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Dermatoglyphic pattern: A genetic marker in Potentially malignant diseases and oral cancer and its role in tobacco cessation: A hospital based study

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Abstract

Aim and objectives- To study dermatoglyphic patterns in healthy subjects, individuals with precancerous and cancerous lesion and condition and to evaluate if dermatoglyphic pattern can be used for predilection of premalignant disorders and oral cancer.

Material and method- Dermatoglyphic pattern of 100 subjects were recorded, out of which 25 subjects were clinically diagnosed cases of oral cancer,25 subjects had oral premalignant disorder and remaining 50 subjects gave history of tobacco consumption but did not show any clinical changes in the oral mucosa. The dermatoglyphic pattern of all the subjects were analysed and the number of arches, loops, whorls and the ATD angle of both the hands were recorded. The collected data was then statistically analysed**.**

Result- The most predominant pattern which was observed was loops followed by whorls and arches.

Keywords: ATD, Dermatoglyphic, Derma, Skin And Glyphe , Carve

Introduction

Oral Cancer (OC) is the sixth most common cancer in the world [1.] Despite intensive efforts throughout the world, cancer still remains an enigma. The Head and neck cancer accounts for 30- 40% of all malignant tumors in India and the most common malignant neoplasm is Oral Squamous Cell Carcinoma (OSCC). The incidence & mortality rate of OC is still unacceptably high. By the time it is diagnosed, OC often is far advanced and deadly. These deaths are particularly tragic because, in most cases, they could have been prevented with early diagnosis and treatment [2]. Early detection of these lesions can dramatically improve the treatment outcome and prognosis in such patients.

Determination of palmer dermatoglyphic patterns may be a early diagnosis and early treatment of oral premalignant and malignant lesions can be planned.

The word dermatoglyphics comes from two Greek words (derma, skin and glyphe , carve) and refers to the

friction ridge formations which appear on the palms of the hands and soles of the feet.[3] Dermatoglyphics is the scientific study of fingerprints, lines, mounts, and shapes of hands. The term was coined by Dr. Harold Cummins, the father of American fingerprint analysis.[4]

Genetics plays an important role in determination of palmer dermatoglyphic patterns. After the complete formation of patterns, they are unaffected by the environment. This explains their unique role, as an ideal marker for individual identification and as well as detection of defects due to intra uterine irregularities in early weeks of pregnancy. Most dermatoglyphics are correlated with genetic abnormalities and are useful in biomedical studies. It plays an important role in the diagnosis of chromosomal disorders. Dermatoglyphics has revealed its significance in Down's syndrome, Turner's syndrome or klinefelter's syndrome, Trisomy 18 syndrome and in Rubinstein –Taybi Syndrome [5]

Dermatoglyphic pattern is a genetic marker for identification of people at risk of development of dental caries. The epithelium of finger buds as well as enamel have ectodermal origin and both develop at the same time in I.U life [3] It is also a genetic marker in detection of cleft lip, cleft palate, periodontal problems and malocclusion. Different malocclusions are prone to specific type of ridge pattern.[6] Genetic predisposition is of ample importance for the etiology behind development of oral malignancy in addition to the usage of areca nut and tobacco.[3] . This genetic susceptibility of an individual can be determined with the help of dermatoglyphics.

Various epidemiological studies support that antenatal disturbances can alter the epithelium to make it susceptible to various carcinogens and such antenatal disturbance if responsible for the disorder should manifest in any prenatal event such as dermal ridge formation.[5] Therefore the quantitative and the qualitative analysis of the finger and the palm prints can be used as a genetic marker in individual susceptible to development of oral squamous cell carcinoma.

This method of using dermatoglyphics as a genetic marker is easy to perform as it uses simple measurements and it is also cost effective compared to genetic cytomarkers.5 so individual can be easily convinced for study of dermatoglyphic pattern.

With the help of dermatoglyphic patterns the genetically predisposed individual can be segregated amongst the population at risk and can be appropriately counselled and motivated to change the lifestyle so the role of dermatoglyphics in tobacco cessation cannot be ruled out.

The present study will be conducted to determine the susceptibility of individual to develop oral cancerous and precancerous lesion and condition and to use it as an aid in tobacco cessation counselling.

