

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

Hassan Shokri¹, Jina Khayat-zadeh^{2*}, Mohammad Reza Fayazi Bordbar³,
Mina Jokar⁴, Aqiq Khakshour⁵.

1- PhD Student in Molecular Genetics, Department Genetics. Islamic Azad University, Damghan, Iran.

2- Associate Professor, Department of Developmental Cell Biology. 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.

Bachelor of Biochemistry, Department Biochemistry. Islamic Azad University, Mashhad, Iran.

(*Corresponding Author: Dr. Jina Khayat Zadeh j, Email:khayat-zadeh@mshdiau.ac.ir)

(Received:5 Jan 2021; Revised: 19 Jan 2021; Accepted: 23 Jan 2021)

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.

Method: 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 schizophrenic men and 72 healthy subjects who were not diagnosed and aged 18 to 65 years old living in Khorasan Razavi were measured by digital caliper.

Result: Significant differences were observed between the average index finger lengths (2d:4d) in men's right hand of healthy and schizophrenic subjects. 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 people 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.

Declaration of Interest: None

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 (N I M H), 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 person 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 schizophrenic patients, as at least one-time 50 percent of

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

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 schizophrenic patients. 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).

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.

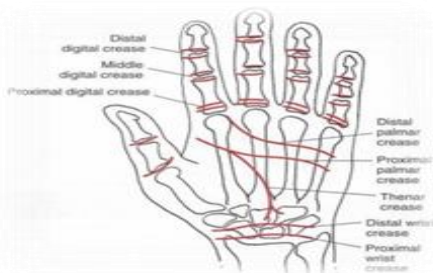


Figure 1. The anatomy of human hand. (9)

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).

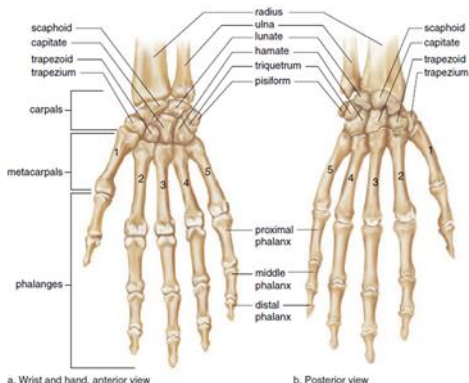


Figure 2. Hand bones. (9)

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).

Related research

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 schizophrenic patients 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 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 quality and have been removed and the rest of the samples are given in the research.

Of all the participants, informed consent was obtained for participation in the research project.

The index and ring finger length of both hands were measured by a caliper with precision of $0/02\text{mm}\pm$, 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

therapeutic planning and the development of basic knowledge in the field of anthropometric and human genetics.

Methods

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 males in the age range of 18-65 years old and were all ethnic gulfs. The quality of the sample size was determined since some of the samples are of poor.

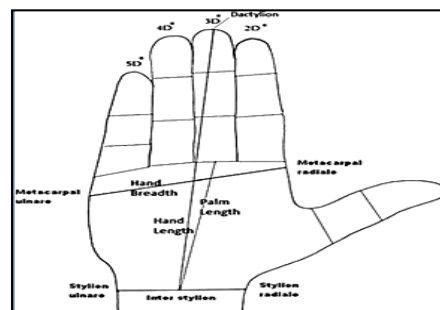


Figure-3: hand landmarks (17)

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. (Figure3) (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 schizophrenic

patients, t-test of two independent samples has 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 finger and the left- and right-hand rings 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 in healthy and schizophrenic men's index finger of both hands, 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 schizophrenic men 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 ($P>0/05$).

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

	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

Based on an average comparison of anthropometric measurements in healthy and schizophrenic men's ring finger of both hands, 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 schizophrenic men 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 ($P>0/05$).

Table 2: comparison significant difference between the index finger and the ring both healthy men and schizophrenia t-test

Schizophrenia and healthy group	Mean differences	standard Mean deviation 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

In an average comparison of index finger to ring finger anthropometric measurement ratio (2D:4D) in both hands of healthy and schizophrenic men, 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 schizophrenic men 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 and schizophrenic men, the average index finger length ratio to ring finger in right hand of schizophrenic men group is less than the average of healthy group ($P>0/05$).

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

FINGER LENGTH RATIO INDEX TO THE RING (2D:4D)		NUMBER	MAX	MIN	VARIANCE+MEAN
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 economical 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 schizophrenic men versus healthy group were investigated.

In average comparison of index finger anthropometric measurement length of right hand in healthy and schizophrenic men, according to table 1 and 2, the average index finger length of right hand in schizophrenic men 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 and schizophrenic men, 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 schizophrenic men 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 and schizophrenic men, although the average of the ring finger length of right and left hands in schizophrenic men 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 and schizophrenic men, 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 schizophrenic men 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 schizophrenic ones. In 2006, Valder and et al., examined a study for sexual differences and their relationship with finger length ratios in adolescents with schizophrenic people. 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 people of the schizophrenic 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), 33 men 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,

Therefore, it seems that according to the results of the present study, except for the right index finger, which showed a significant difference between schizophrenic 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 To all organizations cooperating in this project, especially head of the Ibn-e-Sina hospital, Dr. Fatemeh Moharreri, psychiatric

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 Tahrani-poor 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).

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 and schizophrenic person) 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.

