COMPARISON OF DERMATOGLYPHIC PATTERNS IN POTENTIALLY MALIGNANT LESION, CONDITION AND ORAL CANCER PATIENTS.

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Abstract: Oral cancer is increasing the Indian Subcontinent due to the use of smokeless or smoking tobacco. Thus, there is a major challenge to the health sector to diagnose and treat it as soon as possible. Dermatoglyphics, which is the study of the epidermal ridge patterns which form on the hands and feet could be of great importance in the early diagnosis of Oral Cancer. The following study aims to assess the role of Dermatoglyphics in healthy subjects, patients with Oral Leukoplakia, patients with Oral Submucous Fibrosis and patients having Oral Squamous Cell Carcinoma. 60 individuals were divided into four groups based upon the presence of Oral Leukoplakia, Oral Submucous Fibrosis, Oral Squamous Cell Carcinoma and a control group. Dermatoglyphic patterns were recorded using standard ink method. Various patterns were analyzed statistically and compared in the four groups.

Index Terms: Dermatoglyphics, Finger Patterns, Oral Squamous Cell Carcinoma, Oral Leukoplakia, Oral Submucous Fibrosis.

I. INTRODUCTION

Cancer is one of the most serious health problems worldwide, affecting individuals of different age, gender and races. Oral cancer is any malignant neoplasm which is found on the lip, floor of the mouth, cheek lining, gingiva, palate or in the tongue. It is among the top three types of cancers in India.[1] The incidence of oral cancer is highest in India, south and Southeast Asian countries. In India, 90 -95% of the oral cancers is squamous cell carcinoma.[1] It constitutes the largest group of malignancies in the Indian subcontinent posing a significant challenge to health services, both preventive and diagnostic (Parkin et al., 2002). It is not an immediate death sentence but should be diagnosed and treated early. Genetic studies using cytological markers can act as an aid in determining predisposition of an individual towards oral squamous cell carcinoma. But these studies are far more expensive and complicated.

As defined by WHO, Oral leukoplakia is "a white patch or plaque that cannot be characterized clinically or pathologically as any other disease." [2]

Pindborg in 1966 defined OSMF as, "an insidious chronic disease affecting any part of the oral cavity and sometimes pharynx. Although occasionally preceded by and/or associated with vesicle formation, it is always associated with juxta-epithelial inflammatory reaction followed by fibroblastic changes in the lamina propria, with epithelial atrophy leading to stiffness of the oral mucosa causing trismus and difficulty in eating." [3]

The word 'dermatoglyphics' comes from two Greek words (derma: skin and glyphe: carve) and refers to the epidermal skin ridge formations which appear on the fingers, palms of the hands and soles of the feet.[4]

The control of the development of finger and palmer dermatoglyphic patterns is taken part by many genes. The indication of development of a lesion to premalignancy or malignancy can also be given by these patterns. Thus, indicating people with tobacco chewing habits for oral cancer or precancer.

If used as a diagnostic aid, dermatoglyphics could be of great clinical importance as it may decrease the incidence of the oral cancer.

II. AIM

To assess the role of Dermatoglyphics in healthy subjects, subjects with Oral Leukoplakia, subjects with Oral Submucous Fibrosis and subjects having Oral Squamous Cell Carcinoma.

III. OBJECTIVES

1. To evaluate Dermatoglyphics in healthy subjects, not associated with oral lesions.
2. To evaluate Dermatoglyphics in subjects with Oral Squamous Cell Carcinoma.

3. To evaluate Dermatoglyphics in subjects Oral Leukoplakia.
4. To evaluate Dermatoglyphics in subjects having Oral Submucous Fibrosis.
5. To compare Dermatoglyphics in subjects with no lesions, subjects with Oral Leukoplakia and subjects with Oral Submucous Fibrosis and subjects with Oral Squamous Cell Carcinoma.

