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Study of Finger Print Patterns in Leprosy

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Abstract

Background Dermatoglyphic is the study of epidermal ridge configuration on finger tips, palms and soles. Leprosy is an infectious disease due to *Mycobacterium Leprae*. Few report of dermatoglyphic patterns studies in patients with leprosy have shown that fingerprint patterns were also affected in leprosy.

Objective To identify the effect role of leprosy on of fingerprint patterns.

Methods A prospective case control study on 50 patients complaining from leprosy and 50 control group was conducted within 11 months period in order to study the patient fingerprint patterns.

Results In this study, male (74%) consisted high rate than female (26%) and majority of patients at age group ≥ 54 years old. The whorls and loop patterns were high in control group than cases with 36.3% and 48.9% respectively, while arch pattern was high in case group than control with 29.6% in case group. Arch patterns were high in little, ring and thumb fingers, while loop patterns were high in ring, index and thumb fingers than control one.

Conclusion The findings of this study were suggestive that there was an increase in the loop and arch patterns of individuals with leprosy and this was highly significant when compared to the control group in which the whorls pattern was higher, and to identify the patients with leprosy also to find if there are possible risk for future infection with leprosy by study the patterns of finger print.

Keywords Dermatoglyphic, fingerprints, leprosy.

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Introduction

Fingerprint (dermatoglyphic/ dactylography) is an impression of the friction ridge on all parts of the palms of the hands and soles of the feet; it came from two Greek words derma means (skin) and glyphs means (curves) [(1)]. Dermatoglyphic is highly individualistic and makes up the basis form for personal identification in forensic examinations; Galton classified dermatoglyphic depending upon their primary pattern as loops, whorls, arches, and compound as seen in figure (1) [(2)]. These dermal ridge differentiation takes place early in fetal development, between 13th to 19th weeks of intrauterine life, the medico-legal importance of these patterns are unique and remain unchanged throughout life [(3)]. The study of dermatoglyphic plays an important role and could be recognized as a powerful tool in the diagnostic features of certain psychological, medical, genetic, and congenital malformation [(4)] and its considered as a window of various diseases [(5)] including mongolism, rubella syndrome, congenital heart disease, selected neurological diseases, and other disorders [(6)].

Figure 1. Different patterns of fingerprint

Leprosy also known as Hansen's disease is a long term chronic granulomatous bacterial infectious disease that primarily affects the skin and peripheral nerves. This disease is caused by an obligate intracellular bacillus, *Mycobacterium Leprae* or *Mycobacterium Lepromatosis* [(7)]. Initially, infections are without symptoms and typically remain this way for 5 to 20 years, symptoms that develop include granulomas of nerves, respiratory tract, skin, and eyes [(8)]. This disease presents itself in two well defined stable and opposite poles (Lepromatous and Tuberculoid) and two unstable groups (Indeterminate and Dimorphic). The spectrum of presentation of the disease may also be classified as tuberculoid tuberculoid (TT), borderline tuberculoid (BT), borderline borderline (BB), borderline lepromatous (BL), and lepromatous lepromatous (LL) [(7)].

Leprosy is spread between people, this is thought to occur through a cough or contact with fluid from the nose of an infected person, leprosy occurs more commonly among those living in poverty [(9,10)]. The clinical presentation and histopathologic changes depend on the immune status of the patient at the time of infection and over the nature course of the disease.

The diagnosis is currently based on 3 cardinal signs specified by the world health organization (WHO): hypopigmented or erythematous macules with sensory loss, thickened peripheral nerves, and positive acid-alcohol-last smear or skin biopsy [(11)]. The greatest risk factor for developing leprosy is contact with another case of leprosy; contacts of people with leprosy are five to eight times more likely to develop leprosy than members of the general population, however, conditions that reduce immune function, such as malnutrition, other illnesses, or host genetic differences, may increase the risk of developing leprosy [(9,12)].

The last epidemiology in leprosy, in 2015, the number of cases of leprosy was about 175,000 and the number of cases was 210,000 in 2013; 14 countries only recorded 95% of the globally reported leprosy cases, of this, India has the greatest number of cases (59%) followed by Brazil (14%) and Indonesia (8%) [(13)].

