---|
| | Control (n= 20) | HTN (n=20) | Control (n= 20) | HTN (n= 20) |
| presence | 1 | 3 | 1 | 2 |
| absence | 19 | 17 | 19 | 18 |
| p-value | 0.291 | | 0.548 | |
| X2 | 1.111 | | 0.360 | |
| df | 1 | | 1 | |

P-value significant if < 0.05 - $x^2$ = Chi-square value - df= degree of freedom
HTN: hypertension

**4-The Frequency (presence) of the Sydney Crease:**

The present study declared that the Sydney crease appeared twice in the right hand of the control group versus (8) in the right hand of the hypertensive group. The Sydney crease frequency of the left hand of the control group was (1) versus (8) among the left hand of the hypertensive group (Table 8).

In the present study, the hypertensive group had significantly higher Sydney crease frequency of the right hand in comparison to the control group (p= 0.013). The hypertensive group had significantly higher Sydney crease frequency in the left hand in comparison to the control group (p=0.008) (Table 8).

**Table 8:** Frequencies of Sydney crease in hypertensive patients and control groups.

| Sydney crease | Right hand | | Left hand | |
|---|---|---|---|---|
| | Control (n= 20) | HTN (n= 20) | Control (n= 20) | HTN (n= 20) |
| Presence | 2 | 9 | 1 | 8 |
| Absence | 18 | 11 | 19 | 12 |
| P-value | 0.013* | | 0.008* | |
| $x^2$ | 6.144 | | 7.025 | |
| df | 1 | | 1 | |

P-value significant if < 0.05 - $x^2$ = Chi-square value - df= degree of freedom
HTN: hypertension

**Lip Print Patterns:**

Not identical lip print patterns were observed in the subjects. Specific patterns of branching and location of the lip grooves were evident even in cases showing the same lip pattern types in all the six compartments

**a. Upper Lip Print Patterns:**

As regards the upper lip print patterns, the present study demonstrated that the most frequent upper lip print pattern among the control group was the vertical type (43.3%) followed by the reticular (21.7%), the branched (15%), the intersected grooves (11.7%) and lastly the irregular/ undifferentiated (8.3%) (Table 9, Histogram 9).

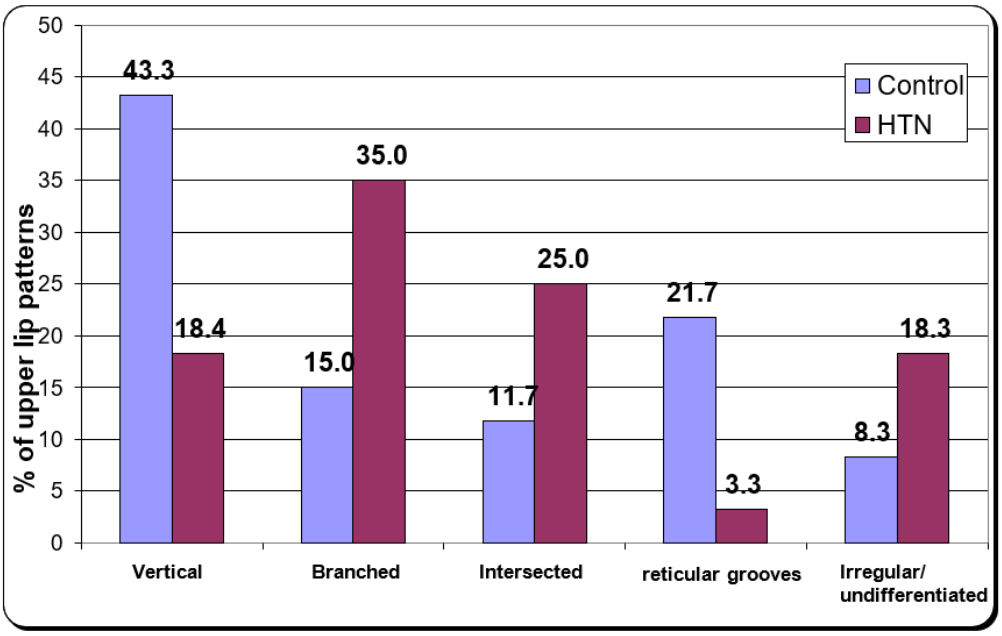
The most frequent upper lip print pattern among the hypertensive group was the branched (35%) followed by the intersected (25%), the vertical (18.4%), the irregular/ undifferentiated type (18.3%), and lastly the reticular grooves (3.3%) (Table 9, Histogram 9).