IV. MATERIALS AND METHODS

A total, of 60 patients visiting Bharati Vidyapeeth Dental College and Hospital, Pune and Bharati Hospital, Pune were included in this study. The permission to conduct the study was obtained from the Institutional Ethics Committee. Cases diagnosed with Oral Squamous Cell Carcinoma, Oral Leukoplakia and Oral Submucous Fibrosis were included in the present cross-sectional study. A total of 600 fingerprints were taken i.e., 10 fingerprints of each patient.

Group A – 15 subjects without any tissue abuse habit and oral lesions (Control group)

Group B – 15 Patients having Oral Squamous Cell Carcinoma.

Group C – 15 Patients having Oral Leukoplakia.

Group D – 15 Patients having Oral Submucous Fibrosis.

The participants who gave their voluntary informed (written) consent were included in this study. For control group subjects with no habits and no oral lesions were selected. After fulfilling the inclusion and exclusion criteria, the patients were randomly selected using simple random sampling (SRS) method.

Exclusion criteria: Subjects with vesicle, scars, burns and rashes on fingers.

The 'Ink method' of Cummins and Midlo was used for evaluation of prints in this study. Ink was applied evenly on the surface of the fingers after through washing of hands. Gentle pressure was applied while taking prints on the paper. For finger prints rolling impression technique was used. Finger prints were analyzed qualitatively and classified into type of pattern such as arches, loops and whorls. The frequency and percentage of the patterns was noted and correlated with the subject groups and conclusions were drawn out accordingly.
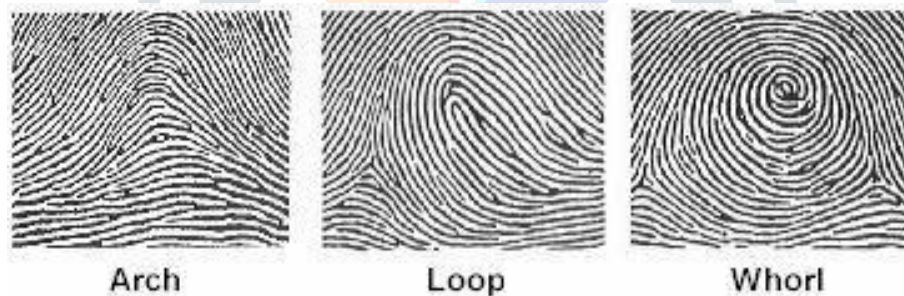

Figure 1) Types of figure print patterns

V. RESULTS

Group A (Subjects without any tissue abuse habit and oral lesions) - Of 150 prints in Group A, 42 (28.0%) had Whorled Pattern, 87 (58.0%) had Looped Pattern and 21 (14.0%) had Arched Pattern.

Group B (Patients having oral squamous cell carcinoma) - Of 150 prints in Group B, 47 (31.3%) had Whorled Pattern, 98 (65.3%) had Looped Pattern and 5 (3.3%) had Arched Pattern.

Group C (Patients having Oral Leukoplakia) - Of 150 prints in Group C, 59 (39.3%) had Whorled Pattern, 82 (54.7%) had Looped Pattern and 9 (6.0%) had Arched Pattern.

Group D (Patients having Oral Submucous Fibrosis) - Of 150 prints in Group D, 51 (34.0%) had Whorled Pattern, 81 (54.0%) had Looped Pattern and 18 (12.0%) had Arched Pattern.

Comparison of dermatoglyphic pattern between Groups A and B:

Of 150 prints in Group A, 42 (28.0%) had Whorled Pattern, 87 (58.0%) had Looped Pattern and 21 (14.0%) had Arched Pattern. Of 150 prints in Group B, 47 (31.3%) had Whorled Pattern, 98 (65.3%) had Looped Pattern and 5 (3.3%) had Arched Pattern.

Distribution of dermatoglyphic pattern differs significantly between Groups A and B (P-value<0.01).