Acknowledgment

at research center and behavioral sciences of Mashhad University of medical sciences

References

1. Harrison, P. J., 1999. The neuropathology of schizophrenia. A critical review of the data and their interpretation. *Brain.*, 122:563-624.
2. Torrey, E. F., Miller, I., Rawling, R., Yolken, R. H., 1997. seasonality of births in schizophrenia and bipolar disorder: a review of literature. *schizophr. Res.*, 28: 1-38
3. Brown S. 1997. Excess mortality of schizophrenia. A meta-analysis. *Br. J. Psychiatry*, 171: 502-8.
4. Markow, T. A., 1992. Genetic and developmental stability: an integrative conjecture on etiology and neurobiology of schizophrenia. *Psychology. med.*, 22:295-305
5. Abolhasanzade, A., Ahi, A., Farzampour, SH., Masteri Farahani, R. 2010. Investigation of soft classical about face of Youth Male 18-22 year-old in Tehran based on index prosopic in 2005. *Journal of military and health sciences research of Islamic Republic of Iran. Number3. Pages 867 to 872.*
6. Afshar Naderi, GH. R. 1988. *Biological anthropology*. Compiled by Shamla, M. K., Nashr Gostare, Tehran, First edition, 152.
7. Hasanzadeh, GH. R. 1999. *Human origins (Anthropology)*. Elm-Adab publishers. First edition. Pages 40 to 50.
8. Jahanshahi, M., Golalipour, M. J. Heydari, K. 2008. Ethnic and face shapes of boys in 17–20-year-old in Gorgan. *Journal of Birjand University of medical science*, 15(4); 100-104.
9. Warwick, W., Mannister, D. 1973. *Grays anatomy*, Thirty seventh edition. Churchill livingstone. Chapter3.osteology, p.416-422
10. Manning, J. T., Scutt, D., Wilson, J., Lewis-Jones, D. I. 1998. The ratio of second to fourth digit length: a predictor of sperm numbers and concentrations of testosterone, luteinizing hormone and oestrogen. *Hum. Reprod*, 13: 3000–3004.
11. Brown, W., Hines, M., Fane, B., Breedlove, M. 2002. Masculinized finger length patterns in human males and females with congenital adrenal hyperplasia. *Hormones Behav.*, 42: 380-386.
12. McIntyre, M. 2003. Digit ratios, childhood gender role behavior, and erotic role preferences of gay Men. *Arch. Sex. Behav.* 6: 495-497.
13. Loehlin, J., McFadden, D., Medland, S., Martin, N. 2006. Population differences in finger-length ratios: *arch. Sex. Behav.*, 6: 739-742.
14. Lippa, R. 2006. Finger lengths, 2D:4D ratios, and their relation to gender related personality traits and the big five. *Biol. Psychol.*, 71: 116-121.
15. Schneider, H., Pickel, J., Stalla, G. 2006. Typical female 2nd–4th finger length (2D:4D) ratios in male to female transsexuals possible implications for prenatal androgen exposure. *Psych neuroendocrinology.*, 31: 265-269
16. Beier, L., Liebert, A., Chemnitz, K. 2007. Institut fur, Flemmingstr. Second to fourth digit length ratio (2D:4D) and adult sex hormone levels: new data and a meta analytic review. *psychoneuroendocrinology.*, 26: 567-589.
17. Krishan, K., Kanchan, T., Asha, N., Kaur, N., et al. 2013. Estimation of sex from index and ring finger in a North Indian Population. *J. Forensic. Leg. Med.*, 20: 471-479
18. Lin, Y. C., Wang, M. J., Wang, E, M., 2004. The comparisons of anthropometric characteristics among four peoples in East Asia. *Appl. Ergon.*, 35(2):173-78.
19. Ismaila, S. O., 2009. Anthropometric data of hand, foot, ear of university students in Nigeria. *Leonardo. J. Sci.*, 8(15):15-20.
20. Lin, Y. C., Wang, M. J., Wang, E, M., 2004. The comparisons of anthropometric characteristics among four peoples in East Asia. *Appl. Ergon.*, 35(2):173-78.
21. Nicholls, M. E., Searle, D. A., Bradshaw, J. L. 2004. Read my lips: asymmetries in the visual expression and perception of speech revealed through the mcgurk effect. *Psychol. Sci.*, 15(2): 138-41.
22. Saksena, S. S., Bixler, D. 1990. Facial morphometrics in the identification of gene

- carriers of X-linked hypohidrotic ectodermal dysplasia. *Am. J. Med. Genet.*, 35(1): 105-114.
22. Walder, D. J., Andersson, T. L. C., McMillan, A. L., Breedlove, S. M., et al., 2006. Sex differences in digit ratio (2D:4D) are disrupted in adolescents with schizotypal personality disorder: Altered prenatal gonadal hormone levels as a risk factor. *Schizophr. Res.*, 86:118–122.
 23. Collinson, S. L., Lim, M., Chaw, J. H., Verma, S. 2010. Increased ratio of 2nd to 4th digit (2D:4D) in schizophrenia. *Psychiatry Research*. 176: 8–12.
 24. Arazi H, Eghbali E, Dadvand S.Sh, Pahlevanzadeh M. Relationship between 2D:4D digit ratio with waist to hip ratio, muscle mass and strength in postmenopausal women. *Feyz*2017; 20(6): 557-65.
 25. Tehranipour M, Vatanshenas Mehrbakhsh M. Anthropometric Study of the Ratio of Left-Hand Index Finger to Ring Finger (2D:4D) among Sistani Boys with and without Intellectual Disability Aged 7 to 10 Years in Zabul, Iran . *JOEC*. 2018; 17 (3) :63-72
 26. Rahman, A. A, Lophatananon, A., Brown, S. S. 2010. Finger length may predict prostate cancer. *Br. J. Cancer.*, 30: 157-16

