TROPICAL GENETICS

Volume 2, No 2, November 2022
https://ojs.genetikawan muda.com/index.php/tg

Original Research

Unique pattern of hypertension fingerprints

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Article Info

Article history:
Received 5 November 2021
Accepted 17 November 2021

Keywords:
arch, hypertension, fingerprint and dermatoglyphics

How to cite:
Syamsurizal, *et.al*. 2022. Unique pattern of hypertension fingerprints. *Tropical Genetics,* 2(2): 48-55.

Abstract

The fingerprint pattern (dermatoglyphics) of each individual is not the same. Fingerprint patterns are often used as an identification tool in criminal cases and disease diagnosis. Fingerprint patterns for health diagnosis are usually diseases caused by genetic factors, for example hypertension. The purpose of this study was to describe the characteristics of fingertip dermatoglyphics of hypertension patients. The research sample was 60 people consisting of 30 people with hypertension who visited the DR. M. Djamil Padang and controls 30 non-hypertension (normal) people from Biology FMIPA UNP students. Simple random sampling. The research variables are tendril patterns on the fingertips. The Chi-square test was used to analyse the tendril pattern data of hypertension patients. The results showed that the arch fingerprint pattern is a unique character in hypertensive patients.

Introduction

The term dermatoglyphics was first coined by Harold Cummins and Charles Midlo in April 1926, at the 42nd meeting of the American Association of Anatomists. Dermatoglyph comes from the Greek, namely from the words derma (skin) and glyphe (indentation), so dermatoglyph can be interpreted as an indentation on the skin. In the same year the term dermatoglyphics was first used in the report "American Journal of Physical Anthropology". The use of the term dermatoglyphics is limited only to the characteristics of the skin surface, namely on the palms and soles of the feet and some areas on the tail (Syamsurizal, 2016b).

The appearance of tendrils in each individual is different, even in monozygotic twins. The development of these tendrils begins when the pregnancy is 3 months old and becomes perfect by the time the pregnancy is 7 months old. The pattern of tendrils formed is determined by the influence of many genes (polygen). These genes are scattered among the 46 human chromosomes ((Syamsurizal, 2017). The tendrils that have been formed will not change for life. Because dermatoglyphs in each individual are unique and will not change throughout life, the characteristics of dermatoglyphs can be used for various purposes, including as a means of identifying a person such as the use of fingerprints as signatures on important papers by the Chinese since 3 centuries before AD, even in Indonesia, thumbprints are still used as a substitute for signatures for people who are illiterate ((Syamsurizal, 2016b). In addition, fingerprints are also used as an investigative tool in criminal cases, as is done by the police to track criminal offenders. Notes about fingerprint patterns can also be related to a person's life line, as was done Kastama (2000) and other authors such as Zemenek (2001) who linked the type of tendril pattern with character somebody. Equally important, dermatoglyphics can be used as a diagnostic tool for several diseases, because although the tendrils that form on the skin are never duplicated in two people, close similarities can be found in certain individuals (Mayer, in Anonim, 2002).

According to Surjadi (1981), dermatoglyphic disorders have been found by many experts and these abnormalities can be associated with chromosomal disorders and hereditary diseases. These chromosomal abnormalities include trisomy 21 (Down's syndrome), trisomy Dl (13-15) and Turner's syndrome. A similar opinion was also expressed by Deaton in Suryo (1997, p. 416) who reported that the pattern of fingerprints on the hands, palms and soles of the feet has a close relationship with various hereditary diseases or defects due to chromosomal abnormalities, for example in people with Down syndrome, with the characteristic presence Simian line and pattern of ulnar loops on the fingertips (Syamsurizal, 2016a).

In connection with the use of dermatoglyphics as a tool for hereditary diseases, Emputri (2000) has conducted research on diabetes mellitus and found that there are many arch patterns found on the fingertips and the type of pattern found in the Interdigital III area (ID III) and atd angle diabetes mellitus sufferers is greater than the control group. The relationship between dermatoglyphic abnormalities and diabetes mellitus can occur because both of these are influenced by many genes (polygen) as stated by Emery (1974) that traits inherited by many genes include intelligence, height body type, skin color, number of dermal folds, blood pressure and certain abnormal characteristics such as diabetes mellitus, anclosing, spondylitis, rheumatoid arthritis, peptic ulcer and ichaemic liver disease.

