RESEARCH
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A CORRELATION BETWEEN GYNAECOLOGICAL PARAMETERS AND DERMATOGLYPHICS IN BREAST CANCER PATIENTS, HEALTHY AND HIGH-RISK INDIVIDUALS IN A TERTIARY CARE CENTRE

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Abstract
Introduction:
Breast Cancer is currently one of the most prevalent cancers worldwide. Its gynaecological confounding factors have been very well documented. At the same time, the dermatoglyphic correspondence and its predictive ability to breast cancer have been proved. Therefore, this study aims to find a link between these parameters and the qualitative dermatoglyphic indices.
Methodology:
The study was carried out in 3 groups of 90 age-matched individuals. The groups are breast cancer patients, high-risk individuals and healthy individuals. A thorough reproductive history was taken including factors such as age at menarche, menstrual regularity and age at menopause (if attained), Qualitative dermatoglyphics were procured through the standardised ink and paper method to get a remarkable rolled fingerprint.
Results:
Highly significant values ($p<0.0001$) were found in all gynaecological parameters where a higher frequency of whorls in breast cancer patients, arches in high-risk individuals and an equivalent frequency of arches and whorls were predisposed to healthy individuals.
Conclusion:
This, therefore, paves the way for further research into the prognostic abilities of gynaecological parameters through qualitative dermatoglyphic indices.
Keywords: Breast Neoplasm; Dermatoglyphics; Menarche; Menopause; Case-Control Study;

INTRODUCTION

Breast cancer is known to have a wide array of risk factors which could preclude its prevalence in society. Some of these risk factors are attributed to gynaecological parameters which can increase the risk of breast cancer in an individual by 3%. These variables such as early menarche and late menopause[1] may have life-long effects and therefore have been known to be indicative of an increased probability of procuring the disease.

While these parameters do give insight into the risk assessment for breast cancer, studies conducted on dermatoglyphic traits have also proven to aid in the same[2]. Presentations of these parameters have been found to display a wide array of presentations in individuals. These traits have been attributed to multifactorial characteristics, of which genetics plays a vital aspect. The genetic linkage of defects in DNA repair is responsible for the age of occurrence of menopause[3]. These baseline defects could be a factor in increasing the risk of breast cancer. Certain alleles mediate the effect of premenopausal hormones in breast cancer[4]. At the same time, strong genetic linkages have been determined between dermatoglyphics and breast cancer. In addition, its stable nature throughout life makes it a reliable risk-indicative parameter[5].

Reproductive health is one of the most important factors when considering the risk factors for gynaecological cancers. To start with age at menarche, a meta-analysis conducted by the Collaborative Group on Hormonal Factors in Breast Cancer[6] showed that the mean age of menarche was 13·1 years and the predominance of breast cancer in the age below the mean showed a higher predominance of breast cancer with a relative risk of 1·050 for every year younger than the mean. When taking into consideration the same meta-analysis and menopause as the risk factor, it was found that when taking 55 as the restricted age of menopause, premenopausal women had a higher relative risk (1.43) than postmenopausal women.

In considering dermatoglyphics, the genetic correspondence of certain qualitative parameters can be predictive of the

development of certain diseases whose polygenic inheritance negatively impacts conditions in the uterus[7]. This could draw in the potential for it to be a predictive modality in closely tied relations to gynaecological determinants in breast cancer.

Materials and Methods:

The case-control study was carried out in a tertiary health care setting under the Department of Obstetrics and Gynaecology, and Anatomy over 4 months. The sample required for the study was obtained using the formula:

$$n = \frac{(p_1q_1 + p_2q_2) * (Z_{1-\propto/2} + Z_{1-\beta})^2}{(p_1 - q_1)^2}$$

According to the research conducted by Sakineh Abbasi et al.[8] The minimum number of candidates required in the three groups was found to be 90 age-matched individuals with 95% confidence and 80% power.

Inclusion Criteria: Histo-pathologically confirmed, female, breast cancer patients were taken for the study whose age group was restricted from 30 to 60 years. After this, age-matched high-risk and healthy individuals were included in the study. To define the high-risk group, certain parameters were listed. Individuals who met any 2 of these criteria or who had a first-degree relative who had a previous history of breast cancer were included. The parameters were :

1. Any previous history of surgery for any Non-cancerous Breast Condition, or non-cosmetic breast condition.
2. Menarche before the age of 13[6].
3. Menopause above the age of 50[6].

(Only those individuals/patients who gave voluntary informed consent were included)

Exclusion Criteria: Those who failed to meet the inclusion criteria or who presented with inflammatory or benign breast lesions were excluded.

