

## The symmetry analysis, Fars race men through Poroscopy

Hossein Akbari Nooghabi<sup>\*1</sup>, Nasser Mahdavi Shahri<sup>2</sup>, Javad Baharara<sup>1</sup> and Farhang Haddad<sup>2</sup>

<sup>1</sup> Department of Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran

<sup>2</sup> Department of Biology, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

\*Corresponding E-mail: [hossein\\_akbarynooghaby@yahoo.com](mailto:hossein_akbarynooghaby@yahoo.com)

### ABSTRACT

Symmetry exists as a morphological/Anthropometrical feature to establish the body axes during embryonic. Poroscopy (the study of pore channels sweat glands) is a method for identification of individuals, in this method, the properties of pore channels of sweat glands are compared with each other, from different aspects. Changes in asymmetry are a capacity versus adaptive genetic factors. The pore characteristics are constant, unchanging and unique and in the case of inadequate information collected by studying skin line properties poroscopy can also be used. Analysis of skin lines and pores, sweat glands channel are being used in medicine for diagnostic identification and early recognition of many diseases. Since, different methods used in poroscopy so far are not very liable, in this innovative method attempts were made to investigate the no and symmetry of pores of sweat glands in the first clause of the left and right thumbs. Also, the formation of pore channels of sweat glands in men in the age group of zero to 60 years were studied and compared. This analytical study was performed in observational approach of random samples of healthy men raised in Mashhad. After obtaining informed consents and completed questionnaires from 25 babies, 11 children, 14 adolescents, 25 young and 25 middle-aged men, the print of the first paragraph thumbs (right and left 1 3) and refer fingers of two hands (right: Number 2 left: No. 4) on the coverslip were recorded using a digital microscope (Dino-Lite-plus AM313) with 65 × magnification. The fingerprints and pores of sweat glands is calibrated using the software MIP4.2 Full Image. The data analysis was performed with Statistical Analysis Software Spss21. The results showed that the size and the average number of channels and pores of sweat glands in the left and right hand thumb and index finger were reduced by age, in each case ( $P < 0.05$ ). The amount of overlap asymmetry between the pore channels of sweat glands on the right and the left thumb in babies, children, adolescents, young and middle-aged were 13/48, % 1/36, % 65, % 65, % 4/32 and for the refer finger were % 83/49, % 75, % 66/66 % 66/41 % 83/45 respectively.

**Keywords:** Symmetry analysis, symmetry, asymmetry, Poroscopy, Sweat gland pores, fingerprint identification, Digital anthropology

### INTRODUCTION

The embryonic vertebrate and invertebrate many show significant asymmetry for their organs. Nearly all visceral organs of the chest and abdomen are asymmetrical in anatomy, physiology and their location. This lack of symmetry is maintained throughout the development of chordate. Although the details of this asymmetry is very varied among species, however, all natural persons of a hypothetical species, are similar asymmetry. Asymmetry in terms of medicine is also good value because several syndromes in humans, affected the left and right axes [1]. Dermatoglyphic is scientific, and doing the correct and principled study, on skin lines and the palms of the hands and feet fingertips. Dermatoglyphic studies done more than 70 years.

Tested a variety of asymmetries two sides. Researchers to study the genetic mechanism of asymmetry, examined the asymmetry in dermatoglyphic patterns, because they will not be affected by changes in the environment after birth [2].

One of the most important aspects of anthropology is the study and comparison of different characteristics in different human populations. Biological and cultural characteristics have altered in various populations due to human adaptation to the environment. In fact, human populations have adopted different lifestyles and cultural strategies to overcome the existing problems.

One of the anatomical characteristics of the human body is the presence of sweat gland pores in the fingers, palm of the hands, and soles of the feet. These pores characterize particular patterns for each individual. Accordingly, these characteristics, particularly the quantitative features, have been the main focus of various anthropological studies [3].

