CHAPTER I
INTRODUCTION

Epidermal ridges on volar skin of the hands and feet in man and other primates form characteristic patterns which have long attracted the attention of scientists. More than 150 yrs. ago, Purkinje described the ridge anatomy. In this century, Cummins was a pioneer in scientific ridge pattern analysis and it was he who coined the term 'dermatoglyphics' (skin carvings) for this branch of science. The dermatoglyphic characters are unique as criteria for the study of human variations. This is because the intricate patterns of epidermal ridges are established during the early fetal life and are not affected by age and post-natal circumstances except as a result of serious injury to the deepest layer of epidermis. Ridge patterns form in utero and are easily seen at birth. Their development is strongly influenced by genetic factors (Holt, 1968). They form in relation to volar fat pads on digits and in interdigital, thenar, hypothenar and calcar areas. The pads are discernible at about the sixth week of gestation, begin to regress during the 12th & 13th week and are gradually replaced by ridges which coalesce into patterns. The ridge patterns continue to form until approximately the 19th week. The ridges on the hands form several weeks earlier than those on
the feet, in keeping with rostral-caudal growth sequence. Sweat gland ducts open upon primary ridge peaks but secondary ridge which have no duct openings may also be seen (Schaumann and Alter, 1974). These ridge structures increase in size as the infant grows but pattern remain unchanged throughout the life. Dermatoglyphic characters are highly variable not only from one individual to another but also from one population to another, the variations are of course largely heritable (Basu, 1985).

Dermatoglyphic traits offer useful criteria for assessing the biological affinities between populations. The heredity of dermatoglyphic features conforms to a polygenic system with individual genes contributing small additive effects. These features appear to be less affected by force of selection than either morphological or serological traits. Thus, they are probably less sensitive to environmental effects or chance fluctuations and therefore relatively more stable, particularly quantitative dermatoglyphic traits for which heritability estimates are available. These properties have made dermatoglyphics a valuable research tool in the field of physical anthropology, population dynamics, human genetics and the related field of medical biology.
HISTORICAL BACKGROUND

A large body of dermatoglyphic data reported in literature relate to ridge configurations of hand. One of the most neglected aspect of dermatoglyphic research has been the study of the ridges of the plantar surface. This is mainly due to the reason that getting toe prints pose certain practical difficulties as toe patterns are small in size compared to finger prints and lie near the creases of toe, in the inter-phalangeal joints. Digital triradii of plantar surface are often missing from sole prints because they lie in the creased area where the toe meet the ball of the foot (Fox & Plato, 1987).

Wilder (1902) compared human sole prints to quadrupedal mammals. He continued in ensuing years to describe sole patterns, developed a plantar nomenclature and compared sole pattern distribution in twins and many racial groups (Wilder 1904 a, b; 1913, 1916, 1922, 1924, 1925). These early descriptive papers ignited interest in sole dermatoglyphics. Several researchers began publishing results on population plantar prints as well as new born prints (Montgomery 1925-27; Cummins and Midlo 1926, 1943; Newman 1936; James 1939). Lemza and Galaktionov (1982) studied sole dermatoglyphics of the aborigines of North. W.Siberia, Taimir and Kamchatka. Moreover most studies on the sole alone examined diseased
Most studies of plantar dermatoglyphics are based on standard methodology of Cummins and Midlo (1943). However, the interdigital triradii in zygodactyly are referred to as, $z$, $z'$ and $z''$ (Penrose & Loesch, 1969) rather than $ab$, $bc$, $cd$ (Cummins & Midlo 1943). The 'Z' classification was used as an abbreviation for the $ab$ formulation and has been used most often in the plantar literature. Loesch (1974) submitted a report on the genetics of sole and plantar dermatoglyphics. Later in the field of plantar dermatoglyphics on Caucasian plantar pattern types has been published by Fox & Plato (1987).

PLANTAR DERMATOGLYPHIC RESEARCH IN INDIA

The earliest foot print samples from Indian population were obtained by Montgomery (1925). Actual plantar dermatoglyphic researches on Indian population really began in early sixties. Considering the very large number of endogamous groups that constitute the Indian population the dermatoglyphic data so far collected from India are meagre. Samples are often small and investigations are mostly restricted to digital patterns only. Studies on plantar features of caste populations from various states of India are indeed sparse with the exception of Himachal Pradesh and
Uttar Pradesh (Sharma 1962; Tiwari & Bhasin 1971; Tiwari & Kapoor 1980). Studies on Caste samples have also been reported in certain other areas viz. W.Bengal, Jammu & Kashmir, Delhi & Bihar (Mukherjee & Saha 1970; Bali 1962; Datta 1964; Dash Sharma 1978) respectively.