Aims and Objectives of the study :-

- To study dermatoglyphic patterns in healthy subjects, individuals with precancerous and cancerous lesion and condition
- To assess the genetic susceptibility of an individual to develop precancerous and cancerous lesion and condition by using dermatoglyphic pattern
- To counsel and motivate the subjects with tobacco habit and follow up the same subjects.

Material and Methods

Source of data: The study is designed to be conducted on patients reporting to the Department of Dentistry, Indira Gandhi Institute of Medical Sciences, Patna.

Methods of collection of data: The study group comprises of 100 (in ratio of 1:1) cases in total of which 50 participant will be healthy individuals, 25

histopathologically confirmed patients of oral squamous cell carcinoma and 25 patients of clinically diagnosed premalignant lesions, in the age range of 20 -70 years. The procedure will be explained to the patients. Institutional ethical committee clearance & a written consent was obtained from them The research group will comprise of 100 patients, and will be segregated into three groups, as mentioned below

GROUP A: 25 Patient of oral squamous cell carcinoma

GROUP B: 25 Patient of Premalignant lesions (Osmf, Leukoplakia)

Group C: 50 Patients normal individuals with habits (such as tobacco/areca nut) for more than one year and no clinical presentation of precancerous and cancerous lesions and conditions.

Procedures

Individuals will be explained about the study and only those individuals who have given consent will be included in the study. Complete case history will be recorded with thorough clinical examination using specially designed case history format. Clinically diagnosed cases of premalignant lesions and histopathological confirmated oral squamous cell carcinoma, will be selected for the study.

All the subjects included in the study will be explained about the non- invasive procedure of recording the palm and finger prints. Ink method will be used to record the palm and finger prints. They will be asked to wash their hands with soap and water. After drying the hands, duplicating ink will be uniformly spread over the palm. Print of fingertip will be recorded first followed by that of the palm on a white paper.

Inclusion criteria

- Both gender belonging to Age group of 20 -70 years of age.
- Patients with clinica1y diagnosed potentially malignant lesions & histopathologically proven Oral Squamous cell carcinoma & without any major illness or systemic disease .
- Subjects with the habit of tobacco / areca nut usage.

Healthy individuals with no histoy of tobacco/areca nut consumption in any form

Exclusion Criteria

- Any burns, injuries, deformities or diseases such as psoriasis involving the fingers and palm.
- Patients with systemic diseases like Diabetic Mellitus, Nephrosis, Hypertension, endocrine disturbances, liver dysfunction, & lipid metabolism disorder.Pregnant women.

Results

Table 1: Age wise distribution

	Normal			Premalignant			SCC			Chi Square	P Value
	Arches	Loops	Whorls	Arches	Loops	Whorls	Arches	Loops	Whorls	25.39	<0.001
20-40	34	137	139	21	87	42	11	41	28		
41-60	13	101	75	1	35	24	19	64	66		
61-80	0	19	10	5	22	13	9	32	9		