Today, significant progress has been made in understanding the relationship between genetic disorders and skin of the palms and soles and toes of sweat gland pores channels. Analysis makeup palm lines and pores of sweat glands channels have been established as research and diagnostic tools in medicine. Insight, is provided with important information about the relationship between skin lines and many diseases.

The identity of human beings is characterized by age, sex, race, and features of body organs. Under certain circumstances, identification of an individual is essential for medical, judicial, criminal, and forensic purposes. In fact, skin properties of fingertips and fingerprints can reveal the identity of an individual.

Poroscopy is the study of the sweat gland pores, which is based on a comparison of the pores of the skin, configuration, size and relative position of them [4]. Poroscopy has a way of identifying people, which in this way would be to compare the characteristics of sweat glands pores of different dimensions with each other. The pores are on the lines of the skin (dermal ridge) the first paragraph of fingers and palms of the hands and soles of the feet. This method was first developed in 1912 by Edmund Locard then developed. At that time, he discovered that the properties of the sweat gland pores like properties of skin lines is effective in identifying people. In this method, properties of sweat gland pores, which are unchanging and exclusive, are compared from different aspects. Overall, poroscopy can be applied in case the characteristics of skin lines are not adequately identified [3, 4].

Given the importance of application software used for our software in digital anthropology MIP4.2 Full. MIP4.2 Full software was developed by Nahamin Pardazan Asia Co. (Iran), a knowledge-based company, as requested by the author. In four main stages (inserting pictures, markings, calibration, automation and save) images of sweat gland pores were analyzed.

Based on the available literature on poroscopy of sweat gland pores, we might be able to more reliably identify individuals and predict the prognosis of certain diseases. Therefore, the present research could add to the available information and be used by other researchers in different fields [5].

The main goal of this research is the study of symmetry analysis sweat glands pores in the first paragraph fingers left or right through Poroscopy.

## MATERIALS AND METHODS

### *Materials*

A digital microscope (Dino-Lite-Plus AM313) and a laptop computer (DV6 6c55, hp) were used in the present study. Also, MIP4.2 Full software (Nahamin Pardazan Asia, Iran), Microsoft Office 2010, AreaSearch software, and SPSS version 21 were applied for analyses. A 24×24 mm lamella (Superior, Germany) and Nino cleanser wipes were employed during the experiments. Finally, a questionnaire was completed for all the participants.

### *Study population*

In this study, six groups of Fars men residing in Mashhad, Iran were selected among children (from daycare centers in seven districts of the city), adolescents (from all-male schools), staff of schools in Districts 3 and 5, and university students and staff of Islamic Azad University of Mashhad. The subjects were then classified in terms of age:

- 1) Babies within the age range of 0-2 years, selected from daycare centers in seven districts of Mashhad;
- 2) Children within the age range of 2-12 years, selected from the primary schools in seven districts of Mashhad;
- 3) Adolescents within the age range of 12-20 years, selected from the middle schools and high schools in seven districts of Mashhad;
- 4) Young adults within the age range of 20-40 years, selected among the staff and students of the Faculty of Basic Sciences in Islamic Azad University of Mashhad and Ferdowsi University;
- 5) Middle-aged men within the age range of 40-60 years, selected among the educational staff and students of Mashhad Ferdowsi University and Islamic Azad University of Mashhad;
- 6) The elderly within the age range of > 60 years (Sforza, 2010).

The sample size in these groups was calculated at 100, 70, 50, 100, 70, and 20 cases, respectively (total: 410). Considering the fact that the study population consisted of Fars men, the candidates were included in the study in case they met the following criteria: 1) Fars ethnicity (Fars father or mother); 2) male gender; 3) ideal health status (confirmed through inquiring the subject or the family); 4) absence of skin problems based on the observational or fingerprint evaluations; and 5) completion of the questionnaire.

#### ***Identification of sweat gland pores by poroscopy***

Technical principles were followed during all stages of the study, since classification and evaluation of sweat gland pores are not applicable unless the images are considered reliable. In this study, poroscopy was applied to identify sweat gland pores. The trace of the first knuckle of the thumbs (right: No. 1, left: No. 3) and index fingers (right: No. 2, left: No. 4) was marked on the lamella.