The present study declared that the vertical and the reticular grooves patterns were significantly increased among the control group in comparison to the hypertensive one (p = 0.003, 0.002), respectively. The branched pattern was significantly decreased (p = 0.001) while the intersected and the irregular/ undifferentiated patterns were insignificantly decreased among the control group in comparison to the hypertensive one (p = 0.059, 0.107), respectively (Table 9, Histogram 9).

**Table 9:** Upper lip print patterns in the hypertensive and control groups.

| Shapes of lip prints | Control (n= 60) | | HTN (n= 60) | | P-value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Vertical | 26 | 43.3 | 11 | 18.4 | 0.003* |
| branched | 9 | 15.0 | 21 | 35.0 | 0.001* |
| Intersected | 7 | 11.7 | 15 | 25.0 | 0.059 |
| reticular grooves | 13 | 21.7 | 2 | 3.3 | 0.002* |
| Irregular/ undifferentiated | 5 | 8.3 | 11 | 18.3 | 0.107 |

Data expressed as frequency (percentage)
P-value was significant if < 0.05




**Histogram 9:** Upper lip patterns among the studied groups.

**b. Lower Lip Print Patterns**:

The present study of lower lip print patterns revealed that the most frequent lower lip print pattern type among the control group was the vertical type (58.3%) followed by the reticular grooves (26.7%), the branched (6.7%), the irregular/ undifferentiated (5%) and lastly the intersected (3.3%) (Table 10, Histogram 10).

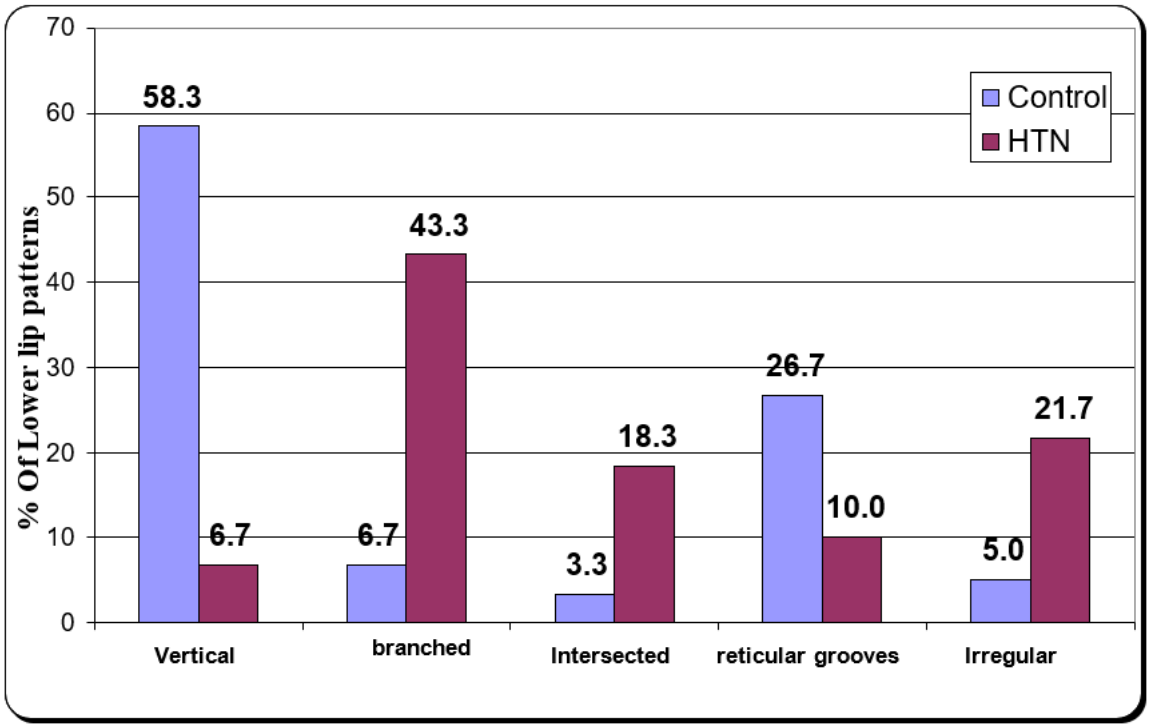
The most frequent lower lip print pattern among the studied hypertensive group was the branched (43.3%) followed by the irregular/ undifferentiated (21.7%), the intersected (18.3%), reticular grooves (10%), and lastly the vertical type (6.7%) (Table 10, Histogram 10).