After voluntary informed consent was obtained, a pre-designed and validated pro forma was used to obtain the demographic details. Followed by which a thorough reproductive history was taken, in the presence of a female nurse, for every patient which included factors such as age at menarche, menstrual regularity and age at menopause (if attained).

Qualitative dermatoglyphics were then procured through the standardised ink and paper method for each individual to ensure a clear, remarkable rolled fingerprint was obtained from every finger on both hands.

Statistical Analysis:

The variations in gynaecological and obstetric parameters and qualitative dermatoglyphic patterns were studied on the numbers software and their significance was computed using the chi-square test on InStat software where p values < 0.05 were considered significant with a 95% confidence interval.

Results:

Four patterns of dermatoglyphics were discerned across the three groups which were whorls, arches, ulnar loops and radial loops. Chi-square tests were used to analyse the gynaecological parameters and the qualitative dermatoglyphic pattern on both hands across all fingers.

The first parameter taken into consideration was the age of menarche (*Table 1*) with a cut-off age of 13. The number of individuals who had attained menarche before the age of 13 in all three groups was: 12 in the breast cancer group, 32 in the high-risk group and 23 in the healthy individual group. The number of individuals who had attained menarche above and including 13 years of age was: 78 in the breast cancer group, 58 in the high-risk group and 67 in the healthy individual group.

Table 1: Univariate analysis between the age of menarche and qualitative dermatoglyphic patterns across the three groups

Age at Menarche	Hand	Finger Print	Breast Cancer Patients	High-Risk Individuals	Normal Individuals	Chi-Square	Degrees of Freedom	P-value
<13	Right	Whorl	46 (76.67%)	50 (31.25%)	64 (55.65%)	42.250	6	<0.0001
		Arch	11 (18.33%)	102 (63.75%)	46 (40%)			
		Ulnar Loop	1 (1.67%)	3 (1.88%)	2 (1.74%)			
		Radial Loop	2 (3.33%)	5 (3.13%)	3 (2.61%)			
	Left	Whorl	50 (83.33%)	50 (31.25%)	60 (52.17%)	50.947	6	<0.0001
		Arch	7 (11.67%)	99 (61.88%)	47 (40.87%)			
		Ulnar Loop	1 (1.67%)	5 (3.13%)	4 (3.48%)			
		Radial Loop	2 (3.33%)	6 (3.75%)	4 (3.48%)			
>= 13	Right	Whorl	288 (73.85%)	77 (26.55%)	169 (50.45%)	168.61	6	<0.0001
		Arch	75 (19.23%)	195 (67.24%)	152 (45.37%)			
		Ulnar Loop	14 (3.59%)	8 (2.76%)	9 (2.69%)			
		Radial Loop	13 (3.33%)	10 (3.45%)	5 (1.49%)			
	Left	Whorl	301 (77.18%)	102 (35.17%)	178 (53.13%)	182.29	6	<0.0001
		Arch	44 (11.28%)	171 (58.97%)	142 (42.39%)			
		Ulnar Loop	19 (4.87%)	8 (2.76%)	9 (2.69%)			
		Radial Loop	26 (6.67%)	9 (3.1%)	6 (1.79%)			

For individuals who had attained menarche below 13 years of age:

Highly significant values were obtained on both hands. On the right hand ($\chi 2 = 42.25$; df = 6; p=<0.0001), 46 (76.67%) was the highest frequency of displaying whorls in patients with breast cancer, followed by 102 (63.75%) frequency of arches in high-risk individuals and 64 (55.65%) whorls and 46 (40%) arches in the group of healthy individuals. On the left hand ($\chi 2 = 50.947$; df = 6; p=<0.0001) similar trends were found where breast cancer patients displayed the highest frequency of whorls - 50

(83.33%), while 99 (61.88%) arches were exhibited by high-risk individuals and healthy individuals had identical frequencies in whorls - 60 (52.17%) and arches - 47 (40.87%).

For individuals who had attained menarche above and including 13 years of age:

On the right hand ($\chi 2$ = 168.61; df = 6; p=<0.0001) highly significant values were obtained. 288 (73.85%) whorls were the predominating frequency in the group of breast cancer, followed by 195 (67.24%) in high-risk individuals with arches and 169 (50.45%) whorls in healthy individuals and 152 (45.37%) arches. On the left hand ($\chi 2$ = 182.29; df = 6; p=<0.0001) the trend seemed to be repeated. 301 (77.18%) whorls were found in breast cancer patients while 171 (58.97%) arches in high-risk individuals and healthy individuals had 178 (53.13%) whorls and 142 (42.39%) arches.