Figure 1: Age wise distribution

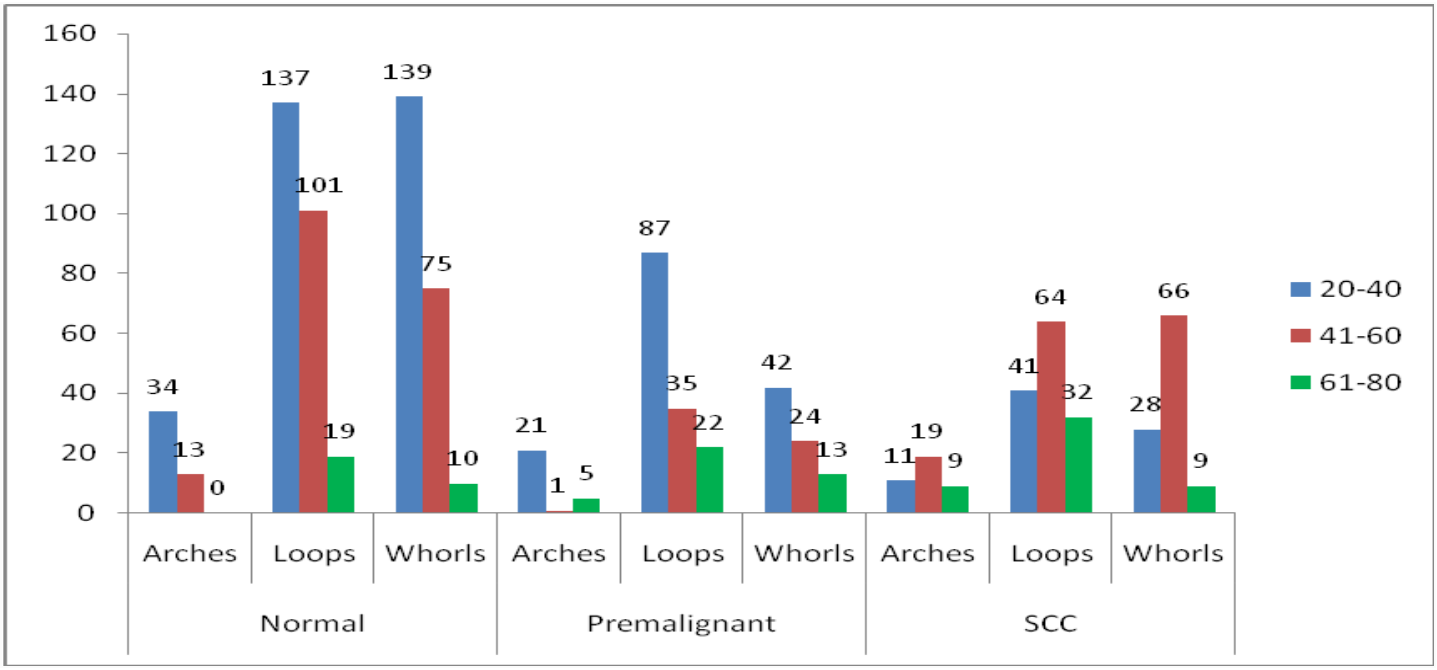


Table 2 Gender wise distribution

	Normal			Premalignant			SCC			Chi square	P value
Gender	Arches	Loops	Whorls	Arches	Loops	Whorls	Arches	Loops	Whorls	35.24	<0.05
Male	44	245	217	22	135	72	34	130	99		
Female	3	12	7	5	9	5	5	7	4		