The present study declared that the vertical and the reticular grooves patterns were significantly increased among the lower lip print patterns of the control group in comparison to those of the hypertensive group ($p = 0.000, 0.018$), respectively. The branched, intersected and irregular/ undifferentiated patterns were significantly decreased among the control group in comparison to the hypertensive one ($p = 0.000, 0.008, 0.007$), respectively (Table 10, Histogram 10).

**Table 10:** Lower lip print patterns in the hypertensive and control groups.

| Shapes of lip prints | Control (n= 60) | | HTN (n= 60) | | P-value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Vertical | 35 | 58.3 | 4 | 6.7 | 0.000* |
| Branched | 4 | 6.7 | 26 | 43.3 | 0.000* |
| Intersected | 2 | 3.3 | 11 | 18.3 | 0.008* |
| Reticular grooves | 16 | 26.7 | 6 | 10.0 | 0.018* |
| Irregular/ undifferentiated | 3 | 5.0 | 13 | 21.7 | 0.007* |

Data expressed as frequency (percentage)
P-value was significant if < 0.05
HTN: Hypertension




**Histogram 10:** Lower lip patterns in the hypertensive and control groups

## DISCUSSION

17.9 million deaths occur each year due to hypertension (HTN) which is a significant cardiovascular risk factor that affects 1.3 billion individuals globally. 75% of all HTN-related deaths worldwide take place in low- and middle-income nations where HTN prevalence is higher and population awareness and HTN control are less prevalent than in high-income nations. About 26% of Egyptian adults fit the HTN criterion (Soliman *et al.*, 2021).

The fact that this risk factor is so closely linked to the risk of CVD in Egyptian adults raises serious concerns. Long-term, successful policies for its prevention and control should be developed by policymakers. Finding a screening tool to recognize at-risk people early and stop subsequent complications is one of these efforts; dermatoglyphics and lip print patterns as easy and inexpensive tools could help in this regard.

The current findings of the fingerprints frequencies among the studied groups as revealed in tables (1,2) showed a higher frequency of ulnar loop pattern in both normotensive and hypertensive for the right hand (82% and 50%) and for the left hand (91% and 51%) respectively. This observation is in agreement with most of these earlier studies as the ulnar loop pattern was reported to be predominant (Oladipo & Akanigha, 2005, Muhammad et al., 2008).

The present results declared that the whorl pattern frequency on the right hand is significantly increased in the hypertensive group in comparison to the control group (30 %, 9%) respectively.

For the left hand, it was noticed the same; as the whorl pattern was dominant in a hypertensive group (27%) in comparison to the control (2%). These differences were found to be significant.

These findings come in line with the findings of (Umana *et al.*, 2014) on the Nigerian population where his results are similar to our results. Their report declared a significant association between fingerprint patterns and hypertension, especially in female subjects.

Also, in accordance with our observations comes the study results of other authors from different populations all over the world, (Ganesh Kulkarni et al., 2014) on India, (Tafazoli *et al.*, 2013) on Iranian,

(Godfrey *et al.,* 1993) on Lancashire London; all reported significant dominance of whorls frequency in the hypertensive patient compared to the normotensive one. Furthermore, (Iqbal *et al.,* 2012) found that out of one hundred hypertensive patients, the majority of them possessed a whorl pattern of fingerprints.

A similar study done by (Dike Eberechi *et al.,* 2012) on 80 patients suffering from essential hypertension (University of Port Harcourt teaching hospital Rivers State Nigeria) showed the highest frequency as the whorl pattern on both hands with the average value of 66.6%.