Comparison of dermatoglyphic pattern between Groups A and C:

Of 150 prints in Group A, 42 (28.0%) had Whorled Pattern, 87 (58.0%) had Looped Pattern and 21 (14.0%) had Arched Pattern. Of 150 prints in Group C, 59 (39.3%) had Whorled Pattern, 82 (54.7%) had Looped Pattern and 9 (6.0%) had Arched Pattern.

Distribution of dermatoglyphic pattern differs significantly between Groups A and C (P-value<0.05).

Comparison of dermatoglyphic pattern between Groups A and D:

Of 150 prints in Group A, 42 (28.0%) had Whorled Pattern, 87 (58.0%) had Looped Pattern and 21 (14.0%) had Arched Pattern. Of 150 prints in Group D, 51 (34.0%) had Whorled Pattern, 81 (54.0%) had Looped Pattern and 18 (12.0%) had Arched Pattern.

Distribution of dermatoglyphic pattern differs significantly between Groups A and D (P-value<0.05).

Comparison of dermatoglyphic pattern between Groups B and C:

Of 150 prints in Group B, 47 (31.3%) had Whorled Pattern, 98 (65.3%) had Looped Pattern and 5 (3.3%) had Arched Pattern. Of 150 prints in Group C, 59 (39.3%) had Whorled Pattern, 82 (54.7%) had Looped Pattern and 9 (6.0%) had Arched Pattern.

Distribution of dermatoglyphic pattern did not differ significantly between Groups B and C (P-value>0.05).

Comparison of dermatoglyphic pattern between Groups B and D:

Of 150 prints in Group B, 47 (31.3%) had Whorled Pattern, 98 (65.3%) had Looped Pattern and 5 (3.3%) had Arched Pattern. Of 150 prints in Group D, 51 (34.0%) had Whorled Pattern, 81 (54.0%) had Looped Pattern and 18 (12.0%) had Arched Pattern.

Distribution of dermatoglyphic pattern differs significantly between Groups B and D (P-value<0.01).

Comparison of dermatoglyphic pattern between Groups C and D:

Of 150 prints in Group C, 59 (39.3%) had Whorled Pattern, 82 (54.7%) had Looped Pattern and 9 (6.0%) had Arched Pattern. Of 150 prints in Group D, 51 (34.0%) had Whorled Pattern, 81 (54.0%) had Looped Pattern and 18 (12.0%) had Arched Pattern.

Distribution of dermatoglyphic pattern did not differ significantly between Groups C and D (P-value>0.05).

VI. DISCUSSION

Ramani *et al*. observed the genetic component for various fingertip patterns. [5] Once formed, they are age and environment stable, becoming a reliable indicator, of a genetic damage. [6] Galton conducted an extensive research on the significance of skin ridge patterns not only to demonstrate their permanence but also their use as a means of personal identification. He demonstrated the hereditary significance of fingerprints, and the biological variations of different fingerprint patterns amongst different racial groups. [7], [8] A large number of genes interplay with environmental influences in forming these distinct fingerprints. [6]

According to Freny Karjodkar and Ambika G. et.al, through decades of scientific research, the hand has come to be recognized as a powerful tool in the diagnosis of psychological, medical, and genetic conditions.[9] Cummins, in 1926 first introduced the term "dermatoglyphics" which refers to the study of the naturally occurring patterns of the surface of the hands and feet. Various scientific studies have used this approach since then to establish relationship of fingerprints as genetic and/or chronic health markers.[9]

Tamgire EW, Chimurkar VK, Rawlani SS and Sherke AR et al. studied fingerprint patterns of subjects with OSMF and having gutka chewing habit and those without OSMF and having gutka chewing habit. He then observed that all patterns (whorled, loop and arch) were equally distributed in patients with OSMF and patients without OSMF.[10]

Current study showed that the distribution of dermatoglyphic pattern differs significantly between Groups A (healthy patients without habit) and D (patients with OSMF) (P-value<0.05). Of 150 prints in Group A, 42 (28.0%) had Whorled Pattern, 87 (58.0%) had Looped Pattern and 21 (14.0%) had Arched Pattern. Of 150 prints in Group D, 51 (34.0%) had Whorled Pattern, 81 (54.0%) had Looped Pattern and 18 (12.0%) had Arched Pattern.