Figure 2: Gender wise distribution

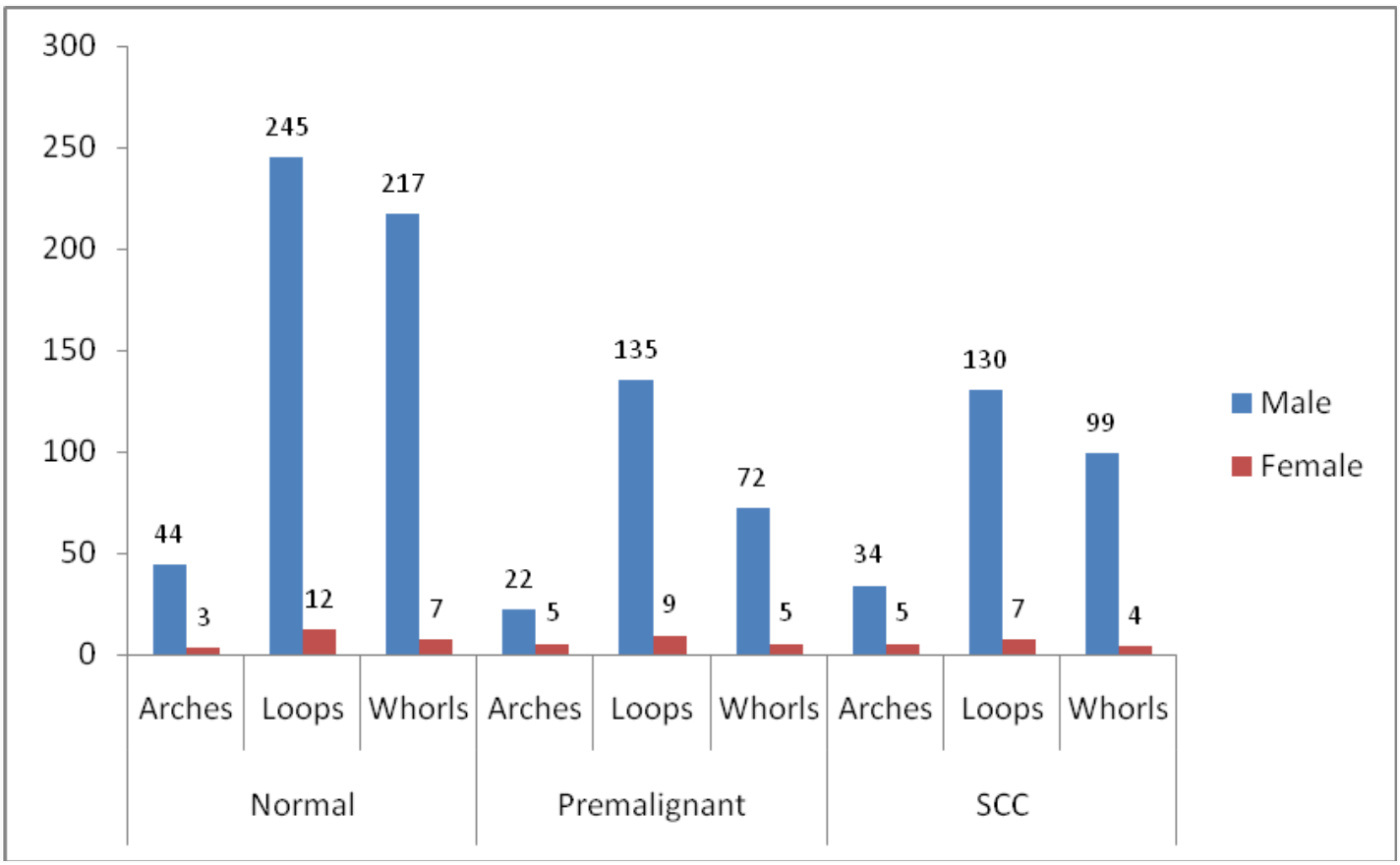


Table 3: Age wise distribution

	Normal		Premalignant		SCC		Chi square	P value
	Left ATD Angle	right ATD Angle	Left ATD Angle	right ATD Angle	Left ATD Angle	right ATD Angle	31.65	< 0.05
20-40	40.2	38.3	40.9	40	38.3	36.5		
41-60	40.8	41	39.1	40	38	39.9		
61-80	41.6	41	39.2	43.2	40	40.4		

