Original Article

An Anthropometric Investigation of Index Finger Length Ratio to Ring Finger (2d:4d) in Men with Schizophrenia Living in Khorasan Razavi

Hassan Shokri[1], Jina Khayat Zadeh[2]*, Mohammad Reza Fayazi Bordbar[3], Mina Jokar[4], Aqiq Khakshour[5]

1. PhD Student in Molecular Genetics, Department of Genetics, Damghan Branch, Islamic Azad University, Damghan, Iran.
2. Associate Professor, Department of Biology, Faculty of Science, Mashhad Branch, Islamic Azad University, Mashhad, Iran.
3. Professor of Psychiatry, Psychiatric and Behavioral Sciences Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.
4. General Physician, Health Center No. 5, Mashhad University of Medical Sciences, Mashhad, Iran.
5. Bachelor of Biochemistry, Department of Biochemistry, Faculty of Science, Mashhad Branch, Islamic Azad University, Mashhad, Iran.
***Corresponding Author:** Dr. Jina Khayat Zadeh; **Email:** khayatzadeh@mshdiau.ac.ir*

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Abstract

Introduction: Schizophrenia is a group of mental disorders that its main characteristics are failure to understand reality and inability to do daily tasks. Anthropometry, which is a type of biometrics, is a science that measures the dimensions and angles of body parts, as well as skin lines and fingerprints on living people. Perhaps knowledge about natural features of finger dimensions provides useful information in the field of medical anthropometry. Therefore, anthropometric properties of the fingers can be used to identify and develop research in this topic. And given that finger length, like brain development, is formed by a family of developmental genes. So, the objective was to find a link between brain violation and finger length.

Methods: This study was a case-control and cross-sectional sampling was done in the one-year. The index and ring finger lengths of both hands in 62 men with schizophrenia and 72 healthy subjects who were not diagnosed and aged 18 to 65 years old living in Khorasan Razavi were measured by digital caliper.

Results: Significant differences were observed between the average index finger lengths (2d:4d) in men's right hand of healthy men and men with schizophrenia. Among other variables, significant differences weren't observed between healthy and patients.

Conclusion: It may seem that the results above are used by methods for genetic studies of biometric changes in patients with schizophrenia from the index finger length ratio to the right and left ring fingers for further studies to make an estimation and generation. It's essential to spread the similar statistical research wider statistical societies.

Conflict of Interest Declaration: Not declared.

Keywords: Index Finger, Anthropometry, Schizophrenia, Men

Introduction

In general, a person is called mentally ill if they fail to recognize the difference between real and unreal subjects. Schizophrenia is described in diagnostic and statistical manual of psychiatric disorders (DSM-IV) as lasting at least six months and including one month of active phase symptoms, which means more than two of following symptoms: Delusions, hallucinations, turbulent talk, negative symptoms, catatonic behavior, and inertia. In terms of epidemiological studies conducted under the supervision of the National Institute of Mental Health (NIMH), the prevalence of schizophrenia has been reported to be between 0.6 and 1.9 percent over lifetime and on average, about 1 percent of people suffer from schizophrenia. In sight of age and sex, the outbreak of disease is equal in both men and women, but there are differences in the onset and pathology of the disease; for example, in men it develops earlier than women (1).

Considering birth season, a patient with schizophrenia may be born in winter and early spring, which the present hypothesis includes specific seasonal factors, such as a virus or seasonal diet changes (2). In geographical distribution, the lack of even distribution could be cause of virus or infection element in schizophrenia. Accidents or other natural factors consequent mortality in patients with schizophrenia, as at least one-time 50 percent of patient suicide and 15 to 20 percent get success (3).

The schizophrenic DSM-IV classification that has been published by American Psychiatric Association, briefly includes: disturbed schizophrenia, catatonic schizophrenia, paranoid schizophrenia, unsophisticated schizophrenia, simple schizophrenia (1).

Wide range of genetic studies suggest a strong component of schizophrenic inheritance and the probability of being associated is related with the degree of kinship affinity so that monozygotic twins show high levels of joint disease risk (4). Even if the accommodations of twins are different, the proportion of schizophrenia is same and it demonstrates the advantage of genetic to environment. If schizophrenia is caused by brain chemical impairment, it may have an inheritable characteristic. There is no doubt that brain disorders can be hereditary (4).