In the study conducted by Kumar & Kumar (1974), Indians appear to have the highest frequencies of toe arches. Kalhotra et al (1982) presented a detailed methodology for counting ridges of true patterns in plantar configurational areas.

DERMATOGYPHTICS IN MEDICINE

Cummins (1936) made major contribution to the medical applications of dermatoglyphics by elucidating the unusual frequency of certain ridge patterns in patients with Down's Syndrome. Uchida & Soltan (1963) are credited with pointing out the increased frequency of dermatoglyphic abnormalities in patients with chromosomal aberrations. When Alter (1966) reviewed dermatoglyphic and chromosomal aberrations, a large body of literature linking the two, had accumulated. Reports of unusual dermatoglyphics in patients with chromosomal defects as well as other disorders continue to appear with considerable frequency. The clinical applications of dermatoglyphic analysis are many. It might serve as a useful screening technique in selecting patients suspected of
chromosomal defects for more definitive studies (e.g. Karyotyping). Detection of unusual dermatoglyphic in a particular patient may alert the clinicians to the possibility of a chromosomal or teratogenic abnormality which might otherwise have been missed (e.g. prenatal rubella infection). Dermatoglyphics may also be used to establish zygosity (Parisi & Di Bacco, 1968) and paternity (Cummins & Midlo, 1961). There clinical applications coupled with the case analysis should encourage a more widespread use of dermatoglyphic analysis in clinical diagnosis.

**OBJECTIVE OF THE STUDY**

The main purpose of conducting this study is to describe toe and plantar dermatoglyphic features in five endogamous groups of Punjab with a view to fill an important gap in our knowledge of plantar dermatoglyphic variations in North-West India. The data generated through this study is analysed to study inter and intra group variations as well as bisexual differences in dermal ridge configurations in five endogamous groups under study. Further, the study envisages comparison with such data as are available in the published literature for neighbouring populations to assess the pattern of dermatoglyphic variations in this region.
Location of punjabi caste groups (under study) in Punjab
LAND AND PEOPLE

Mansa is a district divided mainly in three subdivisions and three Tehsils. It is situated on the Bathinda-Delhi railway line. It is connected by road with Patiala (110 kms), Bathinda (55 Kms) and Chandigarh, the state headquarter (175 Kms).

This place is said to have been founded by Bhai Gurdas who hailed from village Dhinga in Bathinda district. He is said to have been married at this place among the Dhaliwal Jats. Once he came to his in-laws home to take his wife along but they refused to send her with him. At this Bhai Gurdas sat in Meditation before the house of his inlaws. After sometime, the parents of girl agreed to send their daughter with him. But he refused to take her along with him, stating that he had now renounced the worldly way of life. In his memory, a smadh was constructed where a fair is held every year in March-April.

Total area covered by this district is 2192.3 m² with a population of 5,78,815 comprising 53% male and 47% female population. 85% of the total population live in rural area. This area is quite backward compared to other districts of Punjab. The Scheduled castes constitute 23.48% of the population. Main occupation of its population is agriculture and labour. This area falls under ‘Cotton belt’ of
Punjab. Climate is dry and characterized by very hot summer, a short rainy season and a bracing cold season.

The ancient history of Mansa has been traced to the Indus Valley Civilization. Certain sites explored in Mansa district link it with the sites explored and excavated in Rupnagar district. This civilization has been called the Indus Valley Civilization because most of its sites have been found along the river Indus. The civilization was spread over a vast area and the present Mansa district was part of it. It is also called the Harappa Culture, because the sites of ancient culture excavated at Harappa in Pakistan have given ample proof that the Indus Valley Civilization was much developed and advanced.

Language

Linguistically, Mansa district is surrounded by Bangru and Rajasthani, spoken in Haryana and Rajasthan states respectively and Malwai, an important dialect of Punjabi, spoken in Sangrur, Ludhiana and Faridkot districts of Punjab. The impact of Bangru and Rajasthani on the language of Bathinda is not of much significance. The language of Mansa spoken in the village is almost the core of Malwai dialect. The urban speech is a hindi influenced Punjabi variety of this dialect but there is complete mutual intelligibility between the urban and rural language. The
variety of language spoken in the rural area is the dominating one. Mostly Gurmukhi script is used for writing dialect. The position of glottalic /h/ is very interesting in this area. Mostly it plays a silent role in the pronunciation of words.