Fig. 3: Age wise distribution

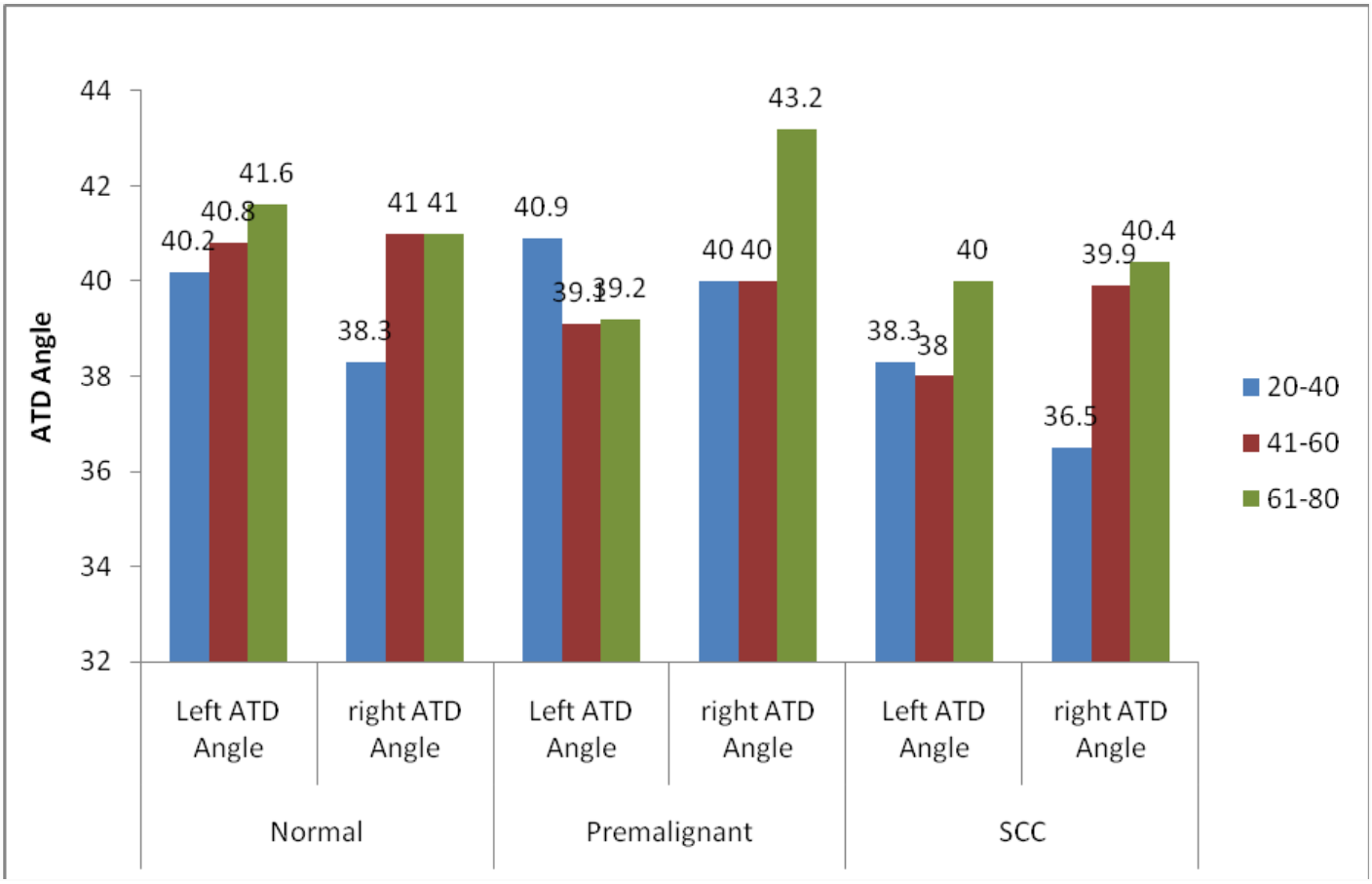


Table 4: Gender wise distribution

	Normal		Premalignant		SCC		Chi square	P value
	Left ATD Angle	right ATD Angle	Left ATD Angle	right ATD Angle	Left ATD Angle	right ATD Angle	29.34	<0.05
Male	40.2	40.8	40.5	40.7	38.5	38.8		
Female	40	40.2	40.3	40.4	38.2	38.4		