N Lakshamana, A Ravikiran, Y Samatha, Abhishek Singh, Pavani B, B Kartheeki et al. carried-out a cross sectional study consisting of 225 patients, consisting of 75 patients who were diagnosed with Oral Leukoplakia and OSMF, 75 patients who were diagnosed with oral cancer, and 75 high risk patients with habit but without any active lesions. This study concluded that loop pattern was more common in patients with malignancy and premalignancy with significant P values. Whereas whorl pattern was more common in patients of the control group.[11]

The present study indicates that loop pattern was common in all four groups with significant P values and whorl pattern was seen least in subjects of the control group.

Another study was conducted by Maria Priscilla David and Pooja Sinha et al, which consisted of a total of 70 patients, i.e. 30 patients with potentially malignant disorders,10 patients with oral squamous cell carcinoma and 30 healthy individuals. It concluded that Group I (healthy patients) 41.00% showed loop pattern, 58.66% showed whorled, and 0.37% has arched pattern. Among Group II (patients with potentially malignant disorders), 65.33% had loops, 34.00% had whorls and 0.67% had arches. Among Group III (oral cancer) patients, 60.00% had loops, 32.00% had whorls and 8.00% had arches.[12]

The current study showed that in Group A (healthy patients); 14.00% showed arch pattern, 58.00% showed loop pattern and 28.00% showed whorled pattern. In group B (patients with oral squamous cell carcinoma); 3.30% had arches, 65.30% had loops and 31.3% had whorls. In group C (patients with oral leukoplakia); 6.00% had arches, 54.70% had loops and 39.3% had whorls. In group D (patients with Oral Submucous Fibrosis); 12.00% had arches, 54.00% had loops and 32.00% had whorls.

In one large, well known retrospective study that looked at approximately 3,300 biopsies of oral white lesions, Waldron and Shafer determined that 19.9 percent of leukoplakia's showed some degree of epithelial dysplasia.[13] In India, one study showed a malignant transformation rate of 7.6 percent for oral submucous fibrosis.[14] From this we can say that Oral Submucous Fibrosis has a lower potential for malignancy than Oral Leukoplakia.

The present study showed that there was a gradual decrease in the percentage of arch pattern, from control group (14%), to Oral Submucous Fibrosis (12%) to Oral Leukoplakia (6%) to Oral Squamous Cell Carcinoma (3.3%). This also is indicative that Oral Leukoplakia has a higher potential for malignancy than Oral Submucous Fibrosis.

VII. CONCLUSION

The study performed showed that the loop pattern was more common in all 4 groups. There was a decrease in the percentage of arch pattern observed in normal controls followed by those having OSMF, oral leukoplakia and those with oral squamous cell carcinoma respectively. Also considering studies performed by Waldron and Shafer and Pindborg JJ et al., we can say that lack of arch pattern in patients with premalignancy can be indicative of malignant transformation of the lesion. Hence dermatoglyphics can be used as an excellent aid in diagnosing oral cancer.

VIII. ACKNOWLEDGEMENT

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[Figure 1] handlines.blogspot.com/2005/09/do-you-have-unusual-fingerprints.html

Group Code	Description	No. of cases	No. of Dermatoglyphic prints
Group A	Subjects without any tissue abuse habit and oral lesions	15	150
Group B	Subjects with Oral Squamous Cell Carcinoma	15	150
Group C	Subjects with Oral Leukoplakia	15	150
Group D	Subjects with Oral Submucous Fibrosis	15	150
	Total	**60**	**600**

Table 1) Distribution sample size studied across four study groups.