Other authors (Khatimah & Rosida, 2013) reported that hypertensive subjects ($n$ = 32) had predominantly whorl patterns (81.25% cases). The strong correlation between essential hypertension and the fingerprint whorl pattern has been theorized to be caused by the synchronization of proximities and the organogenesis of the cardiovascular system. (Edward (2007)

The outcomes of another study (Oladipo *et al.,* 2010) were partially similar. They investigated fingerprint patterns among River's state indigenes. They discovered that in hypertension patients, whorl patterns in most digits of either the right or left hand are more common, but in normal people, ulnar loops are more common, especially in the right hand. The maximum frequency was found on the left hand of the normal subject radial loop. Their research also found that the frequency of loops was higher in normotensives compared to hypertensives. on average. The outcomes, meanwhile, were not statistically significant.

To certain degree findings of some authors disagreed with our current findings; for example, the study of (Mouneshkumar *et al.,* 2021) found the most prevalent pattern in the hypertensive patient is ulnar loop 77% followed by arch 13% then radial loop 7.6 and lastly whorl 5.5%. Another study on 100 hypertension patients who attended an outpatient clinic in Lahore revealed that 67% of the patients had whorl patterns, 28% had loop patterns, 5% had composite patterns, and none had arch patterns in their fingerprints (Pervez et al., 2012).

In contrast with our findings what is reported by Igbigbi in his analysis of black Malawi subjects suffering from diabetes mellitus and hypertension. There were no discernible whorl fingerprint patterns in hypertensive people. In addition, female hypertension subjects showed an exceptionally substantial ($P < 0.001$) dominance of ulnar loop pattern frequency. (Igbigbi, 2004).

Also, another study reported that only the right hand of female hypertensives showed more whorls, while both hands in both sexes of Indian hypertensives showed more arches and radial loops (Bulagouda *et al.,* 2013).

Regarding the distribution of the different patterns on the finger-tips of the right hand and left hand in both hypertensive patients and control groups, it was a quietly clear absence of the radial loop pattern on the thumb and index in the right hand while it was absent on the thumb, middle and little fingers in the left hand.

The ulnar loop pattern gained the highest distribution on all the digits for both hypertensive patients and control groups and for both hands. However, it has been noticed that the little finger gained the highest frequency of this pattern in the hypertensive group (65%, 70%) for the right hand and left hand respectively. Also, the analysis of the results revealed a dominant distribution of the whorl pattern on all digits except the little finger in both hands, where the index finger got the highest percentage distribution.

The finding of other studies declared controversy where (Deepa, 2013) reported that in Indian hypertensives (females); the index finger exhibited more whorls, loops, and arches whereas the thumb revealed more whorls, loops, and arche; which partially agreed with our findings.

Also, (Oladipo *et al.,* 2010) found that in hypertensive individuals in most of the digits on both the right and left hands of both males and females, the whorls displayed the highest frequency. Patients with essential

hypertension were highly related to whorls on the first digit of the right hand.

Also, Ahmad and Pimpalkar in their research paper revealed obvious contrast to our findings where their results. indicated less percentage of loops in the first digit of hypertensive patients while the arch pattern was observed to be more frequent in hypertensive females (Ahmad, & Pimpalkar, 2017).

While considerable disparities were shown between some African countries and others, the study results of various populations revealed parallels in digital ridge patterns across some African countries, showing their close historical and anthropological relationship. These findings highlight the specificity of digital patterns in identifying ethnic and population groups.

This might clarify the disagreement between the conclusions of different authors. Other potential explanations for this discrepancy between the findings of the authors include the use of inadequate controls, incomplete diagnoses, limited sample numbers, and statistical errors.

Counting was done primarily for a-b ridge count in this investigation. The entire ridge count was not performed. The a-b ridge count has been suggested to be more environmentally driven and less heritable than other dermatoglyphic features such as fingertip patterns. Because the part of the palm where the a-b ridge is located (the second interdigital region) begins to develop earlier than the fingers and progresses more slowly, the a-b ridge count is sensitive to environmental stress. (Saha *et al.*, 2003).

As a result, the ridges in this region may form over a longer period of time, exposing the area to potential environmental harm. Hypertension is a condition thought to be caused by hereditary and environmental factors that impede metabolism. The total ridge count of the fingers, on the other hand, appears to be under rather strong genetic control and minimally impacted by environmental variables. (Kokubo *et al.*, 2019).