Fig 4: Gender wise distribution

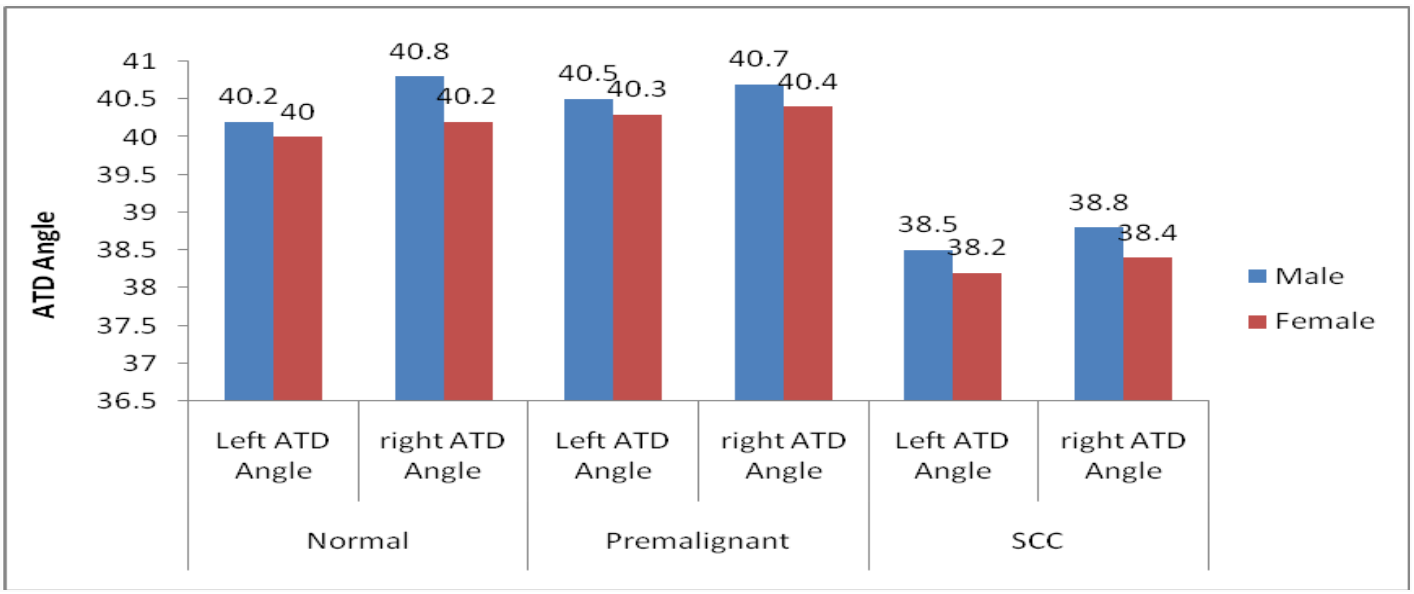


Table 5: Frequency of finger ridge patterns in the three groups

Pattern	SCC (%)	Premalignant (%)	Normal %	Chi-Square	P Value
Arches	34 (31.2)	27 (24.8)	48 (44)	27.52	<0.001
Loops	130 (25.3)	144 (28.1)	238 (46.4)		
Whorls	86 (13.8)	79 (12.7)	214 (34.5)		