Despite effective treatment and education effort, leprosy stigma conditions to be problematic in endemic developing countries [(14)]. Modern multidrug therapy and new antibiotics of proven efficacy have made it possible to meet the WHO's targeted reduction in the incidence of *M. Leprae* infection to a single case per 10000 inhibitions in countries where the disease is endemic [(11)]. However, reports of dermatoglyphic patterns studies in patients with leprosy has been done by few workers [(6)] as studies by Enna et al. (1970) [(15)], Kapoor and Verma (1982) [(16)], Ghei et al. (1984) [(17)] have shown that finger print patterns were also affected in leprosy [(18)].

The objective of the current study was to determine whether the fingerprint patterns have a future role in identifying persons at risk of leprosy (to take preventive measurement from early against leprosy patients by study fingerprint patterns).

Methods

This study is a case control study (50 individuals complaining from leprosy and 50 healthy individuals as control group, which consisted of normal healthy individuals without any disease or congenital anomalies) conducted at the Out-Patient Clinic of Leprosy at Al-Gamhoria Teaching Hospital and in Leprosy Centers in Taiz and Hadhramout, from the period of February 2014 to January 2015. Information and consent was taken from the patients themselves, but in the case of children that consent was taken from parents by the authors at the clinic time. The materials that were used in this study are as follows:

- A clean plain glass plate (3x5 inch) with blue ink.
- White papers.
- Good lighting and hand magnifying lens.
- Detergent with towel for cleaning the ink from the hand.

To take finger prints, the following method was used: First, press and roll the finger firmly on the ink area, then press thoroughly to print record card (white paper). Next, label each print "left" and "right" for the hands, afterwards, label each fingerprint with "T" for thumb, "I" for index, "M" for middle, "R" for ring and "L" for little finger. Finally, all prints were analyzed by using a magnifying lens.

Statistical analysis

The collected data was analyzed by a computer facility, using microstate perform descriptive statistics of the investigated variables such as mean, range, frequency, percentage. A Chi square test (X2) was used for studying the association of categorical variables. The level of statistical significance was taken as $P < 0.05$ then presented in statistical tables.

Results

The study sample distributed into 50 persons as control group (without leprosy) and 50 persons as case group (with leprosy). The female consisted 26% of sample size while male appear with 74%. Age ≥54 years considered the dominant age group in this study, as seen in figures 2 and 3.