Cytogenetic studies have shown abnormality of sex chromosome and reversal of chromosome 9 in some patients with schizophrenia. Although study about affiliation of locus on the short arm of chromosome 6 has possibility to be related with it. Beside affiliated studies, another field of current research has focused on molecular mutation such as microdeletion and trinucleotide repeat expansion, which involves mental disorders, as microdeletion on chromosome 22 and development GAG repeating units on chromosome 12 is related to schizophrenia (4).

Anthropometry is composed of two Greek words: *anthropo* and *metric* meaning human and measurement, respectively. Anthropometry is a branch of biometry that contains only humans. The general concept of this science is obtaining and measuring dimensions and body size (5).

Anthropometry examines quantitative characteristics that comprise of linear dimensions which are obtained from body angles. Anthropometry is one of the most important methods of quantitative assessment of hard and soft body tissues. In each nation and origin, quantitative and qualitative studies of growth of hand bones and measurement of normal and abnormal hand's structures could be useful for diagnosis, determination and treatment of abnormality in medical sciences; moreover, it could be used to recognize nations, origins and describe their properties in the field of anthropometry (6,7).

Since, anthropometric parameters are based on age, gender, geographic location

and characteristics of different breeds of humans, anthropometric studies have to be done separately for each population by age and gender (8).

The first digit is the thumb (1D), the second is the index finger (2D), the third is the middle finger or the longest finger (3D), the fourth is the ring finger (4D), the fifth (5D), is the little finger.

Three phalanges are present on each finger. The terminal or distal phalanges are the phalange bones that support the fingertip pads and nails. The intermediate phalanges are called middle phalanges. The proximal phalanges are those that join with the metacarpus. (Figure 1) The thumb consists of two phalanges and does not possess a middle phalange (9).

There are five long bones in metacarpus which are called metacarpals, and every single finger has three bones but each thumb consists of two bones. Finger bones are called phalanges. Every metacarpus and phalanges are made up of three parts: the proximal, middle and distal (9).

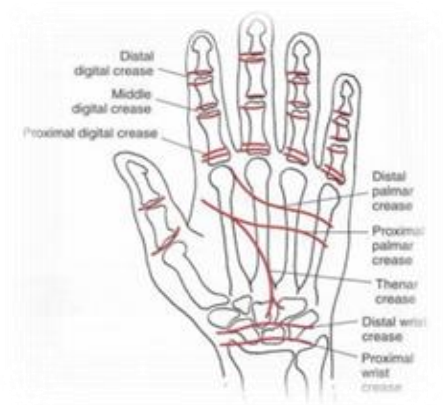

Figure 1. The anatomy of human hand (9).

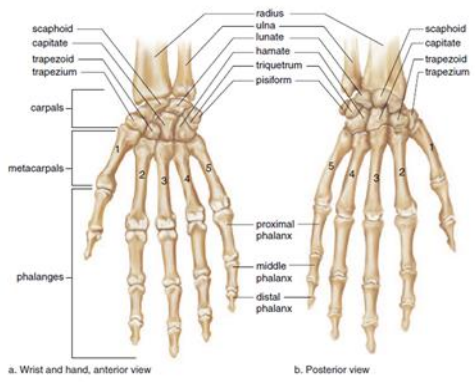

Figure 2. Hand bones (9).

Related researches

The 2D:4D ratio shows the sperm numbers, concentrations of testosterone, luteinizing hormone and estrogen (10).

Human males and females with congenital adrenal hyperplasia have masculinized finger length patterns (11).

The relation between 2D:4D ratio, childhood gender role behavior and erotic role preferences of gay men was investigated (12).

Study of the Australian, Britain and American finger length patterns are related with ethnicity or latitude (13)?

The 2D:4D ratio and its relation to gender-related personality were investigated (14).

A high ratio of 2D:4D in male-to-female transsexuals' indicator of a reduction in prenatal androgen expression (15).

The relation between hand fingers length patterns and sex hormone levels of an adult were studied (16).