Images were captured, using a digital microscope (Dino-Lite-Plus AM313) with 65× magnification; this method was developed by the researcher. The index finger was evaluated in this study, given its importance in fingerprint identification and criminology [6].



**Figure 1.** A sample of sweat gland pores captured by a digital microscope (Dino-Lite-Plus AM313), In this picture has been revealed regular sweat gland pores on the lines

#### ***MIP4.2 Full software***

MIP4.2 Full software was developed by Nahamin Pardazan Asia Co. (Iran), a knowledge-based company, as requested by the author. In four main stages, images of sweat gland pores were analyzed. In the first stage, the image was selected from the corresponding folder; specific numbers were preferably designated to each finger of an individual in the image.

The second step was to calibrate the images so that the selected area ( $\mu\text{m}^2$ , pre-defined by the software) was similar in all images. In the third stage, the staining method (set by the software) was selected for sweat gland pores either

automatically or manually. Finally, in the fourth stage, the location where the image should be saved was determined and the final process was run.

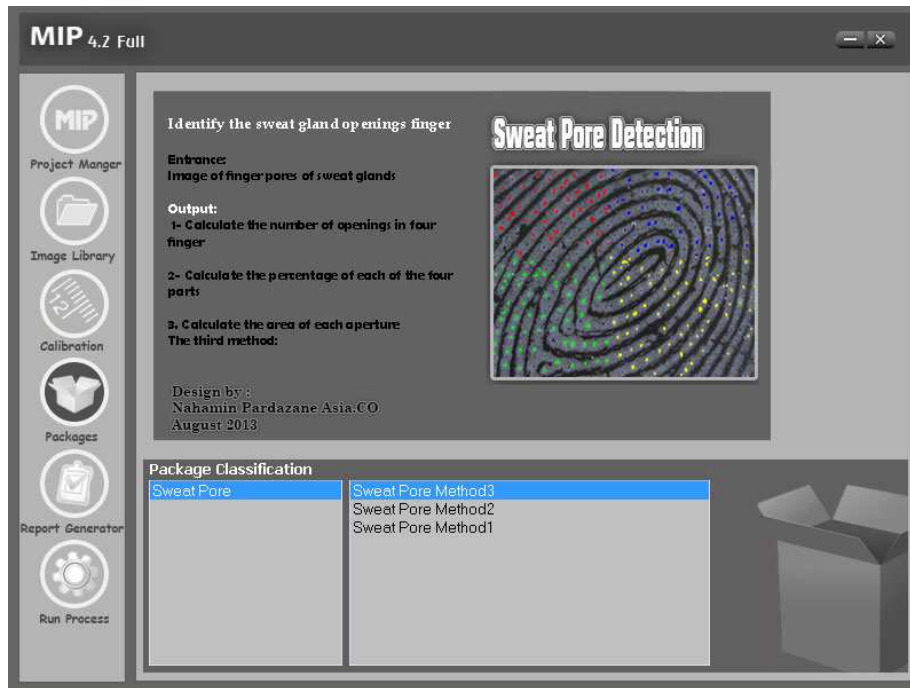


Figure 2. Sweat pore detection method using a digital microscope (Dino-Lite-Plus AM313)

**Analysis of the images of sweat gland pores**

By using Microsoft Office 2010, the perfect contrast for a better view of sweat gland pores was achieved. Then, images of the sweat gland pores and fingerprints were calibrated, using MIP4.2 Full software (with a specific width and length) and divided into four sections. The sweat gland pores in each section were identified with red, blue, green, and yellow colors (Figures 1 & 2). Finally, the number, area ( $\mu\text{m}^2$ ), and percentage of sweat gland pores were determined. The results were converted to spreadsheet data by AreaSearch software. Then, the data were copied in Excel software, and finally, SPSS version 21 was used for statistical analysis.