The second parameter was menstrual regularity (*Table 2*). Regular menses were found in 78 patients with breast cancer, 81 high-risk individuals and 82 healthy individuals. Irregular menses were found in 12 patients with breast cancer, 9 high-risk individuals and 8 healthy individuals.

Table 2: Comparative analysis between the menstrual regularity and qualitative dermatoglyphic patterns across three groups

Menstrual Regularity	Hand	Finger Print	Breast Cancer Patients	High-Risk Individuals	Normal Individuals	Chi-Square	Degrees of Freedom	P-value
Regular	Right	Whorl	293 (75.13%)	114 (28.15%)	207 (50.49%)	192.36	6	<0.0001
		Arch	72 (18.46%)	268 (66.17%)	184 (44.88%)			
		Ulnar Loop	13 (3.33%)	10 (2.47%)	11 (2.68%)			
		Radial Loop	12 (3.08%)	13 (3.21%)	8 (1.95%)			
	Left	Whorl	306 (78.46%)	133 (32.84%)	224 (54.63%)	206.47	6	<0.0001
		Arch	46 (11.79%)	244 (60.25%)	165 (40.24%)			
		Ulnar Loop	17 (4.36%)	13 (3.21%)	12 (2.93%)			
		Radial Loop	21 (5.38%)	15 (3.7%)	9 (2.2%)			
Irregular	Right	Whorl	41 (68.33%)	13 (28.89%)	26 (65%)	22.759	6	0.0009
		Arch	14 (23.33%)	29 (64.44%)	14 (35%)			
		Ulnar Loop	2 (3.33%)	1 (2.22%)	0 (0%)			
		Radial Loop	3 (5%)	2 (4.44%)	0 (0%)			
	Left	Whorl	45 (75%)	19 (42.22%)	14 (35%)	42.028	6	<0.0001
		Arch	5 (8.33%)	26 (57.78%)	qu			
		Ulnar Loop	3 (5%)	0 (0%)	1 (2.5%)			
		Radial Loop	7 (11.67%)	0 (0%)	1 (2.5%)			

For individuals who had regular menses:

Notable values were found on both hands. The right hand ($\chi 2$ = 192.36; df = 6; p=<0.0001) revealed the highest frequencies of whorls with 293 (75.13%) in breast cancer patients, while 268 (66.17%) arches were exhibited in high-risk individuals, and 207 (50.49%) whorls and 184 (44.88%) arches were expressed in normal individuals. The left hand ($\chi 2$ = 206.47; df = 6; p=<0.0001) also set forth identical findings with 306 (78.46%) whorls in patients with breast cancer, 244 (60.25%) arches in high-risk individuals and 224 (54.63%) whorls and 165 (40.24%) arches in normal individuals.

For individuals who had irregular menses:

Noteworthy contributions were obtained on both hands. The right hand ($\chi 2$ = 22.759; df = 6; p=0.0009) revealed the highest frequencies of whorls with 41 (68.33%) in breast cancer patients, while 29 (64.44%) arches were exhibited in high-risk individuals, and 26 (65%) whorls were found in normal individuals. The left hand ($\chi 2$ = 42.028; df = 6; p=<0.0001) showed the highest frequencies with 45 (75%) whorls in patients with breast cancer, 26 (57.78%) arches in high-risk individuals and 24 (60%) whorls in normal individuals.

The last criterion included was the attainment of menopause as shown in *Table 3*. 39 breast cancer patients, 36 high-risk individuals and 60 healthy individuals had attained menopause. Those who hadn't were 51 patients with breast cancer, 54 high-risk individuals and 30 healthy individuals.

Table 3: Univariate analysis between the attainment of menopause and qualitative dermatoglyphic patterns across the three groups

Menopause Attained	Hand	Finger Print	Breast Cancer Patients	High-Risk Individuals	Normal Individuals	Chi-Square	Degrees of Freedom	P-value
Yes	Right	Whorl	149 (76.41%)	56 (31.11%)	159 (53%)	87.989	6	<0.0001
		Arch	34 (17.44%)	116 (64.44%)	127 (42.33%)			
		Ulnar Loop	8 (4.1%)	4 (2.22%)	7 (2.33%)			
		Radial Loop	4 (2.05%)	4 (2.22%)	7 (2.33%)			
	Left	Whorl	150 (76.92%)	60 (33.33%)	155 (51.67%)	109.40	6	<0.0001

