



FINGER PAPILLARY TRAITS IN BULGARIAN FEMALE BREAST CANCER PATIENTS

Galina Yaneva¹, Nadezhda Petrova², Dobri Ivanov¹

1) Department of Biology, Faculty of Pharmacy, Medical University, Varna, Bulgaria.

2) Department of Human Anatomy and Physiology, Faculty of Biology, University of Plovdiv "Paisii Hilendarski", Plovdiv, Bulgaria.

ABSTRACT

Purpose: The objective of the present investigation was to juxtapose some qualitative dermatoglyphic characteristics of finger papillary patterns between breast cancer patients and healthy control females.

Material/Methods: In 2014-2017, several qualitative fingerprint papillary traits such as loops, arches and whorls were examined in 82 females with breast cancer and 60 healthy women from the region of Varna using the classical dermatoglyphic method of Cummins & Midlo.

Results: There was a coincidence of the mean values of homologous finger papillary traits between breast cancer patients and healthy controls. There were statistically significant differences between breast cancer patients and healthy controls in terms of the sum frequencies of left thumb, left and right index finger papillary traits, the frequencies of arches ulnar loops and whorls of the left index finger, the frequencies of arches of the left ring and left little finger, of the whorls of the right index, middle and little fingers, the total frequencies of left and right finger papillary traits as well as the total frequency of the finger papillary traits of the left and right hand and both hands.

Conclusion: These statistically significant differences between breast cancer patients and healthy females in terms of the mean values of fingerprint papillary traits of all the five homologous fingers, of total frequencies of these traits of the first and second left-hand finger as well as of the second, third and fifth right-hand finger could contribute to the enrichment of the screening and prognostic dermatoglyphic armamentarium in the field of breast cancer.

Keywords: breast cancer, dermatoglyphics, fingerprints, loops, whorls, arches,

INTRODUCTION

Recently, numerous dermatoglyphic studies in patients with a variety of health conditions [1] show a correlation of certain dermatoglyphic properties with malignant diseases including breast cancer [2]. Evidence accumulates that improved models of dermatoglyphic traits could effectively be used not only for the investigation of breast cancer genetic basis but also either as a screening tool in females at increased risk of this socially significant disease and for reduction of this risk, respectively, or for early patient's management. The distinctive character of fingerprints is highly variable and a tool of tracing individuals to a particular population [3].

The objective of the present investigation was to juxtapose some qualitative dermatoglyphic characteristics of finger papillary patterns between breast cancer patients and healthy control females.