Figure 3. A view of sweat gland pores in the left thumb using MIP4.2 Full software and a microscope (Dino-Lite-Plus AM313) with 65× magnification; the pores were classified into four parts identified by red, blue, green, and yellow colors

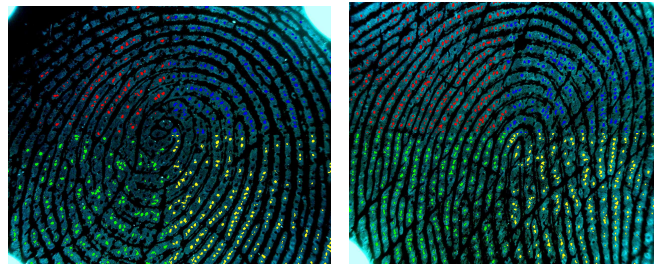


Figure 4: compares the fingerprint image that is located right thumb and left respectively.

**Statistical analysis**

In this analytical, observational study, Fars men were selected via simple random sampling in Mashhad and were divided into six groups. For statistical analysis, SPSS version 21 was used. In order to determine the normal or non-normal distribution of the data, Kolmogorov-Smirnov test, Shapiro test, Q-Q plots, histograms, and box plots were used. As the data were not normally distributed, non-parametric tests, such as Pearson's correlation and Wilcoxon tests, were applied.

**RESULTS**

**Final results of questionnaire analysis**

After completing the questionnaires, 190 out of 410 subjects were introduced to the study. The sample dropout was due to non-Fars ethnicity of some samples, environmental factors (before or after birth), and genetic defects. Fingerprints of the left and right hands were obtained from 220 men, some of which were eliminated due to the fuzziness of skin lines (caused by skin burn or abrasion). Sampling and identification were not possible for men, aged 60 years (or above) due to skin erosion. Finally, 25 babies, 11 children, 14 adolescents, 25 young adults, and 25 middle-aged men (total=100) were studied.

Table 1: Average number of sweat gland pores in the thumb and index finger of right and left hands in different age groups (MEAN + SEM)

Right thumb	Right index finger	Left thumb	Left index finger
412/32+5/45	440/32+65/27	435/31+67/49	554/35+77/4

Figure 5 shows that the average area ( $\mu\text{m}^2$ ) sweat gland pores on the right hand thumb, except for children less the left thumb.

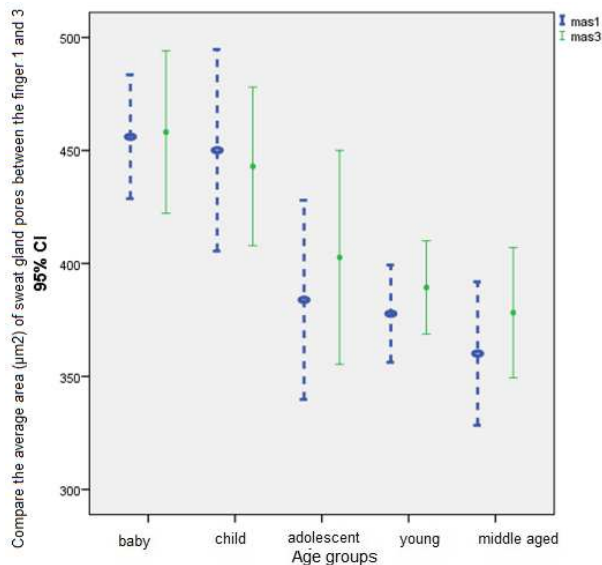


Figure 5: Comparison of area ( $\mu\text{m}^2$ ) of sweat gland pores in the right and left thumb at different ages

Figure 6 shows that the average area ( $\mu\text{m}^2$ ) sweat gland pores on the right hand index finger, except for middle-aged less the left index finger.