Objectives and assumptions

Implementing this research to develop fundamental researches of medical anthropometry and basic knowledge of clinical prognosis, collecting an archive of biometric properties and information in patients with schizophrenia can be used for prevention, prognostication and therapeutic planning. The aim of this study is to investigate anthropometry in the position of fingers.

According to the affliction of schizophrenic disease problems and its prevalence in today's industrial societies, providing appropriate prevention knowledge of these diseases could be beneficial. Therefore, investigating these issues has been targeted in this study.

Also, the information will be important in the prognosis of psychiatric, medical, and therapeutic planning and the development of basic knowledge in the field of anthropometric and human genetics.

Methods

This study was a case-control and cross-sectional sampling was done in the one-year period from the beginning of 1393 to the beginning of 1394 in Mashhad. In this study, male patients referred to the clinics of Ibn-e-Sina who were hospitalized at Ibn-e-Sina hospital in Mashhad diagnosed of schizophrenic disorder confirmed by two psychiatrists and able to enter the study were selected and given the limited study Fars ethnic, ethnicity also asked patients. Due to the dissatisfaction with the presence in the research and affected by other psychiatric disorders and ages outside the desired range were excluded from the study, and considering the number of patients available, the sample size in this pilot study on two groups of healthy people (control) and patients. The patient group included 62 male people in the range of 18-65 years old with diagnosis of schizophrenic disorder which was confirmed by two psychiatrists were selected and given the limited study Fars ethnic, ethnicity and patients were also questioned. The second group (control) consisted of healthy subjects who were not diagnosed with the disorder as well as no having a sister or brother with them was confirmed, were selected randomly from the middle school of Mashhad and Islamic Azad University, Mashhad Branch. The group included 72 men in the age range of 18 to 65 years old and were all ethnic gulfs. The quality of the sample size was determined since some of the samples are of poor quality and have been removed and the rest of the samples are given in the research.

Informed consent was obtained from all participants, for participation in this study.

The index and ring finger length of both hands were measured by a caliper with precision of ±0.02mm, from the back of the hand from beginning of the metacarpophalangeal joint to the tip of the finger. In this measurement, the fingers were flat with angle of approximately of 90 degrees ratio to the palm of the hand (17).

After the completion of this stage, the designers carefully measured anthropometric parameters and the results and number were entered into the Excel, Minitab, and SPSS software for statistical analysis. In the subject of inference, according to the hypothesis of the research, the Leven's test, the Kolmogorov-Smirnov test, the independent samples test and the paired samples T test have been used.

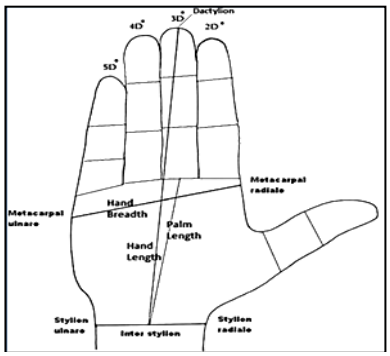

Figure-3: hand landmarks (17)

Kewal Krishan and Tanuj Kanchan was presenting landmarks to estimate the length of the hand, the width of the hand and the length of the fingers in 2011 which include the following. (Figure 3) (17).

Results

In order to compare the anthropometric size of the index finger and left and right-hand rings of healthy men with the anthropometric size of the index finger and left and right-hand rings of patients with schizophrenia, t-test of two independent samples have been used (Checking the significance level). Assumption zero in this test is the equality of the average length of the index finger and the ring of the right and left hands of men in both healthy and sick groups. Therefore, the assumption against the inequality of the mean length of the index and the left- and right-hand ring fingers is defined in both healthy and sick groups. If the numerical probability value is less than 0.05, then we say that the null hypothesis is significant at the five percent level.

An average comparison of anthropometric measurements of index fingers of both

hands in healthy people and men with schizophrenia, according to chart-1 and 2, shows a significant difference between the average index finger length of right hand in two groups of healthy men and patients. Also, in this sample, the average index finger length of right hand in men with schizophrenia group is significantly less than the average of the healthy group. Also, there is no significant difference between the average index finger length of the left hand in two groups of healthy men and patients (P>0.05).