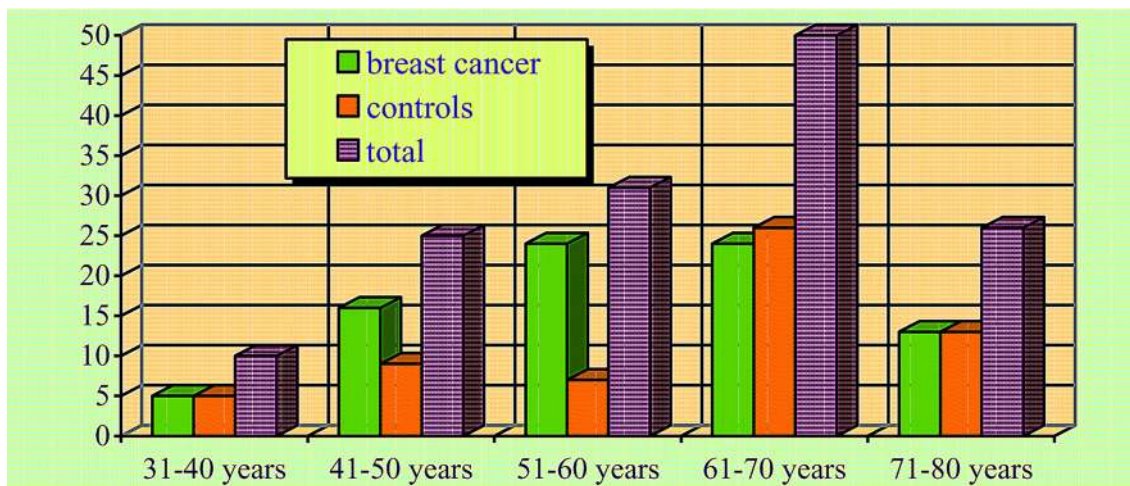
MATERIALS & METHODS

Our study was carried out in the period from January 1, 2014 till December 31, 2017. It covered 82 women with clinically, histologically and mammographically confirmed breast cancer as well as 60 healthy women from the region of Varna, Bulgaria. Breast cancer patients were aged between 36 and 80 years, while healthy females were aged between 31 and 79 years. All of them were of Bulgarian ethnic origin. Dactyloscopy of some qualitative fingerprint papillary traits such as loops, arches and whorls were applied according to a classical method of Cummins & Midlo [4]. Descriptive statistics, including variation and graphical analysis, independent *t*-test and χ^2 -test were used. Statistical data processing was done by means of SPSS software package, version 19.

RESULTS

In our contingent, females aged between 51 and 70 years prevail (Figure 1).

Fig. 1. Age distributions of breast cancer patients and controls



Mean values of homologous finger papillary traits of breast cancer patients coincide with those of healthy controls (Table 1).

Table 1. Coincidence of mean values of homologous finger papillary traits between breast cancer patients and controls

Right and left hand fingers	breast cancer	healthy controls	<i>t</i>	p
I	0.55±0.50	0.65±0.48	-1.22	0.226
II	0.40±0.49	0.50±0.50	-1.15	0.251
III	0.56±0.50	0.6±0.48	-1.28	0.202
IV	0.55±0.50	0.55±0.50	-0.01	0.989
V	0.62±0.49	0.53±0.50	1.06	0.293

Sum frequencies of left thumb left and right index finger papillary traits differ statistically significantly between breast cancer patients and healthy controls ($\chi^2=3.872$; $p=0.049$; Figure 2; $\chi^2=49.532$; $p=0.0001$; Figure 3, and $\chi^2=16.153$; $p=0.0001$; Figure 4, respectively).

Fig. 2. Frequency of left thumb papillary traits in breast cancer patients and controls

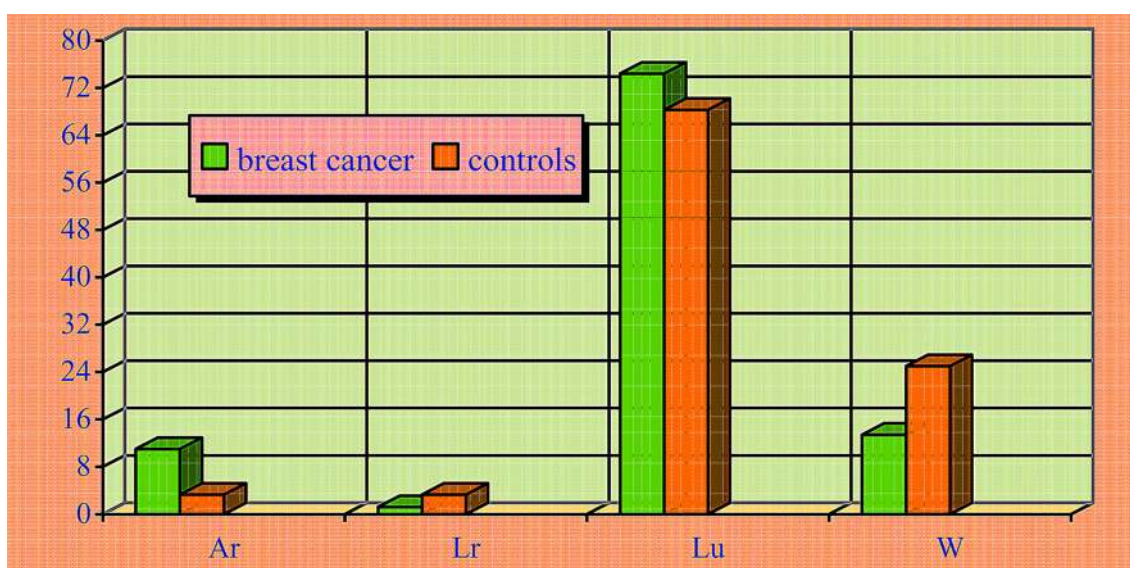


Fig. 3. Frequency of left index finger papillary traits in breast cancer patients and controls