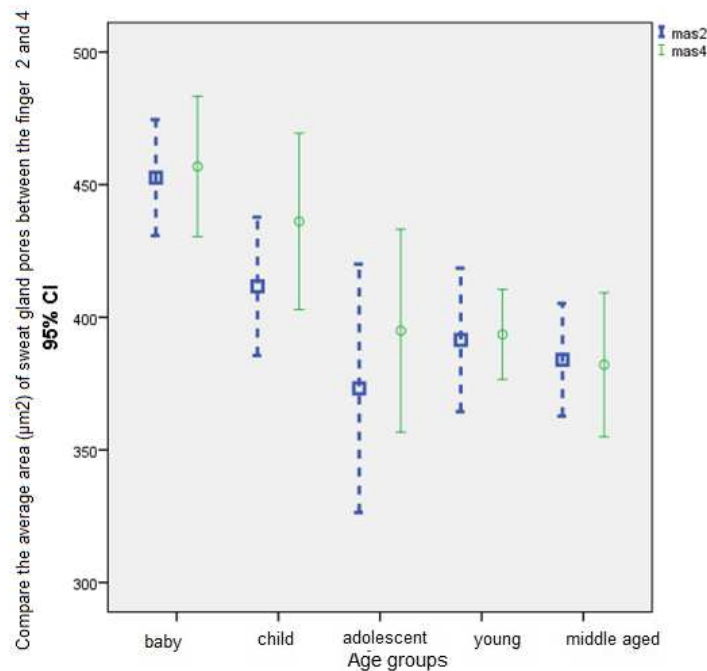


Figure 6: Comparison of area ( $\mu\text{m}^2$ ) of sweat gland pores in the right and left index finger at different ages

### DISCUSSION

Tomkinson and Olds in 2000, he realized, symmetry is a developmental and morphological characteristics known for geometric stability body and said it had been established during the embryonic period [2]. In 2006, the Shiratori and Hamada symmetry is determined during the development and Asymmetry is formed in the following stages of development and growth. Vertebrate embryo goes back to the right in the early stages of gastrulation [7].

Zanki said in the study of 2003 marked asymmetry in the position of the heart, lungs, liver, spleen and dermatoglyphic patterns than before and cannot be easily distorted by the environment. Asymmetry is hereditary and related to the stresses of fetus with chromosomal abnormality, poor diet, infections and maternal health [8]. Asymmetry is a good indicator of developmental homeostasis [9]. Some scholars, including Nicholls in 2004 focused on the practical aspects of asymmetry studies, including neurology, sight reading, hormone levels, incidence of diseases, genetic disorders and different population [10].

Facial asymmetry is common in humans. The etiology includes congenital disorders, acquired diseases, and traumatic and developmental deformities [11]. Human facial asymmetry has long been a critical factor for evaluations of attractiveness and expressions in psychology and anthropology, although most studies are carried out qualitatively. Our findings demonstrate that the asymmetry of specific facial regions captures individual differences that are robust to variation in facial expression. More importantly, our experimental results show that facial asymmetry provides discriminating power orthogonal to conventional face identification methods. Skin lines are like other organs and body parts of a person, on both sides, dissimilar and unequal [12].

According to a study by Bindra et al., characteristics such as the size and shape of sweat gland pores, similar to any other dermatoglyphic feature, can be used for identification [4]. Sweat gland pores are one of the measurable parameters in fingerprint studies. During skin formation in the uterus, sweat gland pores are developed along the skin lines. At the gestational age of 14 weeks, sweat glands begin to appear, as the existing primary ridges increase in width and continue to penetrate into the dermis [13].

Bilateral asymmetry is considered as the difference between the size of the right and left sides of the body. Although it seems the human body, has bilateral symmetry, but for a long time, researchers have noticed that there is morphological skeletal asymmetry in the human body. These studies show that there is asymmetry in anthropometric dimensions, bones, teeth, designs Dermatoglyphic, sweat gland pores, the growth of skeletal components and the different characteristics of the bones of the skull, face and ... (Krishan *et al.*, 2010).