Based on an average comparison of anthropometric measurements of ring finger of both hands in healthy men and men with schizophrenia, according to chart-1 and 2, there is no significant difference between the average ring finger length of right hand in two groups of healthy men and patients. Also, the average ring finger length of right hand in men with schizophrenia is less than the average of the healthy group. Although there is no significant difference between the average ring finger length of left hand in two groups of healthy men and patients (P>0.05).

In an average comparison of index finger to ring finger anthropometric measurement ratio (2D:4D) in both hands of healthy men and men with schizophrenia, according to chart 2, there is no significant difference between the average index finger length ratio to ring finger in left hand of two healthy and patients' men groups. However, the average index finger length ratio to ring finger in left hand of men with schizophrenia group is less than the average of healthy group. Although, there is no significant difference between the average index finger length ratio to ring finger in right hand of the two groups of healthy men and men with schizophrenia, the average index finger length ratio to ring finger in right hand of men with schizophrenia group is less than the average of healthy group (P>0.05).

Table 1: Descriptive statistics of the index and ring fingers (2D:4D) length (millimeter) of both hands in healthy men and men with schizophrenia.

STATUS		FINGER TYPE	NOMBER	MAX	MIN	MEAN + VARIANCE
Right hand	Schizophrenia	Index	62	61.58	85.54	**72.29+0.63**
		Ring	62	61.62	84.77	**74.19+0.63**
	Healthy	Index	72	64.74	84.77	**74.00+0.47**
		Ring	72	67.09	87.06	**75.40+0.50**
Left Han	Schizophrenia	Index	62	61.97	83.38	**72.99+0.62**
		Ring	62	61.64	83.36	**73.85+0.62**
	Healthy	Index	72	40.14	87.02	**74.14+0.66**
		Ring	72	66.02	85.38	**74.89+0.47**

Table 2: Comparison significant differences between the index and ring fingers in healthy men and men with schizophrenia; t-test.

Schizophrenia and healthy group	Mean differences	standard deviation Mean difference	t-Test	Value Probability (p)
Right index finger	-1.7	0.78	*-2.19	**0.03**
Left index finger	-1.14	0.91	-1.25	**0.21**
Right ring finger	-1.22	0.8	1.52	**0.13**
Left ring finger	-1.04	0.77	-1.35	**0.18**

Table 3. Descriptive statistics of the index and ring fingers (2D:4D) length ratio of both hands in healthy men and men with schizophrenia.

Finger Length Ratio Index to The Ring (2D:4D)		Number	Max	Min	Mean + Variance
Right Hand	Schizophrenia	62	1.07	0.88	**0.97+0.005**
	Healthy	72	1.08	0.88	**0.98+0.004**
Left Hand	Schizophrenia	62	1.09	0.92	**0.98+0.004**
	Healthy	72	1.07	0.58	**0.99+0.006**

Discussion

Research has shown that anthropometric data have a gap in different populations. For example, the Scandinavian population is taller than Asians and the Italians populations (18). On the other hand, among different nations of the same origin, there may be a difference in case of economic and social situation and body dimension. But studies have shown that anthropometric differences among different origins are more than different nations (19). Recently a number of researchers have been interested in asymmetric, because they have various functional aspects such as neurology, visual observation, hormonal levels disease awareness, inherited abnormally and demographic variability. However, human knowledge about real benefits of asymmetry is limited because of misunderstanding genetic nature (20). On the other hand, regarding the detection of genetic syndrome in people who have syndrome and then their comparison with anthropometric data obtained from the normal population (in proportion to the age and gender of the affected person) can be helpful to identify the characteristics and specifications of syndrome keys (21). Considering the above mentioned issues and the importance of the subject, regarding the effects of genetic and environmental causes on the access of psychological disorders, such as bipolar disorder and schizophrenia and the role of asymmetric oscillations in the emergence process, in the present study, due to the synchronization possible of the arterial effects on neurological disorders and organs of movement's growth and germination during emergence of embryonic process, the index finger length ratio to ring finger (2D:4D) in the hands of men with schizophrenia versus healthy group were investigated.