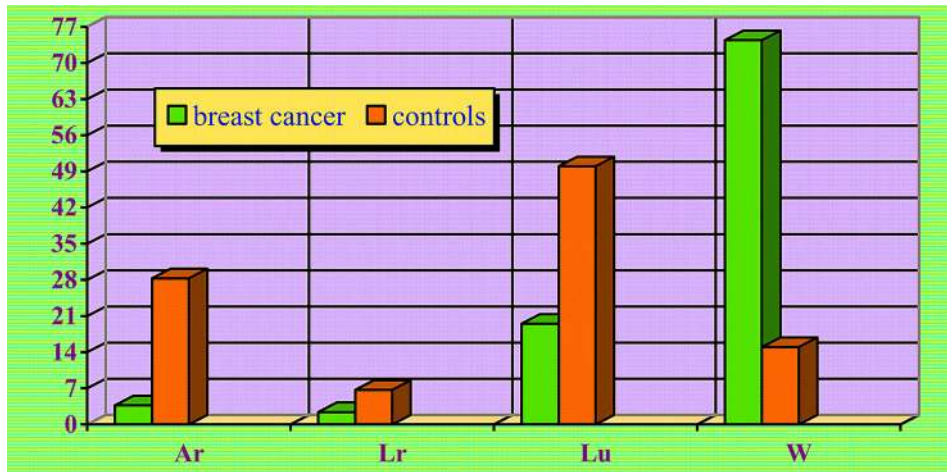
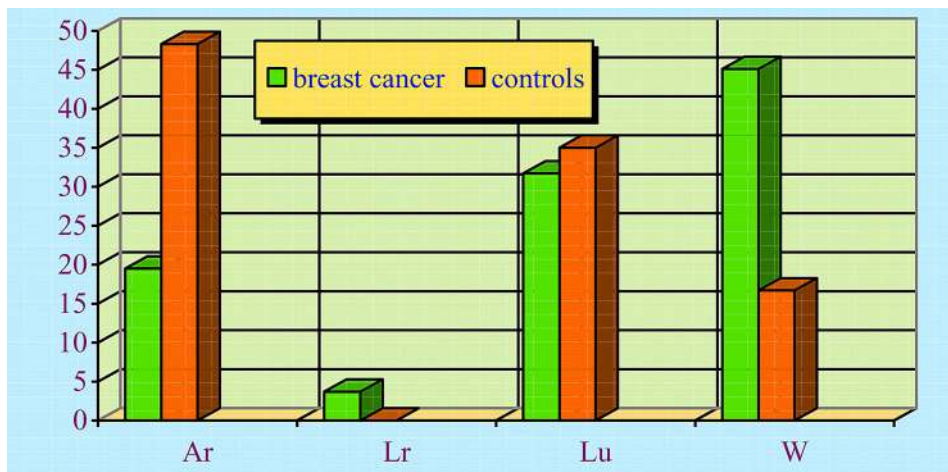


Fig. 4. Frequency of right index finger papillary traits in breast cancer patients and controls



There are statistically significant differences between breast cancer patients and healthy controls in terms of the frequencies of arches (Ar) ($p < 0,001$), ulnar loops (Lu) ($p < 0,001$) and whorls (W) ($p < 0,0001$) of the left index finger as well as concerning the frequencies of arches (Ar) of the left ring and little fingers ($p < 0,05$ each), too. The frequencies of radial loops (Lr) do not differ between both groups.