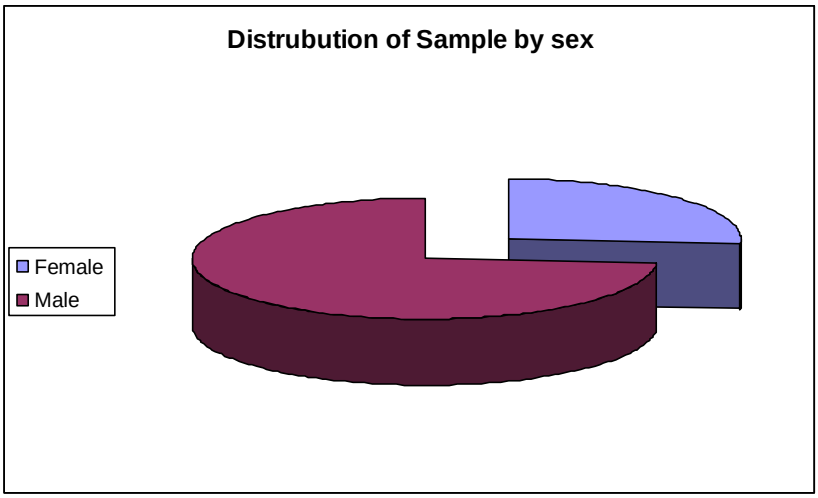

Figure 2. Distribution of sample studies according to sex

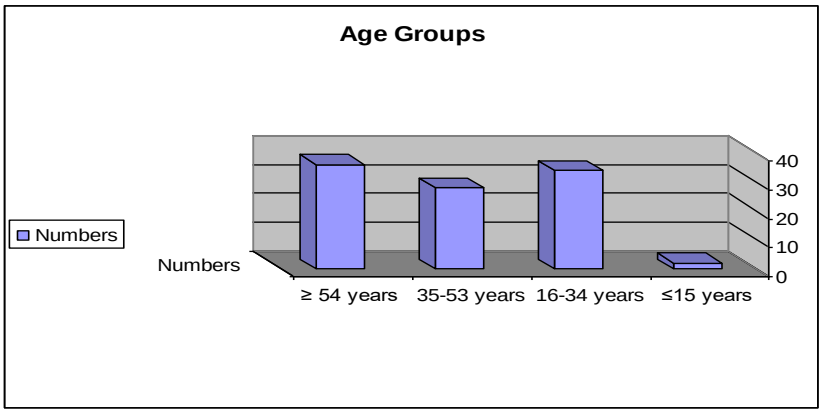

Figure 3. Distribution of sample according to age groups

It was found that the whorls pattern of fingerprint was more likely to appear in right index, right little in case group (person with leprosy) with odd ratio 0.130 (0.041-0.419) and 0.838 (0.260-2.695) respectively and arch pattern more likely to appear in case group in right thumb with odd ratio 0.474 (0.383-0.586), while the loop pattern also more likely in case group than control group in right middle fingers and right little with odd ratio 0.135 (0.056- 0.329) and 0.329 (0.132-0.824) respectively. The compound pattern appeared only in control group in right middle and thumb, as illustrated in table 1.

Table 1. Association between right hand finger print and both individual groups

Finger print	Control	Cases	P value	OR (95% CI)
Right little				
Arch	2 (12.5)	14 (87.5)	0.001	9.333 (1.004-43.681)
Whorl	41 (57.7)	30 (42.3)	0.766	0.838 (0.260-2.695)
Loop	7 (53.8)	6 (46.2)	0.015	0.329 (0.132-0.824)
Right ring				
Arch	5 (20)	20 (80)	0.005	6.000 (2.013-17.728)
Whorl	28 (100)	0 (0.0)	0.000	----------
Loop	17 (36.2)	30 (63.8)	0.009	2.912 (1.290- 6.571)
Right middle				
Arch	5 (33.3)	10 (66.7)	0.151	2.250 (0.709- 7.141)
Whorl	6 (19.4)	25 (80)	0.000	7.333 (2.652- 20.282)
Loop	38 (71.7)	15 (28.3)	0.000	0.135 (0.056- 0.329)
Compound	1 (100)	0 (0.0)	0.315	----------
Right index				
Arch	8 (34.8)	15 (65.2)	0.096	2.250 (0.854- 5.925)
Whorl	20 (83.3)	4 (16.7)	0.000	0.130 (0.041- 0.419)
Loop	22 (41.5)	31 (58.5)	0.071	2.077 (0.934- 4.615)
Right thumb				
Arch	5 (25)	15 (75)	0.022	0.474 (0.383- 0.586)
Whorl	14 (100)	0 (0.0)	0.826	----------
Loop	29 (45.3)	35 (54.7)	0.211	1.690 (0.740-3.857)
Compound	2 (100)	0 (0.0)	0.153	----------

Note: % taken by total row, *p value <0.05 (statistical significant), **Odd ratio (measure the risk)

This study showed that the loop pattern was more likely in case group in left middle and left little with odd ratio 0.141 (0.057-0.347) and 0.371 (0.158- 0.871) respectively. The whorls pattern was more likely in case group with odd ratio 0.091 (0.033- 0.253) for left ring and 0.169 (0.052- 0.548) for left index. The arch pattern was less likely in control group with odd ratio 0.490 (0.185- 1.300) for left middle and 0.691 (0.297- 1.610) for left thumb, as shown in table (2).

Table 2: Association between left hand finger print and both individual groups

Finger print	Control	Cases	P value	OR (95% CI)
Left little				
Arch	9 (36)	16(64)	0.105	2.144 (0.842- 5.459)
Whorl	3 (30)	7(70)	0.182	2.550 (0.620- 10.492)
Loop	38 (58.5)	27(41.5)	0.021	0.371 (0.158- 0.871)
Left ring				
Arch	5 (27.8)	13(72.2)	0.075	3.162 (1.032- 9.685)
Whorl	30 (83.3)	6(16.7)	0.000	0.091 (0.033- 0.253)
Loop	15 (32.6)	31(67.4)	0.001	3.807 (1.657- 8.747)
Left middle				
Arch	14 (63.6)	8(36.4)	0.148	0.490 (0.185- 1.300)
Whorl	4 (0.11)	32(88.9)	0.000	20.444 (6.322- 66.109)
Loop	32 (76.2)	10(23.8)	0.000	0.141 (0.057-0.347)
Left index				
Arch	12 (34.3)	23(65.7)	0.021	2.698 (1.148-6.341)
Whorl	17 (81)	4(19)	0.001	0.169 (0.052- 0.548)
Loop	21 (47.7)	23(52.3)	0.798	1.176 (0.534- 2.593)
Left thumb				
Arch	8 (36.4)	14(63.6)	0.391	0.691 (0.297- 1.610)
Whorl	16 (72.7)	6(27.3)	1.000	1.000 (0.299- 3.341)
Loop	23 (43.4)	30(56.6)	0.161	1.761 (0.796- 3.893)
Compound	3 (100)	0(0.0)	0.073	----------