The author believes that apart from diabetes mellitus, there are other hereditary diseases that can also be associated with dermatoglyphic disorders, one of which is hypertension. Hypertension is an inherited genetic disease, a person's genetic makeup determines how much he tends to suffer from hypertension. If both parents suffer from hypertension, then their children will have a very large risk of developing hypertension (Robbins & Kumar, 1995). This opinion is supported by Sidabutar's statement (1990) as follows:

"The role of genetic factors in essential hypertension is proven by various facts that have been encountered. There is evidence that the incidence of hypertension is more common in monozygotic twins than heterozygous, if one of them suffers from hypertension, supports that genetic factors have a role in the occurrence of hypertension."

As emphasized by Wahyuning Ramelan, that dermatoglyphic patterns can be associated with various diseases including hypertension, while research related to the author's knowledge has never been conducted. Based on the background, the authors are interested to know whether certain dermatoglyphic characteristics will be found on the fingertips and palms of people with hypertension.

Methode

Fingerprints and palm prints of hypertension sufferers were taken at the internal medicine polyclinic specifically for hypertension, DR. M. Djamil Padang, while the normal group's fingerprints and palm prints were collected in people's homes in the vicinity of Air Tawar Barat Padang. Then the data obtained were observed and analyzed in the genetics laboratory of the Department of Biology FMIPA UNP.

Tools and Materials. The tools used for taking fingerprints and palm prints are hand towels, tissues, glass plates, fingerprint recording cards and the materials used are hand soap and stencil ink. While the tools used for recording and measuring data are stereo microscopes, pencils, protractors and rulers.

Population and Sample. The population in this study were hypertensive patients who visited the internal medicine polyclinic, especially hypertension, DR. M. Djamil Padang. The sample in this study were hypertension sufferers who visited the DR. M. Djamil Padang. Samples were taken randomly, the number of samples was 30 people.

Preparatory stage. Before carrying out the research there are several things that need to be prepared, such as obtaining a research permit, then preparing the tools and materials to beused such as stencil ink, glass, tissue paper, hand towels and fingerprint recording cards. This research is a type of descriptive qualitative research with literature review. Descriptive qualitative research produces data in the form of words or pictures rather than numbers. Qualitative research does not use statistics, but collects data which is analyzed and then interpreted. The characteristics of qualitative research are analyzing data inductively and emphasizing meaning as essential. Literature review is a group of activities related to how to collect library data, record, read, and process research materials. This research is supported by data obtained from the literature in the form of research articles, research journals and textbooks. The data used comes from accredited articles and research journals both nationally and internationally related to the topics studied.

Fingerprints and palm prints are taken while the patient is waiting for a call from the doctor by asking the patient's willingness to have his fingerprints taken. If the patient is willing, fingerprints will be taken immediately in the room that has been prepared.

a. Ink on glass plate
   Stencil ink is placed sufficiently on the glass plate, then flattened with a tissue several times so that the ink on the glass plate becomes thin and even.
b. Fingerprint and palm print recording
   Before taking fingerprints, first fill in the sequence number, patient name, age and date of collection on the top left of the fingerprint recording card. The two hands where the fingerprints will be recorded are cleaned first with a cloth until dry. If they are dirty, they must first be washed with soap and dried with a cloth (this is done so that the recording is clearly visible and easy to read). In recording fingerprints, paper with a smooth surface

is used, in this case HVS folio paper is used. This paper is placed on the side of the table in front of the patient to be fingerprinted. The tip of the person's fingers is then pressed and rolled on the inked glass plate and then rolled over the fingerprint recording card from right to left or vice versa, starting from the first finger (thumb) right to (little finger) right, the same goes for the hand left. Whereas for palm print taking, it is done by pressing the palm of the hand against the inked glass plate, then the inked palm is placed and pressed on the finger print recording card. The above applies equally to the collection of fingerprints and palm prints of the normal group. If the results of the recording are not clear, it must be repeated again until it is clear.

c. Observation

The results of the fingerprint recordings were then taken to the laboratory to be observed using a stereo microscope. Observations were made on: Fingertip type tendril pattern. The types of tendrils on the fingers that are found vary as shown in Figure 1, which are then classified into three basic patterns, namely Arch, Loop and Whorl.