The frequencies of whorls (W) of the right index, middle and little fingers are statistically significantly different from those of healthy females ($p < 0,001$; $p < 0,05$ and $p < 0,05$, respectively). Total frequencies of left and right finger papillary traits differ statistically significantly between breast cancer patients and healthy controls ($\chi^2 = 18.708$; $p = 0.0001$; Figure 5 and $\chi^2 = 24.594$; $p = 0.0001$; Figure 6, respectively).

Fig. 5. Total frequency of left finger papillary traits in breast cancer patients and controls

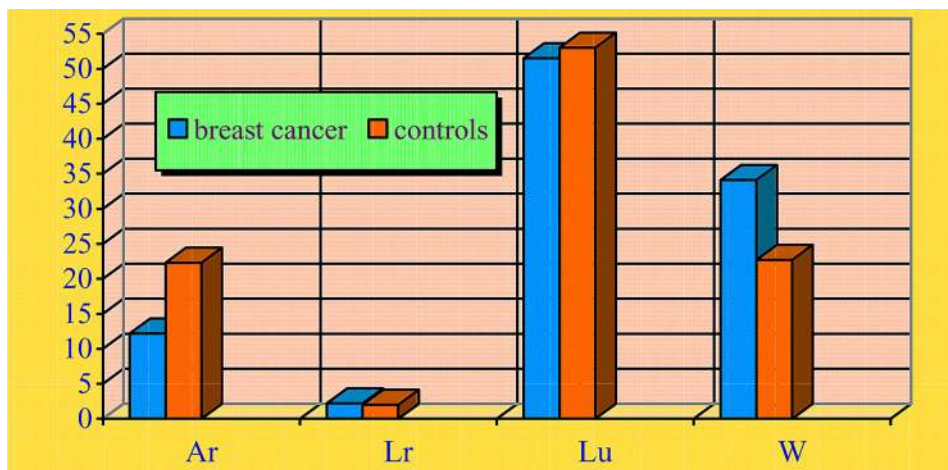
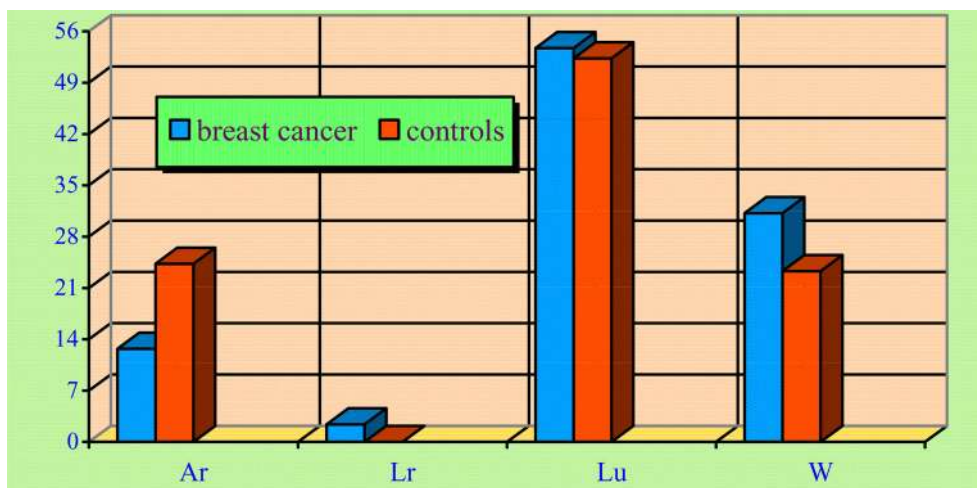
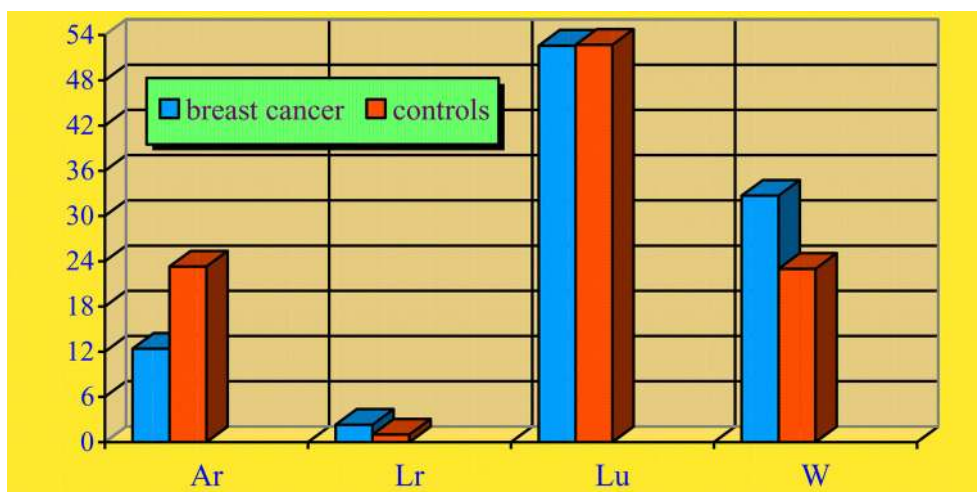