In the present study, it was noticed that the hypertensive group had a significantly lower a-b ridge count in comparison to the control group either that of the right hand or the left hand (p=0.000, 0.000) respectively the significant decrease in a-b ridge count in hypertensive patients confirm that hypertension is affected by both genetic and environmental factors.

In harmony with our study findings, the results of (Deepa, 2013), (Vidya *et al.*, 2010) on the Indian population (Reed, 1995) in Indiana USA documented decreased a–b ridge counts in both sexes of hypertensive patients.

Regarding the palmar atd angles, the present study results revealed that the hypertensive group had significantly lower atd angles in comparison to the control group either that of the right hand or the left hand.

The same observation was stated by many other authors as (Ganesh Kulkarni *et al.*, 2014), (Deepa, 2013), (Godfrey *et al.*, 1993) (Pursnani *et al.*, 1989) where their results indicated a decrease in the atd angle in hypertensives patients for both sexes and in both hands.

Also, (Sangeeth et al., 2022; Sylvia et al., 2020) noticed a decrease of atd angle in hypertensive females and males individuals for both hands but doesn't reach the level of significance. However, other results findings disagree with our results as ((Tafazoli *et al.*, 2013) found Significantly higher atd angle in hypertensive subjects when compared to normotensive individuals.

The observed discrepancies amongst authors are related to differing methods for determining the "atd" angle based on the position of the axis tri-radius. Additional variations in the 'atd' angle may occur as a result of changes in printing pressure and whether the fingers are closely approximated or spread.

In regard to the distribution of unusual palmer flexion creases which were studied in patients and control in this work. The present results revealed that the hypertensive group had insignificantly higher Simian crease frequency for both the right and left hands in comparison to the control group. However,

(Bulagouda *et al.,* 2013; Sylvia *et al.,* 2020) reported the absence of simian crease in both hands of male and females hypertensive patients. This variation in the results may be attributed to the racial factors and population sample.

Regarding the Sydney line, it was demonstrated in the present study that the hypertensive group had significantly higher Sydney crease frequency of the right and left hand in comparison to the control. Also, (Bulagouda *et al.,* 2013) reported the presence of the Sydney line in hypertensive patients. Same for (Sylvia *et al.,* 2020) who observed the presence of the Sydney line in hypertensive cases and their absence in the healthy individual. (23, 0) respectively.

In regard to the association between lip print patterns of hypertensive and normotensive in females; the current study data presented in tables (9 &10) for the upper and lower lip of female hypertensives and normotensives, respectively revealed a statistically significant association between the lip print patterns of hypertensive and normotensive subjects.

In regard to lip prints analysis, we adopted Suzuki and Tsuchihashi's categorization since it is the most generally used classification method in the literature and it is simple to apply and to be interpreted (Jeergal *et al.,* 2016).

The present results declared that with the analysis of lip prints in different studied subjects that there no identically similar lip-print pattern appeared in the two subjects, this comes in accordance with what is reported by (Shokry *et al.,* 2017) who had proven the individuality of the lip prints.

The current results declared that the most frequent pattern in the control group was the type I vertical category (43.3%, 58.3%) in the upper and lower lip respectively, followed by type III, the intersected (21.7 %,26.7 %) and the last one was type V irregular/ undifferentiated or irregular type (8.3 %, 3.3%) in the upper and lower lip respectively.

In accordance with our results, the findings of (Shokry *et al.,* 2017; Youssef & El Emary, 1987) reported that the vertical pattern is the most frequent pattern among lip patterns of upper Egyptians.

However, different populations have reported varying frequencies of lip print patterns. For example, in a study of a Portuguese community, type II was shown to be the most prevalent type (Costa & Caldas, 2012). also, it was declared that the most prevalent pattern, according to (Patel et al., 2010), was Type II (branched-42%) followed by Type I' (incomplete vertical-16%), Type I (complete vertical-14%), Type III (intersecting-10%), Type IV (reticular-10%), and Type V (irregular-8%) which not aligned with our results which again highlights how is the genetic and racial variation impact the pattern appearance.

Considering the hypertensive group, and in regard to the frequencies distribution of the different patterns on the upper lip, the present work results demonstrated that the most frequent was the branched (35%) followed by the intersected (25%), the vertical (18.4%), the irregular/ undifferentiated type (18.3%) and lastly was the reticular grooves (3.3%).