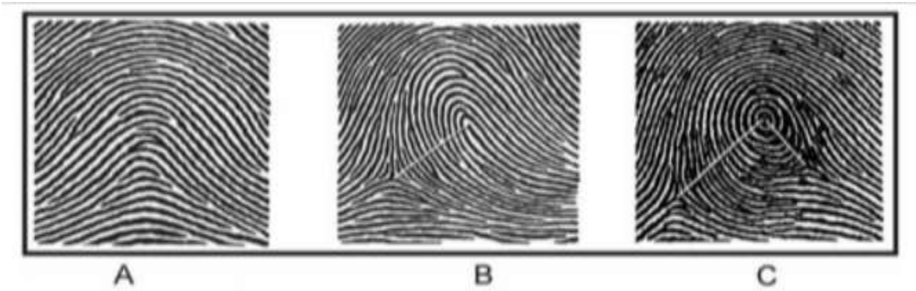

Figure 1. Fingertip type tendril pattern A= *Arch*; B=*Loop*; C=*Whorl* (Khan, 2008)

Data Types. The type of data in this study is primary data, namely data obtained directly from observing fingerprints and palm prints which include patterns on the fingertips, number of tendrils on the fingertips, the angle atd on the palms and the distribution of patterns on the palms.

Data Analysis Techniques. After making observations, then the data were analyzed statistically. For the frequency of patterns on the fingertips analyzed by the Chi-Square suitability test without the a priori hypothesis.

Results and Discussion

Fingerprint pattern is a unique characteristic of each individual and has been identified to have a correlation with several genetic factors and the risk of several diseases (Patil and Ingle, 2021). Three types of fingerprint pattern, the arc, loop, and whorl pattern, has become the focus of research to understand the risk of certain diseases, including hypertension. Arc pattern has curved lines that form an arc; the main lines of the fingerprint run from one side of the fingerprint to the other without forming any bends or swirls like in a loop or whorl pattern. In a loop fingerprint, the ridges enter from one side of the finger, form a curve or loop, and then exit from the same side they entered. At the same time, the whorl pattern is characterized by the presence of one or more spiral-like patterns, or whorls, in the ridge flow (Kücken, 2007)

Fingerprint pattern type data: arch, loop, and whorl on the I-V fingers of the right and left hands of the research subjects were analyzed using the Q2 test. Several studies have attempted to explain the relationship between the fingerprint pattern and the incidence of hypertension. Although research in this area is relatively limited, and the results are not entirely consistent, several studies have indicated an association between fingerprint patterns and the risk of hypertension (Wijerathne, Meier, Agampodi, & Agampodi, 2015).

The results of the statistical analysis of the types of arch fingerprint patterns of the study subjects are presented in Table 1.

Table 1 . Differences in the average type of arch fingerprint pattern of research subjects based on the incidence of hypertension

Hypertension	n	Average	SD	p
Yes	30	0.30	0.89	0.00
No	30	2.00	1.01	

Based on Table 1, it can be seen that the average number of arch fingerprint patterns in hypertension is 0.30 with a standard deviation of 0.89, while in the controls, the average number of arch fingerprint patterns is 2.00 with a standard deviation of 1.01. The statistical test results obtained $p = 0.00$. Thus at $\alpha = 5\%$, there is a significant difference in the incidence of hypertension in the average number of arch fingerprint patterns.