Fig. 6. Total frequency of right finger papillary traits in breast cancer patients and controls



The total frequency of the finger papillary traits of the left and right hand as well as of both hands differs statistically significantly between breast cancer patients and healthy controls ($\chi^2=79.345$; $p=0.0001$; Figure 7).

Fig. 7. Total frequency of finger papillary traits in breast cancer patients and controls



DISCUSSION

Our present results are comparable with data from previous dermatoglyphic investigations.

The papillary fingerprint traits are examined in 100 females aged between 30 and 60 years with breast cancer and 100 age-matched healthy controls without any familial predisposition in India [5]. The number of ulnar loops of the right middle and ring fingers and that of the left index finger are statistically significantly greater in patients than in controls ($p<0.028$, $p=0.030$ and $p<0.048$, respectively). The total number of loops of the middle finger of both hands is statistically significantly greater ($p=0.008$) while that of the arches of the index and middle fingers is smaller ($p<0.036$ and $p<0.050$, respectively) in the patients than in the controls. The total number of loops of all the fingers of the right hand is statistically significantly greater ($p=0.009$) while that of the arches is

smaller ($p=0.005$) in the patients than in the controls. The total number of loops of all the fingers of the left hand and that of both hands are statistically significantly greater ($p<0.032$ and $p<0.011$, respectively) while that of arches of all the fingers of both hands is smaller ($p<0.001$) in the patients than in the controls.

In a case-control study, fingerprint traits between 130 breast cancer females and 127 healthy controls are compared [6]. The loop pattern is most common in both groups (in 52.31% and 45.67%) followed by the whorl pattern (in 46.24% and 50.39% of the cases ($p=0.337$).

The analysis of the qualitative digital dermatoglyphic patterns in 60 female breast cancer patients and 60 age-matched controls shows that six or more whorls in the finger print pattern are statistically significant more common among cancer patients than among controls ($\chi^2 = 5.71$; $p<0.02$) [7]. This specific pattern occurs in 23 out

of 57 patients with infiltrating breast cancer (in 40.35% of the cases). Sum frequencies of whorls of the right index finger and right little finger are higher in the patients than in the controls, too ($\chi^2=5.67$; $p<0.02$ and $\chi^2=7.67$; $p<0.01$, respectively). It has been concluded that the dermatoglyphic patterns can effectively be utilized to study the genetic basis of breast cancer and serve as a screening tool in the high-risk population.

The dermatoglyphic investigation of 50 breast cancer patients and 50 healthy females aged between 25 and 70 years in India demonstrates that the frequencies of the arches of the left hand and both hands ($p<0.05$), of the whorls of the left hand and both hands ($p<0.05$) as well as of the whorls of the right hand ($p<0.01$) is statistically significantly higher in breast cancer patients than in controls [8]. The frequencies of left-hand and right-hand radial and ulnar loops as well as of these loops of both hands are lower in the breast cancer patients than in the controls ($p<0.05$).