Note: % taken by total row, *p value <0.05 (statistical significant), **Odd ratio (measure the risk)

In general, the whole and loop patterns of fingerprint were high in control group with 36.3% and 48.9% respectively than case group, while arch pattern was high in case group than control with 29.6%. The arch pattern high in middle digit of control group than case with 3.9%, while in case group the arch is high in little, ring, index and thumb digitals. The whorl pattern was high in case group in middle digit than others with 11.4%. while the loop patterns appear high in ring, index and thumb of case group than control one as seen in table 3 and figures 4 and 5.

Discussion

There are many people who suffer from some of the skin diseases; these diseases have a strong influence on the process of fingerprint recognition [19]. In the present study, it was observed that, the whorls patterns were higher in number in index fingers and the arch patterns were more in thumb fingers, while the loop pattern higher in number mainly in little and middle fingers respectively in both hands of leprosy group as compared to that of the control group.

Table 3: incidence of specific fingerprint patterns in both individual groups

Digital	Control			Cases		
	Arch	whorl	loop	Arch	whorl	loop
Little	11 (2.2)	44 (8.9))	45 (9.1)	30 (6)	37 (7.4)	33 (6.6)
Ring	10 (2.0)	58 (11.8)	32 (6.5)	33 (6.6)	6 (1.2)	61 (12.2)
Middle	19 (3.9)	10 (2.0)	69 (14)	18 (3.6)	57 (11.4)	25 (5)
Index	20 (4.1)	37(7.5)	43 (8.7)	38 (7.6)	8 (1.6)	54 (10.8)
Thumb	13 (2.6)	30 (6.1)	52 (10.6)	29 (5.8)	6 (1.2)	65 (13)
Total	73 (14.8)	179 (36.3)	241(48.9)	148 (29.6)	114 (22.8)	238 (47.6)

Note: Seven control cases had circular patterns (omitted in this table)