Pattern	No. of prints	% of prints
Whorl	42	28.0
Loop	87	58.0
Arch	21	14.0
Total	**150**	**100.0**

Table 2) Distribution of dermatoglyphic pattern in Group A.
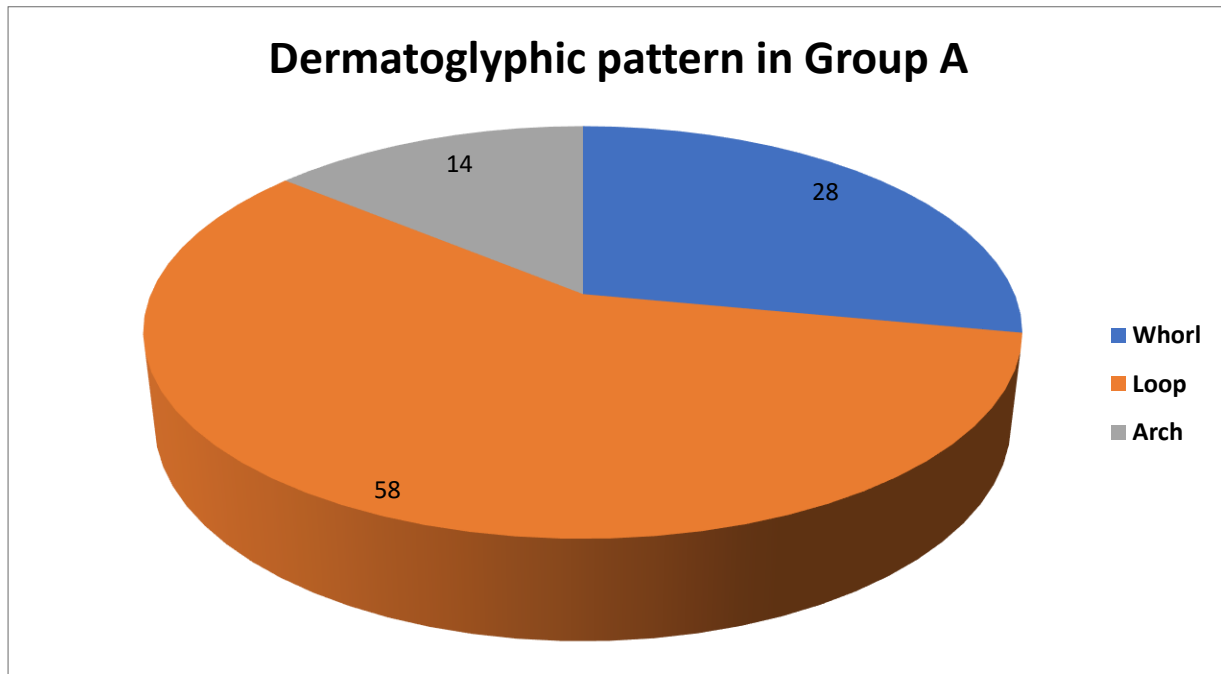
Figure 2) Distribution of dermatoglyphic pattern in Group A.

Pattern	No. of prints	% of prints
Whorl	47	31.3
Loop	98	65.3
Arch	5	3.3
Total	**150**	**100.0**