Regarding the lower lip, it was found that the most frequent lower lip print pattern among the studied hypertensive group was also the branched (43.3%) but it was followed by the irregular/ undifferentiated (21.7%), then intersected (18.3%), reticular grooves (10%), and lastly the vertical type (6.7%) (Table 10, Histogram 10).

The results declared a higher frequency distribution of vertical pattern either for the upper lip (43%, 18.3) or lower lip (58.3%, 6.7%) for normotensive and hypertensive respectively which is found to be statistically significant. The same was observed with the reticular pattern for the upper lip (21.7 %, 3.3%) and for the lower lip (26.7%, 10 %) for the normotensive and hypertensive respectively, and the differences were found significant.

The current findings concurred with those of Umana et al. (2014), who found that long vertical and reticular patterns were higher in normotensive individuals (24% and 12%, respectively) than in hypertension

individuals (15.42% and 3.27%, respectively).

However, our present results indicated that the reverse was the case for the branched and irregular/ undifferentiated/ undifferentiated patterns where the frequencies were much higher in hypertensive in comparison to the normotensive for the upper lip branched (35%, 15%), undifferentiated (18,3%, 8.3 %) and for the lower lip branched (43.3%, 6.7%), undifferentiated (21.7%, 5%). These differences were found also to be significant.

These findings also came in harmony with (Umana *et al.,* 2014) where results declared a higher frequency of branched lip print in the hypertensive (65.42%) than in the normotensive (56.5%) as opposed to the other patterns. Going in the same line with our results his findings regarding undifferentiated patterns where it was found to be higher in the hypertensive (12.15% and 3.74% respectively) than in the normotensive (7.5% and 0% respectively).

Considering the intersected groove pattern, the current findings showed the frequency was found significantly higher in the lower lip in the hypertensive group in comparison to the normotensive group (18.3%, 3.3%). Regarding the upper lip, the pattern frequency was found higher in the hypertensive group compared to the normotensive, but it wasn't reaching the level of significance (25%, 11.7%).

In corroboration to the current study, findings have been documented by (Mouneshkumar *et al.,* 2021) in their study on 140 females showed that the branched lip print pattern had significantly high frequency among hypertensives (70) followed by intersected (42), then straight (20) and lastly reticular (8). However, in controversy to these findings; the results of (Goud *et al.,* 2022) stated that the type I, vertical lip print pattern was the most predominant pattern in hypertensive subjects.

As clearly declared in the current study there is a significant association between dermatoglyphics and cheiloscopic patterns and hypertension. However, it is necessary to carry out additional in-depth studies in this area with big sample sizes of both sexes and in various geographic places. This is to identify, confirm, and assess the relevance of these differences in the dermatoglyphics, cheiloscopic, and physical characteristics of individuals with hypertension.

**Conclusion:**

The current study's findings indicated a strong correlation between lip print patterns and hypertension in females Egyptian individuals as well as between fingerprint patterns and hypertension. It can therefore be used as a straightforward, affordable, non-invasive predictive technique in a poor nation in anticipating those people who are at risk of developing hypertension so that clinicians and the general public at large can be informed about habits and practices that may predispose one to hypertension can be avoided and preventive measures could be implemented.

**Recommendations:**

There is still a knowledge deficit in this area, particularly in relation to lip prints. To improve prediction accuracy, validate the findings, and reach a consensus; we recommend the followings:

1. Evaluation of the finger and lip prints in relation to both family and genetic disorders is necessary.
2. A finger and lip printing bank must be established for research purposes.
3. There should be a patient database with finger and lip prints, particularly for illnesses that run-in families or are inherited.
4. A thorough and extensive investigation is required to investigate the correlation between hypertensive patients' fingerprints and lip patterns. This study provided reasonable weighting on the distribution of finger and lip print patterns in hypertension individuals. Same as clinical history, examination, and investigations, fingerprints and lip prints will be crucial in revealing the genetic susceptibility to essential hypertension.

**Conflicts of Interest:**

There are no conflicts of interest.