		Arch	23 (11.79%)	110 (61.11%)	133 (44.33%)			
		Ulnar Loop	9 (4.62%)	8 (4.44%)	4 (1.33%)			
		Radial Loop	13 (6.67%)	2 (1.11%)	8 (2.67%)			
No	Right	Whorl	185 (72.55%)	71 (26.3%)	74 (49.33%)	125.26	6	<0.0001
		Arch	52 (20.39%)	181 (67.04%)	71 (47.33%)			
		Ulnar Loop	7 (2.75%)	7 (2.59%)	4 (2.67%)			
		Radial Loop	11 (4.31%)	11 (4.07%)	1 (0.67%)			
	Left	Whorl	201 (78.82%)	92 (34.07%)	83 (55.33%)	141.21	6	<0.0001
		Arch	28 (10.98%)	160 (59.26%)	56 (37.33%)			
		Ulnar Loop	11 (4.31%)	5 (1.85%)	9 (6%)			
		Radial Loop	15 (5.88%)	13 (4.81%)	2 (1.33%)			

For individuals who had attained menopause:
Noteworthy contributions were found on both hands. The right hand ($\chi2$ = 87.989; df = 6; p=<0.0001) revealed the highest frequencies of 149 (76.41%) whorls in breast cancer patients, while 116 (64.44%) arches in high-risk individuals and 159 (53%) whorls in normal individuals were obtained. The left hand ($\chi2$ = 109.4; df = 6; p=<0.0001) also found identical findings with 150 (76.92%) whorls in patients with breast cancer, 110 (61.11%) arches in high-risk individuals and 155 (51.67%) whorls in normal individuals.
For individuals who hadn't attained menopause:
Noteworthy contributions were obtained on both hands. The right hand ($\chi2$ = 125.26; df = 6; p=0.0009) expressed the highest frequencies of 185 (72.55%) whorls in breast cancer patients, while 181 (67.04%) arches were exhibited in high-risk individuals, and 74 (49.33%) whorls were found in normal individuals. The left hand ($\chi2$ = 141.21; df = 6; p=<0.0001) showed the highest frequencies of 201 (78.82%) whorls in patients with breast cancer, 160 (59.26%) arches in high-risk individuals and 83 (55.33%) whorls in normal individuals.

Discussion:
Breast cancer is known for its multifactorial risk factors with most researchers focusing on these parameters for early detection. One such factor, dermatoglyphic patterns, elicited the predilection of certain patterns with the likelihood of breast cancer. This study found the frequency of whorls to have a higher predominance in the group of patients with breast cancer while high-risk individuals had a higher frequency of arches followed by healthy individuals who displayed higher percentages of whorls followed closely by arches. These results are comparable with studies which have been conducted[8]. Another factor that proves a significant barrier in dermatoglyphics is the ethnic differences[9] which could go on the explain the varying results of frequencies when comparing this study with others from different ethnic and racial groups. Furthermore, studies including the Bosnian-Herzegovinian Population[2] where quantitative parameters were assessed such as the ATD-angle or even others where ridge counts have been employed to be better indicators for the prediction of breast cancer[8].
Gynaecological variables have been documented thoroughly worldwide as indicators for breast cancer. This study, therefore, employed 7 such independent parameters to compare with the predictability model provided by dermatoglyphics. The first of which was the age at menarche where the cut-off limit was set as the age of 13. This was done in correspondence with the meta-analysis carried out by the Collaborative Group on Hormonal Factors in Breast Cancer where the mean age of menarche was 13·1 years and increased risk of breast cancer in the age below the mean showed a higher predominance of breast cancer with a relative risk of 1·050 for every year younger than the mean. This study found highly significant values in the univariate analyses comparing the two models where both factors could predict the increased risk of breast cancer with a p<0.0001 amongst the three groups of individuals. On taking the second parameter (i.e. menstrual regularity) into consideration, noteworthy values were found in the ability to forecast the disposition of breast cancer. Studies have found a lower incidence of breast cancer in women below the age of 40 who have had irregular menstrual cycles, which can be attributed to variable metabolic and hormonal factors[10].
Finally, menopause was considered a parameter with dermatoglyphics. The previously mentioned meta-analysis also considered menopause as a risk factor where premenopausal women had a higher relative risk (1.43) than postmenopausal women. This study found statistically significant results when comparing the right hand ($\chi2$ = 87.989; df = 6; p=<0.0001) and left hand ($\chi2$ = 109.4; df = 6; p=<0.0001) with the premenopausal status where whorls predominated in both hands in the breast cancer group while arches had a higher frequency in high-risk individuals.

Conclusion:
Despite previous attempts failing to link dermatoglyphic indices and gynaecological parameters, this study found a significant correlation between the variables in the three distinct groups of healthy individuals, high-risk individuals and breast cancer patients.

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