Table 3) Distribution of dermatoglyphic pattern in Group B
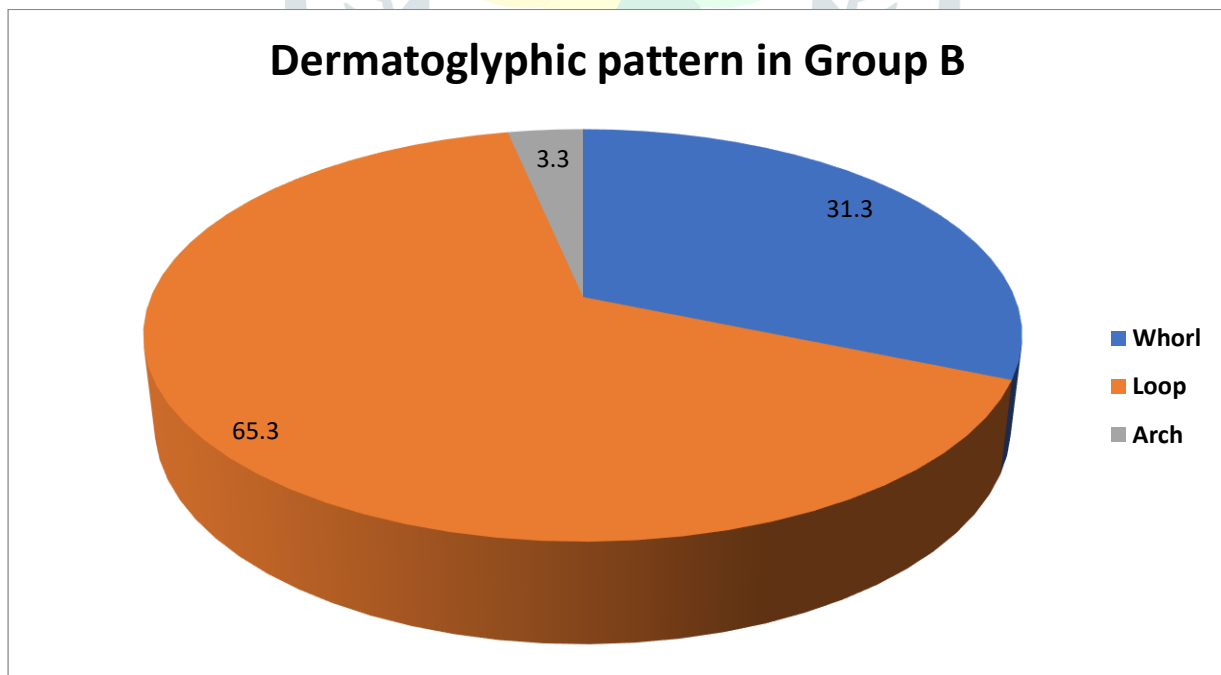
Figure 3) Distribution of dermatoglyphic pattern in Group B.

Pattern	No. of prints	% of prints
Whorl	59	39.3
Loop	82	54.7
Arch	9	6.0
Total	**150**	**100.0**

Table 4) Distribution of dermatoglyphic pattern in Group C.

Dermatoglyphic pattern in Group C
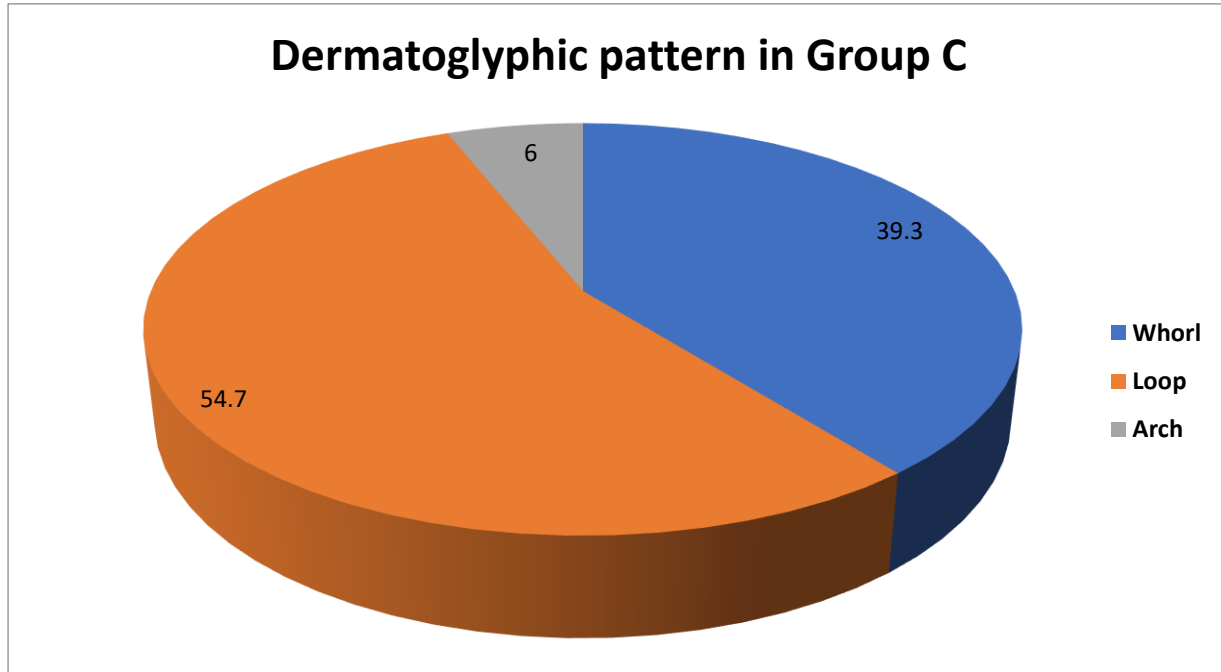
Figure 4) Distribution of dermatoglyphic pattern in Group C.