The dermatoglyphic examination of 100 breast cancer patients and 100 healthy females indicates a strong association of the presence of an ulnar or radial whorl or an arch on six or more than six fingertips coupled with the absence of a radial loop and central whorl with breast cancer in India [9]. Ulnar loop is the most common pattern in patients (in 49.70%) and controls (in 64.40% of the cases) ($\chi^2=18.94$; $p<0.001$). The statistically significantly decreased intensity of ulnar loops in breast cancer patients is compensated by a statistically significantly increased intensity of ulnar and radial whorls (in 26.90% and 6.90% of the cases, respectively).

Ulnar loops show a statistically significant association with breast cancer in 8 out of 10 digits and represents the highest mean percentage frequency of digital pattern ($p<0.05$) followed by whorls, arches and radial loops in 20 breast cancer females aged between 20 and 60 years juxtaposed to 25 healthy controls in Nigeria [10]. In these patients, sum-frequency of ulnar and radial loops, whorls and arches of the right and left hand are 54% versus 34%, 2.4% versus 12%, 34% versus 24% and 8% versus 20%, respectively. The right-hand ulnar loop is statistically significantly more frequent than left-hand one ($p<0.05$).

The quantitative parameters of fingerprints of 100 breast cancer patients (at a mean age of 45.6+11.0 years) are compared with those of 100 healthy females (at a mean age of 33.3+14.96 year) in India [11]. There are statistically significantly more arch patterns (39.8% in the left and 36.0% in the right hand versus 16.2% in the left and 11.4% in the right hand) ($p<0.001$) in breast cancer pa-

tients than in controls. There are less radial loops in the right and left thumbs ($p<0.001$), the left index finger ($p<0.001$) and the left middle finger ($p<0.001$) in breast cancer patients than in controls. The arch patterns of all the five fingers of both hands are more frequent among cancer patients (36.0% versus 11.4%) ($p<0.001$). There are more arches (26% versus 3.7%) and less radial loops (37.8% versus 59.2%) and whorls (21.2% versus 27.8%) ($p<0.001$) in these patients than in controls.

The comparative study of the papillary fingerprint traits of 122 breast cancer patients and 122 healthy females establish statistically significantly higher frequencies of whorls in both hands of the patients than of the controls ($p<0.001$) [12]. The frequency of ≥ 6 whorls is statistically significantly higher in these patients ($p<0.01$) and could serve as an early diagnostic marker for breast cancer.

The results from χ^2 -test demonstrate a statistically significant difference between 30 females with breast cancer and 30 healthy controls in India in terms of frequency of the cases with six and more whorls (53.30% versus 23.33%; $p<0.034$) and total number of the whorls of all the fingers (39% versus 29%; $p<0.012$) [13]. The presence of six and more whorls is more common in breast cancer patients than in healthy controls ($p<0.01$) and can be used for identification of women at risk for the disease.

The comparison between 100 females with pathohistologically confirmed breast cancer and 100 age-matched controls in India demonstrates a statistically significantly smaller number of ulnar loops of the fingers of both hands in the patients than in the controls (34.4% versus 76.8% and 34.6% versus 77.0%, respectively) [14]. On the other hand, the number of the whorls of the fingers of both hands is statistically significantly greater in these patients than in the controls (53.2% versus 15.8% and 56.0% versus 16.2%, respectively).

The analysis of 100 females with pathohistologically confirmed breast cancer and 132 healthy women aged between 20 and 85 years in Bosnia and Herzegovina indicates a statistically significantly more common pattern of less than six finger loops in patients than in controls ($p=0.014$) [15].