**Acknowledgments:**

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## ARABIC SUMMARY

**الأنماط الشكلية لحيود الجلد على راحة اليدين وبصمات الشفاه كدلالات جينية بين مرضى ارتفاع ضغط الدم.**
**دراسة على إناث صعيد مصر بمستشفى جامعة أسيوط التعليمي**

**أمل راتب عبد السميع *[1] ـ منال عزالدين[2] - ، رينيه رفعت بشرى[3،1]**
1-قسم التشريح الآدمى والأجنة
2– قسم الأمراض الباطنة - كلية الطب- جامعة أسيوط -أسيوط – مصر
3-قسم العلوم الطبية - كلية طب الأسنان- جامعة بدر – أسيوط- مصر

**الخلفية**: من المعروف ان ألأنماط المختلفة لبصمات الأيدى وألأصابع والشفاه يتم تحديدهم وراثيا. بالمثل فأن مرض ارتفاع ضغط الدم له ايضا خلفية جينية وراثية. ويعد مرض ارتفاع ضغط الدم من الأمراض الخطيرة الشائعة فهو يؤثرعلى 1.3 مليار شخص ويتسبب فى وفاة 17.9 مليون حالة ة سنويًا في جميع أنحاء العالم حيث أنه عامل رئيسي خطيروراء الكثير من أمراض القلب والأوعية الدموية.
**الأهداف**: أجريت هذه الدراسة للتعرف على الأشخاص الذين لديهم استعداد وراثي للإصابة بارتفاع ضغط الدم ، ولتحديد أنماط البصمات المميزة لحيود الجلد و الشفاه المتلازمة مع ارتفاع ضغط الدم ، ولتقييم مدى موثوقيتها وصلاحيتها.
**الأشخاص والطريقة:** تم أخذ 100 مريضة مصابة بارتفاع ضغط الدم من مستشفى أسيوط الجامعي ، وكذلك عدد متساوٍ من الأشخاص الأصحاء المتطوعين من عامة السكان كضوابط ومتقاربين فى نمط الحياة والوضع الاقتصادي مع المرضى. وتم تسجيل أنماط بصمات الأصابع لجميعهم باستخدام طريقة .Cummin ثم خضعت المطبوعات للتحليل و التصنيف.
ولأخذ بصمات الشفاه تم استخدام أحمر الشفاه ، وورق السندات الأبيض مقاسA4 ، وشريط السيلوفان. ثم تم فحص البصمات وذلك باستخدام تصنيف Suzuki و Tsuchihashi لتصنيف أنواع الأخاديد ، وتم تحليل النتائج إحصائيًا.
**النتائج:** أظهرت النتائج وجود فروقات معنوية لحيود الجلد وكذلك بصمات الشفاه لدى مصابى ارتفاع ضغط الدم مقارنة بالمجموعة الضابطة. اشارت البيانات الى ارتفاع واضح للعراوى الزندية في كل من ذوات الضغط الطبيعي و المصابين بارتفاع ضغط الدم متبوعًا بأنماط بصمات الأصابع الدائرية ثم القوس. كذا كشف التحليل الإحصائي عن وجودارتباط معنوي عند .$p< 0.05$ . أما بالنسبه لعدد بروزات حيود الجلد بين مثلث الشعب أ ,ب فقد بينت الدراسه وجود نقص معنوى فى العدد وكذا لقيمة الزاوية عند مثلث الشعب( أ ,ت ,د)للأشخاص المصابين مقارنة بالمجموعة الضابطة فى كلتا اليدين.
و فيما يتعلق بالأنماط على الشفاه ، فقد أظهرتحليل البيانات ارتفاع واضح للأنماط المتشعبة وألأنماط غير المنتظمة او غير المتمايزة في مجموعة ارتفاع ضغط الدم مقارنةً مقارنةً بالمجموعة الضابطة ولقد كانت هذهالاختلافات معنوية.
**الخلاصة:**
خلصت نتائج الدراسة الى وجود سمات مميزة لحيود الجلد على راحة اليدين و الأصابع وكذا بصمات الشفاه لدى المصابين بارتفاع ضغط الدم مقارنة بالمجموعة الضابطة مما يقود الى امكانية توظيفهم كمؤشر جينى ووراثى فى المسح المبدئى للتنبؤ بأمكانية الأصابة بارتفاع ضغط الدم مستقبلا.