Figure 5- Frequency of finger ridge patterns in the three groups

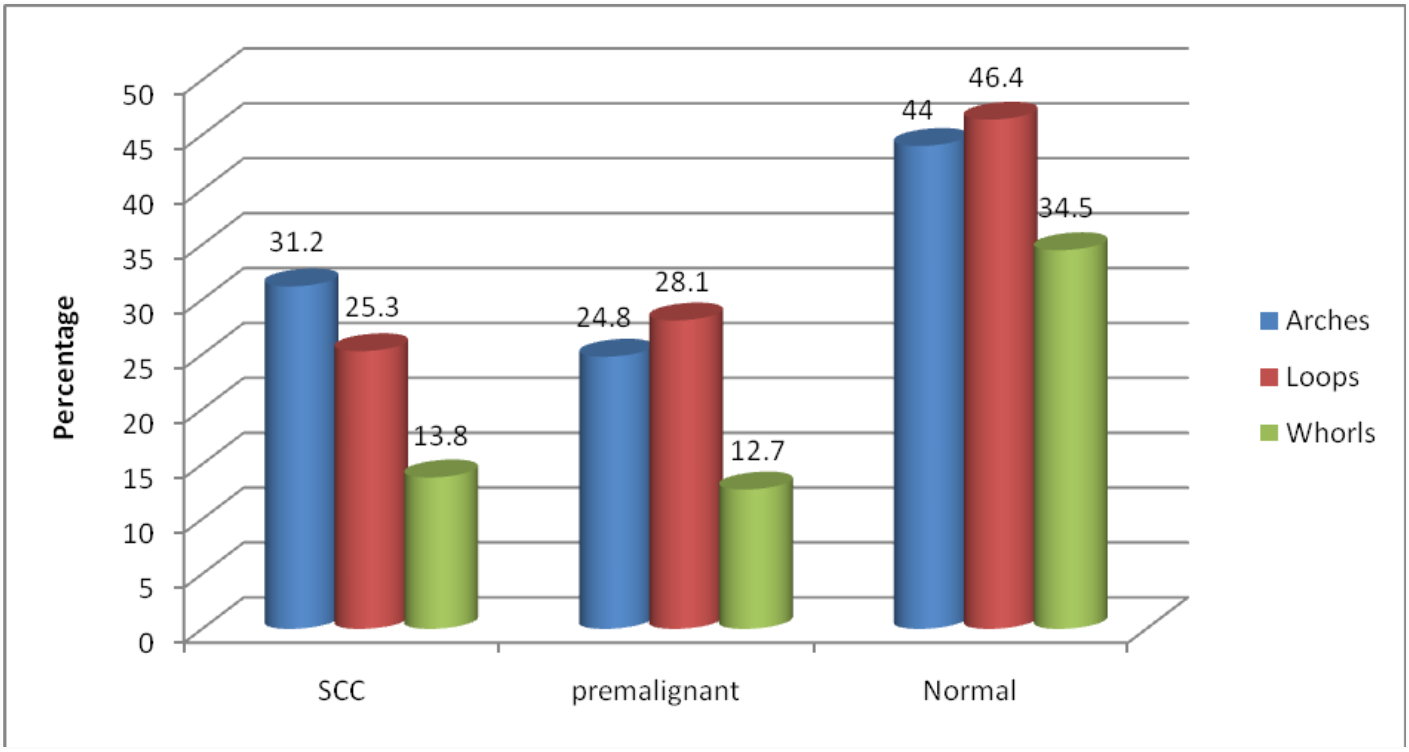
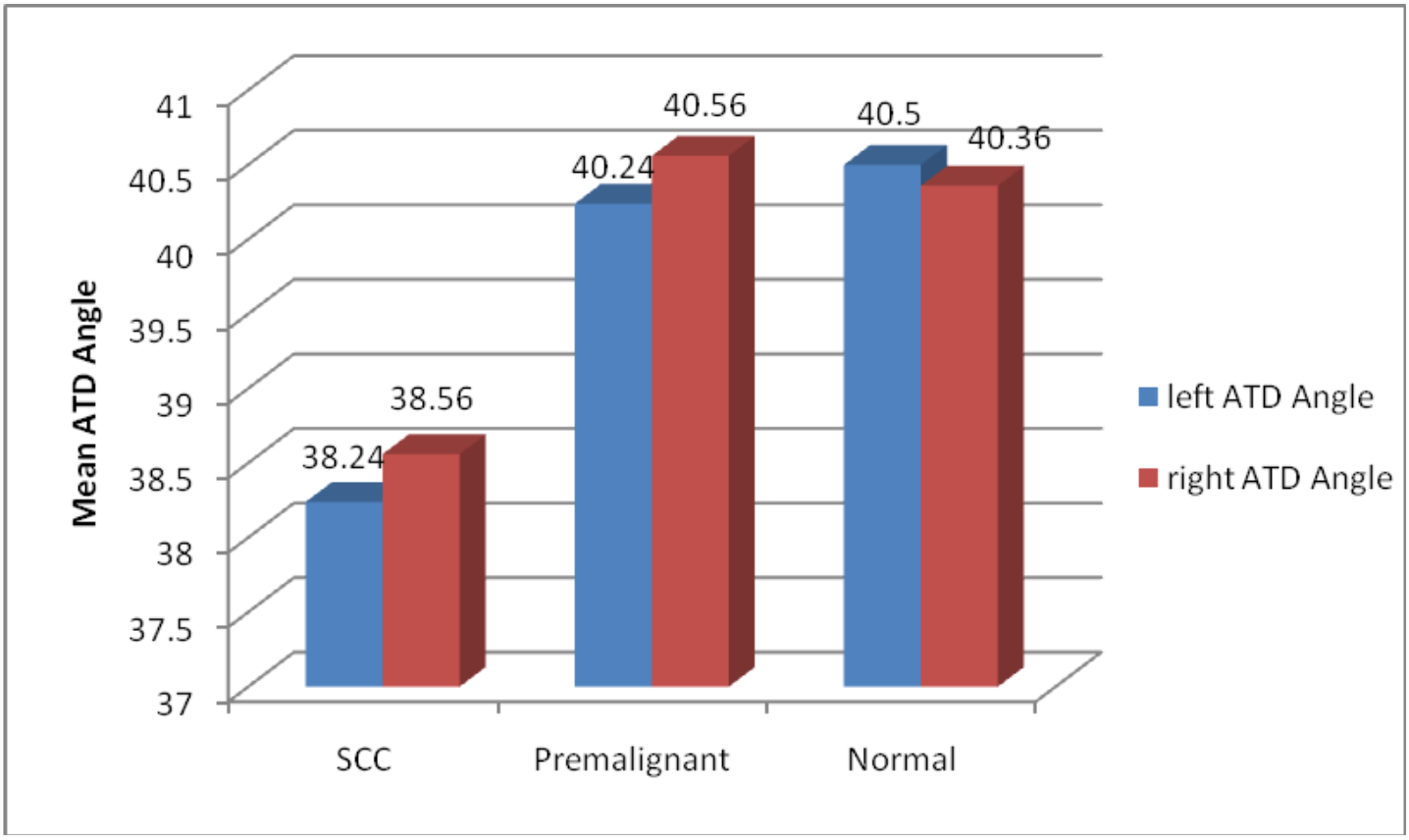