Pattern	No. of prints	% of prints
Whorl	51	34.0
Loop	81	54.0
Arch	18	12.0
Total	**150**	**100.0**

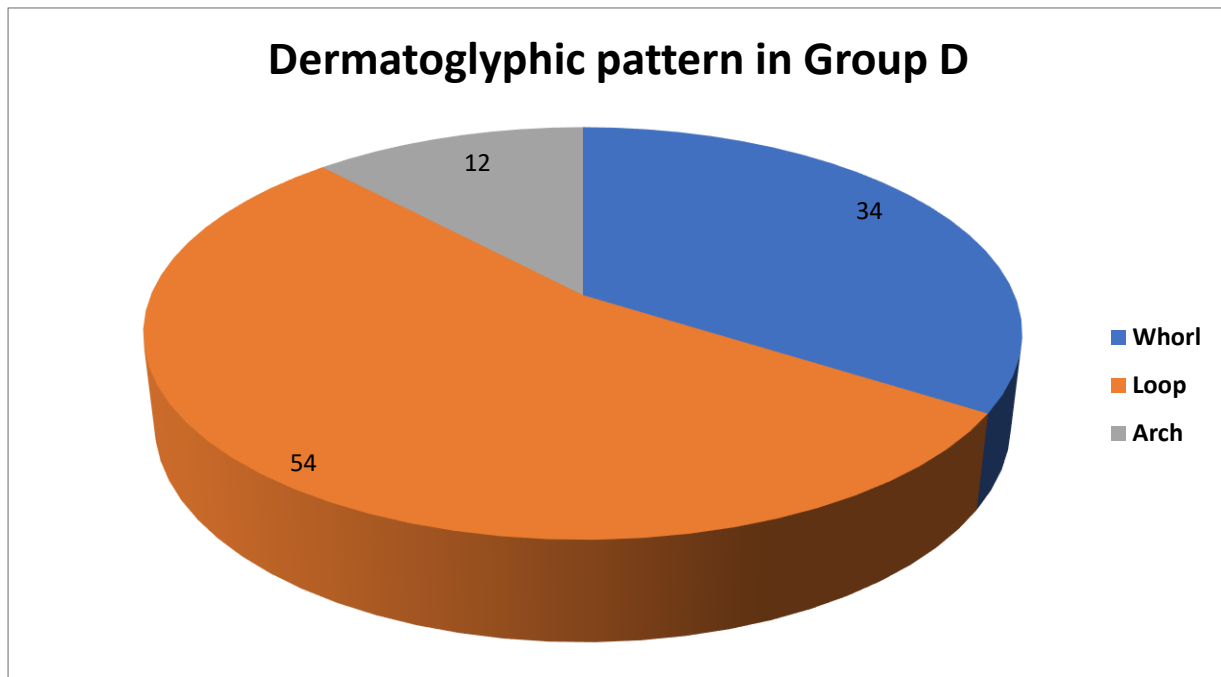**Table 5) Distribution of dermatoglyphic pattern in Group D.**

Figure 5) Distribution of dermatoglyphic pattern in Group D.