#### ***Symmetry Analysis Results***

Based on studies symmetry was observed between the number of sweat gland pores left and right thumb in the first paragraph (see Table 1) and asymmetry between the number of sweat gland pores first paragraph of the index finger of the left hand and right in different age groups (Table 1) (according to Wilcoxon test thumbs  $p > 0/01$  and the index finger  $p < 0/01$ ). The results are in line with research Khosravi in 2008 on the number of sweat gland pores of thumb and ring finger in the first paragraph of fars women but is antithetic to the study results Khosravi on the sweat gland pores on the index finger [5]. Likely because the study on the male population, so probably the most skin and sweat gland pores have been exposed to erosion.

The results also show asymmetry between the area ( $\mu\text{m}^2$ ) of sweat gland pores left and right thumb in the first paragraph (see Figure 5) and asymmetry between the area ( $\mu\text{m}^2$ ) of sweat gland pores first paragraph of the index finger of the left hand and right in different age groups (Figure 6) (according to Wilcoxon test thumbs  $p > 0/01$  and the index finger  $p < 0/01$ ). Because research has not in this case are not comparable results with others.

#### ***Poroscopy results***

Poroscopy has a way of identifying people, which in this way would be to compare the characteristics of sweat glands pores of different dimensions with each other. Sweat gland pores can be found on the skin lines (skin ridges) of the first knuckle of the fingers, palm of the hands, and soles of the feet. Many different methods have been used in fingerprint studies and poroscopy for identification. For instance, printing ink [4], carbon paper [14], and candle flame [5] are well-known conventional methods in this area. In a study by Tafazoli and colleagues in 2013, poroscopy was applied to evaluate the size of sweat gland pores with a camera in healthy men. Similarly, this method was applied in a study by Khosravi *et al.* on healthy Fars women in 2008, living in Khorasan Razavi, Iran [3, 5]. Poroscopy can be employed in fingerprint identification [3, 4], gender identity [15], and detection of diseases such as dysplasia [16], hypertension [5], skin erosion [17], dental damage [17], reduced rate of sweating [18], congenital deafness, and hearing disorders [19].

In the present study, in line with the findings reported in recent research, we evaluated sweat gland pores in Fars men, aged 0-60 years in Mashhad with the help of a Dino-Lite-Plus AM313 camera and using software MIP4.2 Full. Comparison between the present research and the study by Bindra and colleagues showed a dramatic decline in working time and convenience of sampling. Manual counting of sweat gland pores was another shortcoming of their study [4].

#### ***Age-related changes***

One way to study symmetry analysis, the use of methods Dermatoglyphic, to study symmetry analysis prints and patterns Dermatoglyphic first paragraph finger right or left hand. According to the literature, influence of factors such as age, hormones [20], vitamins, and even skin erosion has been confirmed in dermatoglyphics [21, 22].

Limited studies have been conducted on the application of poroscopy techniques for the evaluation of sweat gland pores in human populations in different stages of development. In the present study, a decline was demonstrated in sweat gland pores among different age groups. Considering the fact that sweat gland pores are one of the skin components, advanced age probably leads to the gradual erosion of skin lines and consequently sweat gland pores. In fact, the reduced number of sweat gland pores might be justified by age.

### **CONCLUSION**

Based on studies symmetry was observed between the number of sweat gland pores left and right thumb in the first paragraph (see Table 1) and asymmetry between the number of sweat gland pores first paragraph of the index finger of the left hand and right in different age groups (Table 1) (according to Wilcoxon test thumbs  $p > 0/01$  and the index finger  $p < 0/01$ ). In general, it seems that poroscopy can be a proper method for genetic studies, fingerprint identification, and prognostic prediction in certain genetic diseases. However, further research with a larger sample

size is required to confirm the use of sweat gland pores in fingerprint identification and disease prognosis Using software MIP4.2 Full.

#### **Acknowledgements**

We would like to thank the Vice-chancellor for Research at Islamic Azad University Of Mashhad, Mashhad Welfare Organization, and Khorasan Razavi Department of Education.