Table 6: ATD angle Left and Right hand

	left ATD Angle	right ATD Angle	Chi square	P-value
SCC	38.24	38.56	33.72	<0.9682
Premalignant	40.24	40.56		
Normal	40.5	40.36		

Figure 6: ATD angle Left and Right hand



Discussion

The dermal ridges have various notable characteristics which make them important, not only in personal identification, but also in human biology for various reasons. Firstly, unlike many bodily traits the dermal ridges and configuration once formed remain unchanged except in dimensions, i.e. they are age stable. The ridges are environment stable and begin to appear from 5th month of embryonic life. Although the patterns formed by ridges vary in size, shape and detailed structures, still they can be classified into definite main types. The dermatoglyphic features can thus be exploited quantitatively and qualitatively to be used as "genetic marker" of a disorder.[5]

Keeping this in mind a study was conducted to evaluate if dermatoglyphic pattern can be used as a genetic marker for cancer predilection in subjects consuming tobacco. A total of 100 Subjects were included in the study out of which 50 were those who had habit of tobacco consumption, however, they did not show any changes clinically.. Second group included 25 subjects who had habit of tobacco consumption and were

clinically diagnosed with premalignant disorders. Last group consisted of 25 subjects which were histopathologically diagnosed cases of oral squamous cell carcinomas. It was observed in our study that majority of fingerprints consisted of Loops which was 512. Of these 512 loops, 130 loops were of Squamous cell carcinoma patients, 144 were those of patients with premalignant lesions whereas 238 were of subjects who were consuming tobacco but did not show any changes clinically. Thus it can be observed that loops can be used as a genetic marker for predilection of oral cancer. The most interesting finding in our study was that although majority of loops where seen in subjects who had habit of consumption and did not show any clinical changes however, at the same time, majority of squamous cell carcinoma patients also showed loop ridge pattern. Thus loops can be used as a genetic marker for squamous cell carcinoma. The second highest number of ridge pattern which was observed were whorls. 214 whorls were of those subjects who consumed tobacco but did not show any changes clinically, 79 whorls belonged to those subjects who showed premalignant changes and 86 were of squamous cell carcinoma patients. The ridge pattern which was minimum in number were arches. 44 arches were observed in tobacco consumers with no clinical changes, 27 prints belonged to subjects with premalignant disorders and 34 to squamous cell carcinomas. These findings were similar to the study conducted by Jayalakshmi B, Avinash TML, Bhayya H, et al[7]. in which the number of loops was maximum among OSMF and leukoplakia , however , the number of whorls were found to be increased in subjects who were consuming tobacco but did not show any changes clinically. Our findings were also similar to study conducted by Gupta A, Karjodkar FR. in which the number of loops were more in comparison to SCC and OSMF subjects[5.] The findings of ATD angle in our study was similar to study conducted by Patil PB, Reddy JJ, Joshi V, Kumar KR, Shilpa RT and Satyanarayana P in which they observed a decrease in ATD angle of oral cancer patients when compared with other groups.[8]

Conclusion

We can thus conclude that studying of dermatoglyphic pattern can be used as a genetic marker for predilection of cancer in subjects consuming tobacco and after studying their ridge patterns and ATD angles, patient counselling can be done for tobacco cessation.

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