Pattern	Group A (n=150)		Group B (n=150)		Group C (n=150)		Group D (n=150)	
	n	%	N	%	n	%	n	%
Whorl	42	28.0	47	31.3	59	39.3	51	34.0
Loop	87	58.0	98	65.3	82	54.7	81	54.0
Arch	21	14.0	5	3.3	9	6.0	18	12.0
Total	**150**	**100.0**	**150**	**100.0**	**150**	**100.0**	**150**	**100.0**
Values are n (% of prints).								

Table 6.1) Inter-Group distribution of dermatoglyphic pattern.

	Group A v Group B	Group A v Group C	Group A v Group D	Group B v Group C	Group B v Group D	Group C v Group D
P-value	0.005**	0.020*	0.518NS	0.141NS	0.010**	0.166NS
P-value by Chi-Square test. P-value<0.05 is considered to be statistically significant. *P-value<0.05, **P-value<0.01, NS-Statistically non-significant.						

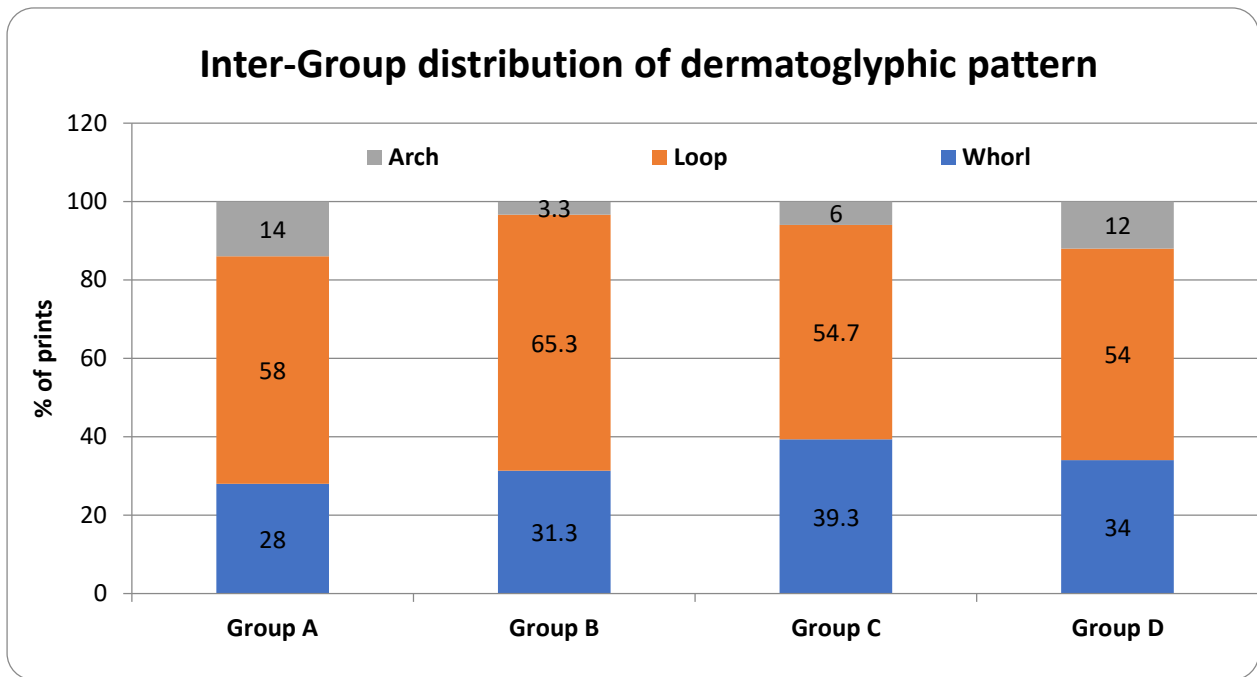**Table 6.2) Inter-Group comparison of dermatoglyphic pattern.**

Figure 6) Inter-Group distribution of dermatoglyphic pattern.