#### **REFERENCES**

- [1] Levin, M.. *Crit. Rev. Oral. Biol. Med.*, **2004**;15(4): 197-206.
- [2] Tomkinson, G. R., Olds, T. S. *Int. J. Sports. Med.*, **2000**; 21(8): 545-50.
- [3] Tafazoli, M., Mahdavi Shahri, N., Ejtehadi, H., Haddad, F., et al. *Anat. Sci. J.*, **2013**;10(2): 99-104.
- [4] Bindra, B., Jasuja, B., Single, A. K. *Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology*. **2000**; 1(1): 291-311.
- [5] Khosravi, A. Distribution of pores of sweat glands and skin line patterns in women with hypertension (high blood pressure) residing in Khorasan province. Master's thesis. Basic Sciences, Ferdowsi University of Mashhad, Department of Biology. Chapter One. Pages 38 to 41. **2008**.
- [6] Negabati, M. Scientific Police (Crime scientific discovery). Third edition, the publisher, Tehran, **2002**; page 38.
- [7] Shiratori, H., Hamada, H. The left-right axis in the nose: from origin to morphology. *Dev.*, **2006**; 133(11): 2095-104.
- [8] Zanki, A., Rampa, A., Schinzel, A. Brachmann-De Lange *Am. J. Med. Genet. A.*, **2003**;118A(4): 358-61.
- [9] Polak, M., Starmer, W. T. *Evolution.*, **2001**; 55: 498-511.
- [10] Nicholls, M. E., Searle, D. A., Bradshaw, J. L. *Psychol. Sci.*, **2004**; 15(2):138-41.
- [11] You-Wei Cheong, MD; Lun-Jou Lo, MD. *Chang. Gung. Med. J.* **2011**; 34: 341-51.
- [12] Jajvandian, R., Mahdavi shahry, n. And Ramazani, A. Volume 9. *Iranian Journal of Basic Medical Sciences*, Mashhad, **2006**; Pages 231-236.
- [13] Mahdavi-Shahri, n., Shariatzadeh, M. A. Illustrated Dictionary formative human embryology. First Edition. aezhpublishations. **2004**; Page 281.
- [14] O'leary, E., Slaney, J., Bryant, G., FRASE, F. C. *Clinical Genetics*, **1985**; 29: 122-128.
- [15] Preethi, D. S., Nithin, M. D, Manjunatha, B., Balaraj, B. M. *J. Forensic. Sci.* **2012**; 57(2): 449-52.
- [16] Manpreet, S., Alka D. K., Vijayalakshmi S K. Karyotyping, dermatoglyphic, and sweat pore analysis of five families affected with ectodermal dysplasia, **2013**; 16(3): 380-387.
- [17] Muarraf Hussain, S., Irfan Ahmed, S. *Journal of Rawalpindi Medical College (JRMC)*, **2012**; 16(2): 200-201.
- [18] Noursbeck, N., Burger, B., Fuchs-Telem, D., Pavlovsky, M., et al. *Am. J. Hum. Gen.*, **2011**; 89: 302-307.
- [19] Osunwoke, E. A., Amah-Tariah F. S., Sapira, M. K., Onosigho, A. *Afr. J. Med. Phy. Biomed. Eng. & Sc.*, **2010**; 2: 98-101.
- [20] Jamison, C. S., Meier, R. J., Campbell, B. C. *American Journal of Physical Anthropology*. **2005**; 90(2): 185-198.
- [21] Mohammadi, S.I. The translation of Laura A. Burke. Developmental psychology. Volume I and II. fourth edition. Arasbaran publications. **2004**; Pages 45-250 and 113-200.
- [22] Mehrbakhsh, a. Study of changes in the symmetry of anthropometric characteristics and Dermatoglyphic a girl from birth to 20 years of age in the Persian tribes living in the city of Birjand. Master's thesis. Basic Sciences, Ferdowsi University of Mashhad, Department of Biology. Chapter One. **2011**; Pages 43-49.