The previous study conducted by Chakravathy et al. (2018) in the India population stated that the arc fingerprint patterns are more likely found in the normal group than in the hypertension group (Shirali, Chowta, Ramapuram, Madi, & Chouhan, 2018). The study results are similar to our study, where the arc pattern was found more in the control group. However, the results of other studies have not always been consistent with the findings above, for example, based on previous studies by Lahiri et al. (2013) conducted on an Indian population. The research found that individuals with an arc pattern fingerprint pattern are more likely to develop hypertension than individuals with other fingerprint patterns. The study involved 276 participants and demonstrated a significant positive association between arc pattern fingerprint patterns and hypertension (Lahiri et al., 2013). A study by Tafazoli (2013) also stated that arch fingerprints are more likely to be found in the hypertension group than in the normal group (Tafazoli, Dezfooli, Shahri, & Shahri, 2013)

The results of the statistical analysis of the types of loop fingerprint patterns of the study subjects are presented in Table 2.

Table 2 . Differences in the average type of fingerprint pattern research subject loop based on the incidence of hypertension

Hypertension	N	Average	SD	p
Yes	30	5.88	2, 77	0.07
No	30	2.00	1.01	

Based on Table 2, it can be seen that the average number of loop fingerprint patterns in hypertension is 5.88 with a standard deviation of 2.77, while in the controls, the average number of loop fingerprint patterns is 2.00 with a standard deviation of 1.01. The statistical test results obtained $p = 0.07$. Thus, at $\alpha = 5\%$, there is no significant difference in the incidence of hypertension in the average number of fingerprint loop patterns.

The results of the statistical analysis of the type of whorl fingerprint pattern of the study subjects are presented in Table 3.

Table 3 . Differences in the average type of fingerprint pattern whorl research subjects based on the incidence of hypertension

Hypertension	n	Average	SD	p
Yes	30	3.82	2.94	0.27
No	30	2.00	1.01	

Based on Table 3, it can be seen that the average number of whorl fingerprint patterns in hypertension is 3.82 with a standard deviation of 2.94, while in the controls, the average number of loop fingerprint patterns is 2.00 with a standard deviation of 1.01. The statistical test results obtained p = 0.27. Thus, at α = 5%, there is no significant difference in the average number of whorl fingerprint patterns in hypertension.

Based on the previous findings of a meta-analysis of 17 research conducted by Wijerathne et al. (2015), a rise in whorl patterns is seen combined with an indicated drop in the frequency of loops in the hypertension group. Seven studies fell under this category (Wijerathne et al., 2015). In one study by Lahiri et al., double loops were shown to be more prevalent in hypertension. However, these patterns are frequently classed as a subset of whorls (Lahiri et al., 2013). In a slight departure from the general trend, the Umana et al. investigation showed a significantly higher loop frequency linked with a higher whorl frequency in the female sample of hypertension and no significant difference in that of the male hypertension (Umana et al., 2014).

It is important to note that variations may influence these different results in research methods, sample sizes, population, and confounding factors. Therefore, further research is needed to understand the mechanisms underlying the potential association between the fingerprint pattern and hypertension risk. Although several studies have shown a correlation between fingerprint patterns and hypertension risk, this finding still needs further confirmation and more in-depth investigation in larger, more controlled epidemiological studies.

Recently, there has been a lot of discussion on how genetics and environment interact, as well as the growing importance of epigenetic variables in shaping phenotypic outcomes, particularly during fetal development. In light of this, it may be essential to look for proof that several mechanisms related to metabolic programming and growth parameters interact during the development of the dermatoglyphics to produce potentially diagnostic dermatoglyphic markers of adverse health conditions, such as hypertension in later life (Wijerathne et al., 2015).

Significantly, the processes included the timing of volar pad formation and ensuing regression. During the first trimester, the volar pad shape on the fetus' fingers and palms is crucial for determining the pattern that will develop specifically, whether ridges will form whorls on more raised, hemispheric pads or arches on a lower, flatter-shaped pad. The manifestation of dermatoglyphic pattern results depends on the timing of intrauterine events. Timing that is delayed might produce distinct patterns than development that are hastened (Wijerathne et al., 2015). Understanding of the relationships between dermatoglyphics and hypertension will continue to grow due to studies mapping out fetal developmental pathways and in-utero circumstances.

Conclusion

From the results of the dermatoglyphic study of the fingertips, it can be concluded that the the were significant association between the average number of arch fingerprint patterns and the incidence of hypertension but there were no association for loop and whorl fingerprint patterns with the insidence of hypertension.

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