The dactyloscopic investigation of 154 females with breast cancer, 154 high-risk ones and 338 healthy controls in the city of Tehran, Iran, reveals a statistically significantly higher frequency of papillary fingerprint traits with ≥ 6 whorls in the breast cancer patients (in 48.7%; $\chi^2=27.452$; $p<0.05$) and in the high-risk females (in 47.4%; $\chi^2=61.821$; $p<0.05$) than in the healthy controls (in 27.5% of the cases) [16]. There is a statistically significant difference between eight dermatoglyphic traits

in the right middle finger ($\chi^2=45.855$; $p<0.05$) as the loop is most common (in 65.4%).

The investigation of several dermatoglyphic traits in 218 ethnic males and 209 ethnic females in Liberia identifies the highest correlations of radial loops with total ridge counts of 0.98 for males and of 0.97 for females [17]. The comprehensive assessment of the main fingerprint patterns such as loops, whorls and arches in 240 Muslim males and 240 Muslim females aged between 18 and 40 years (at a mean age of 24 years) from Central India reveals that ulnar loops are predominant in males and females as well [18].

Based on the statistically significantly different dactyloscopic findings between 50 female breast cancer patients aged between 30 and 70 years the conclusion has been drawn that there exists a genetic influence on the dermatoglyphic traits and thus breast cancer occurrence can be prognosticated by using this noninvasive anatomical marker [19].

The fingerprints in 2484 twin-pairs are used to estimate heritability for the presence of at least one fingertip arch pattern [3]. The frequency of arches in the entire sample is 4.3%, 5.5% in females and 3.2% in males. There

are 267 twin-pairs concordant for the presence of an arch on any finger.

By means of the 'twin' method juxtaposing the genetic predisposition and the environmental influences, the qualitative study of fingerprint traits of 21 pairs of monozygotic and 22 pairs of dizygotic twins from Bulgaria demonstrates that loops are the most frequent finding [20]. Their frequency is 62.27% in monozygotic twins and 52.37% in dizygotic ones. Ulnar loops are most common on the little finger with a frequency of 87.5% in monozygotic and of 69.04% in dizygotic twins.

CONCLUSION

We establish the existence of statistically significant differences between breast cancer patients and healthy females in terms of the mean values of fingerprint papillary traits of all the five homologous fingers, of total frequencies of these traits of the first and second left-hand finger as well as of the second, third and fifth right-hand finger. These results could contribute to the further enrichment of the screening and prognostic armamentarium of modern dermatoglyphics in the socio-medically significant field of breast cancer.

REFERENCES:

1. Andreenko E, Baltova S. Sexual dimorphism in dermatoglyphic traits and fluctuating asymmetry in Bulgarians from northwest Bulgaria. *Homo*. 2017 Aug;68(4):316-27. [PubMed] [Crossref]
2. Milicic J, Pavicevic R, Halbauer M, Sarcevic B. Analysis of qualitative dermatoglyphic traits of the digito-palmar complex in carcinomas. In: Durham NM, Fox KM, Plato CC (eds). *The state of dermatoglyphics: The science of finger and palm prints*. Lewiston, ME: The Edwin Mellen Press; 2000:53-72.
3. Reed T, Viken RJ, Rinehart SA. High heritability of fingertip arch patterns in twin-pairs. *Am J Med Genet A*. 2006 Feb 1;140(3):263-71. [PubMed] [Crossref]
4. Cummins H, Midlo C. Fingerprints, palms and soles. An introduction in dermatoglyphics. *Blakinston, Philadelphia, New York: Reprinted Dower*; 1961. 319 p.
5. Sridevi NS, Delphine Silvia CR, Kulkarni R, Seshagiri C. Palmar dermatoglyphics in carcinoma breast of Indian women. *Rom J Morphol Embryol*. 2010; 51(3):547-50. [PubMed]
6. Sariri E, Kashanian M, Vahdat M, Yari S. Comparison of the dermatoglyphic characteristics of women with and without breast cancer. *Eur J Obstet Gynecol Reprod Biol*. 2012 Feb;160(2):201-4. [PubMed] [Crossref]
7. Chintamani KR, Mittal A, Saijanani S, Tuteja A, Bansal A, Bhatnagar D, Saxena S. Qualitative and quantitative dermatoglyphic traits in patients with breast cancer: a prospective clinical study. *BMC Cancer*. 2007 Mar 13;7:44. [PubMed] [Crossref]
8. Sukre SB, Laeeque M, Mahajan A, Shewale SN. Dermatoglyphics in the identification of women either with or at risk of breast cancer. *Int J Basic Med Sci*. 2012 Dec;3(5):160-5.
9. Paranjape V, Kundalkar A, Swamy AV, Kulkarni Y. Digital dermatoglyphics in carcinoma of breast. *Int J Cur Res Rev*. 2015;7(21):47-52.
10. Oladipo GS, Paul CW, Bob-Manuel IF, Iboroma AD, Fawehinmi HB, Edibamode EI. Study of digital and palmar dermatoglyphic patterns of Nigerian women with malignant mammary neoplasm. *J Appl Biosci*. 2009; 15:829-34.
11. Raizada A, Johri V, Ramnath T, Chowdhary D, Garg R. A cross-sectional study on the palmar dermatoglyphics in relation to carcinoma breast patients. *J Clin Diagn Res*. 2013 Apr;7(4):609-12. [PubMed] [Crossref]
12. Lu H, Huo ZH, Dang J, Peng L, Shi ZY, Jiao HY. Dermatoglyphic patterns of hands in breast cancer. *Acta Anat Sinica*. 2010;41(5):733-6.
13. Lavanya J, Saraswathi P, Vijayakumar J, Prathap S. Analysis of dermatoglyphic traits in patients with breast cancer. *J Pharm Biomed Sci*. 2012;23(24):1-5.
14. Madhavi D, Dorairaj S, Dorairaj SSS, Kommuru H. Dermatoglyphic study in breast carcinoma patients. *Int J Sci Res*. 2016;5(10):837-40.
15. Musanovic J, Metovic A, Pepic

E, Kapic D, Cosovic E, Rebic D, et al. Predictive values of quantitative analysis of finger and palmar dermatoglyphics in patients with breast cancer for Bosnian-Herzegovinian population. *J Evolution Med Dent Sci*. 2018 Jun;7(24):2855-60. [[Crossref](#)]

16. Abbasi S, Einollahi N, Dashti N, Vaez-Zadeh F. Study of dermatoglyphic patterns of hands in women

with breast cancer. *Pakistan J Med Sci*. 2006 Jan-Mar;22(1):18-22.

17. Mbaka G, Ejiwunmi A, Alabi O, Olatayo T. Digital dermatoglyphic variation and migratory pattern of ethnic Liberians. *Egypt J Forens Sci*. 2016 Dec;6(4):416-21. [[Crossref](#)]

18. Kapoor N, Badiye A. Digital dermatoglyphics: A study on Muslim population from India. *Egypt J Forens*

Sci. 2015 Sep;5:90-5. [[Crossref](#)]

19. Abilasha S, Harisudha R, Janaki CS. Dermatoglyphics: a predictor tool to analyze the occurrence of breast cancer. *Int J Med Res Health Sci*. 2014 Jan-Mar;3(1):28-31.

20. Maslarski I, Belenska L. The papillary images as part of the twin method. *Acta Morphol Anthropol*. 2015; 22:88-96.

Please cite this article as: Yaneva G, Petrova N, Ivanov D. Finger papillary traits in Bulgarian female breast cancer patients. *J of IMAB*. 2020 Jan-Mar;26(1):2998-3004. DOI: <https://doi.org/10.5272/jimab.2020261.2998>

Received: 04/06/2019; Published online: 24/03/2020



Address for correspondence:

Galina Yaneva, PhD

Department of Biology, Faculty of Pharmacy, Medical University of Varna
84, Tsar Osvoboditel Blvd., Varna 9002, Bulgaria.

E-mail: galina_yanevaa@abv.bg