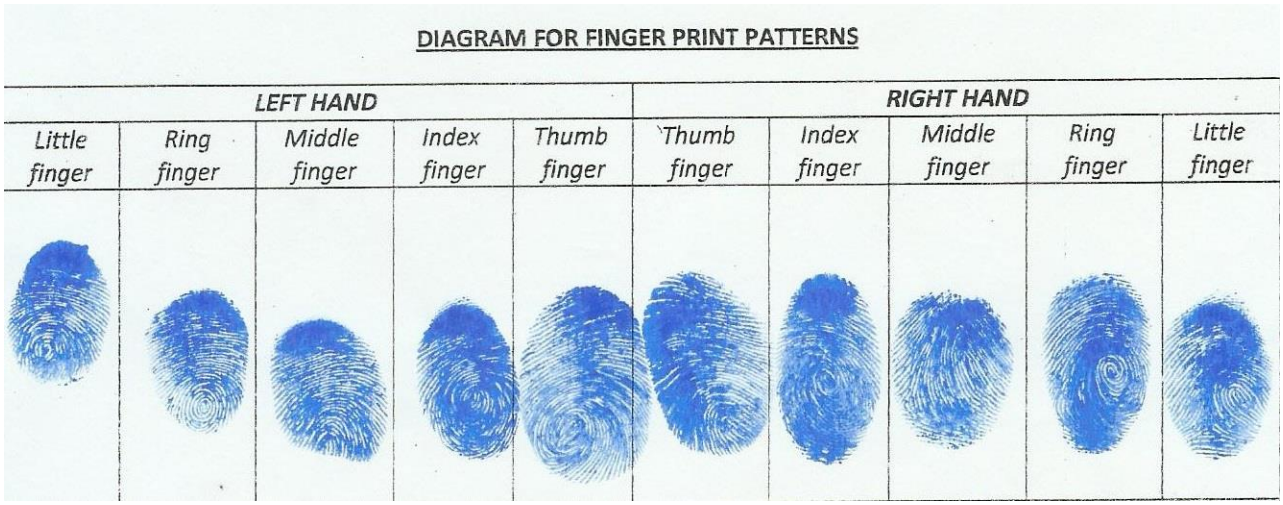

Figure 4. A sample of fingerprint patterns in leprosy

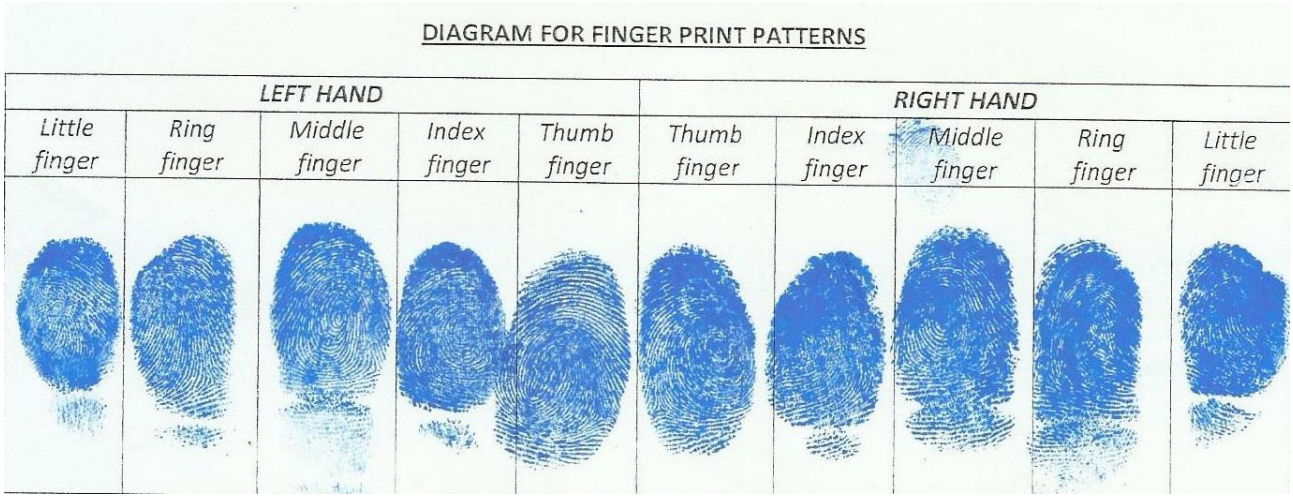

Figure 5. A sample of fingerprint patterns in leprosy

The authors observed a higher number of whorls found in the left ring finger in comparison to the right ring finger of leprosy group. On analysis of leprosy and control group, it has been found that the compound pattern appears only in control group mainly in right middle and right thumb fingers respectively.

In general, the study showed that loop patterns (47.6%) was increased in number follow by arch patterns (29.6%) with decrease in whorl patterns (22.8%) in leprosy group, while in control group it was found that higher numbers were loop (48.2%) followed by whorls (35.8%), with decrease in the number of arch (14.6%). This finding was in contradicts to those of other researchers such as Enna et al (1970) [15], Gupta et al (1986) [20], Natekar and Desouza (2007) who showed that the predominant fingerprint pattern was whorls (69.4%) and decrease in the loops (30.3%) in leprosy patients, whereas the control had decreased number of whorls (44.8%) and increased number of loops (54.7%) respectively [18].The number of arches both in the leprosy and control group were reduced in number and these differences were statistically insignificant. This finding also contradicts with the results of Kapoor and Verma (2011) who did not found any significant difference between fingerprint pattern of leprosy and control cases [16]. while the Ghei et al (1984) did not detect any significant changes in the pattern of whorls in leprosy patients [17].

This study concluded that it is evident from the results that loop patterns were affected in leprosy with decrease in whorl patterns in those patients. The dermatoglyphic features of the present study may be used as suggestive diagnostic tool to make a provisional diagnosis and to identify the persons who are at risk of leprosy. Similar studies can be conducted on large sample size of different population groups to generate more accurate and comprehensive data.

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Author contributions:

Dr. Abdulla: Discussion and interpretation of results. Dr. Bahalah: Printing the leprosy fingerprints. Alnoban: Statistical analysis. Dr. AlQbaty: Data Collection and printing finger.

Conflict of interest

Forensic Medicine.

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