In average comparison of index finger anthropometric measurement length of right hand in healthy men and men with schizophrenia, according to table 1 and 2, the average index finger length of right hand in men with schizophrenia was significantly less than the average of healthy group ($P<0.05$).

In average comparison of index finger anthropometric measurement length of left hand in healthy men and men with schizophrenia, according to table 1 and 2, there is no significant difference between the average index finger length of left hand in two groups of healthy men and patients. Although, the average index finger length

of left hand in men with schizophrenia was 1.14 mm less than the average of healthy group. (P>0.05)

According to table 1 and 2, in average comparison of both hand's ring finger length in healthy men and men with schizophrenia, although the average of the ring finger length of right and left hands in men with schizophrenia was less than 1.22 mm and 1.04 mm respectively from the average of healthy group, it is not statistically significant. (P>0.05)

According to table 3, in average comparison of the index finger length ratio to the ring finger (2D:4D) of the right and left hands in healthy men and men with schizophrenia, the average index finger length ratio to the ring finger of the right hand in two groups of patients and healthy men, although the average index finger length ratio to the ring finger of the right and left hands in men with schizophrenia was less than 0.007 mm and 0.0008 mm respectively from the average of healthy group, it is not statistically significant (P>0.05).

The results of this study are consistent with similar studies that compare healthy individuals and patients with schizophrenia. In 2006, Valder et al., examined a study for sexual differences and their relationship with finger length ratios in adolescents with schizophrenia. Among people of the control groups in the right hand, the longitudinal finger ratios (2D:4D) in women was higher than men but there was no significant difference between patients with schizophrenia group (22). Also in the research by Clinson et al. in 2010, the ratio 2D:4D was investigated on 33 men and 31 women (altogether 64 people) with schizophrenia (54 Indian, 10 Malay, Indian and Caucasian), 33men and 31 woman (altogether 64 people) healthy (58 Indian, 10 Malay, Indian and Thai) Asian, and it was found that the average finger length had no significant difference, but there was significant difference between the patients and healthy groups' ratio 2D:4D. (23) But the results of present research are inconsistent with the data of the study that was mentioned in the case of 2D:4D relating with probability of developing schizophrenia. This may relate with ethnic and genetic differences affecting the morphological anthropological parameters.

In Iran, a similar study has not been conducted in anthropometry of fingertips and schizophrenia. But research on anthropometry and other diseases was carried out. In 2017, Hamid Arazi et al. Investigated the relationship between the ratio of the index finger to the D: 4D ring 2) with the ratio of muscle strength in postmenopausal women (24). In 2013, Karishan et al. examined the relation between sexual needs and finger length ratios 2D:4D on 140 people (70 girls and 70 boys) in northeast. The results showed a significant relation between these two variables. In meantime, 2D:4D in the right hand shows a better prediction than 2D:4D in the left hand (17). Maryam Tahranipoor et al. Studied the anthropometric ratio of the index finger to the ring (2D: 4D) of the left hand of 180 healthy and mentally retarded boys 7 in Sistani tribe living in Zabol city: The results showed the average length of the left fingers of healthy boys from boys' Mental retardation is greater (25). Another study by Rahman and Lofthananon in 2010 suggested that the 2D:4D ratio predicts prostate cancer in men (26).

Therefore, it seems that according to the results of the present study, except for the right index finger, which showed a significant difference between men with schizophrenia and healthy men, this anthropometric feature as a biomarker indicates the prognosis of this disease in the study population of Persian men living in the provinces. Khorasan Razavi could not be presented, so this study should be done with more samples and in wider geographical areas of different races. Also, the level of significance of the index finger length can be used as a special indicator.

In general, anthropometry seems to be a suitable method for genetic studies and possibly prognosis in schizophrenia and many other illnesses. But on the other hand, to comment and conclude whether it is possible to use an anthropometric ratio (between healthy persons and patients with schizophrenia) in early detection of this disease, it is necessary to extend the same statistical research in wider statistical societies. It is hoped that in future similar plans for the completion of the data base on dermatology in Iran, there will be an extensive statistical society in each of the Turk, Kurdish, Baluchi and other breeds, and other types of diseases.

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