Major Caste Groups

The total population of this district is 5,78,815. The Sikhs form the majority and Hindus come next in the order of numerical strength. Caste plays an important role in the socio-economic life of the people of the district. Information on caste-wise population figures are not available because census enumeration with regard to different castes has not been made in the census after 1951. In the absence of such data much of the valuable information pertaining to the life and economy of people cannot be included here. However, the general description of the traditional socio-structure, customs & religious beliefs of some of the castes is given in the following paragraph:

Sikhs:

Sikhs believe in the Karma and transmigration of the soul. Sikhism attaches great importance to the institution of langar, according to which the high and low have to sit
side by side and dine together, there by annihilating all
distinction of caste and creed.

Sikhism is a widely accepted religion in this district. People, belonging to various caste groups like scheduled caste and backward castes also follow this religion. This area is mainly dominated by the following caste groups :

i) Jat :- belong to peasant class of Punjab. They are mostly Sikhs.

ii) Chimba :- belong to artisan class, and are engaged in sewing trade. Locally they are known as 'Darji' or 'Tailor'. They are Sikh by religion.

iii) Sunar :- Gold smith : A large majority of them are Sikhs but a few are Hindus by religion.

iv) Lohar :- Black Smith. They are mostly Sikhs.

v) Ghumar :- Pottery makers. Like others they are also Sikhs.

Except for Jat, all other castes described above fall under the category of Backward Classes. They are mostly engaged in their traditional trade (trade of their parents) and give least preference to education.

But with the changing scenerio after independence, they have started taking formal education and quite a number of them are now engaged in office jobs. People are becoming
more and more aware of the importance of education in their life. They all marry in their respective group only.

Hindus:

i) Brahman: Traditionally, the Brahmans have been a priestly class. Earlier they used to perform mainly priestly duties, but now only a small number of them are engaged in this profession. The Brahmans in the district are mostly from the Saraswat Stock. The Saraswats derive this name from the river Saraswati. They are divided into ‘Athbans’ and ‘Chhcbans’. The distinction between these groups has disappeared with time and they now inter marry Khatris. They constitute a very small part of the total population. Mostly they are of good disposition and generally literate. They are engaged in trade, commerce industry, private and government services.

ii) Bania: The word ‘Bania’ is derived from Sanskrit word ‘Banijya’ or ‘trade’. As the name implies, Bania are primarily a trading class. They are traders par excellence as they have been engaged in business since generations. They trace their origin from Agroha in the Hissar district (Haryana) and claim to be the descendants of Raja Ugrasen.
Besides, there are other denominations like Muslim, Jain which are much much less in number (Jain-0.1%, Muslim-0.3%).

Scheduled Castes:

23.48% of the total population is scheduled castes. They are divided in groups, sub-groups, caste and sub castes which are as following:

i) Ramdasi: Engaged in Skin trade. Basically they are shoe makers. Marriages are performed within the group.

ii) Majbi Sikh: Formerly a sweeper class, engaged in menial jobs during 17th & 18th Century. Subsequently they changed their religion and adopted Sikhism. They gave up their traditional work of doing menial tasks (cleaning laterines) and have started working as labourers in agricultural fields.

iii) Balmik: They are people from outside the Punjab. Their language is different. They consider Balmik as their Guru and worship him. They speak 'Bangru' language. Most of them are working in municipal corporation as sweepers and garbage collectors. They are also engaged in jobs like cleaning laterines collecting garbage etc. for disposal from the houses of dominant castes. Intra group marriage is common practice.
Formerly SC’s (Scheduled Caste’s) avocations were restricted and they could not change them. Things have, however, changed considerably after independence. The SC are now at liberty to adopt any profession, they like. They are engaged in trade, commerce industry, private and Govt. Services including Police and armed force. Since 25% of the Civil posts are reserved for them, the literates find it more lucrative to join Civil Services where they are also entitled to reservation in appointments and promotions. Illiterate SC’s are generally engaged in agriculture. Before independence they were not allowed to own land but all restrictions in this regard have been dispensed with under the constitution of India. They can now purchase land or any other immovable or movable property just as other members of the society can acquire property anywhere in the country. According to government policies, the surplus land with the govt. is being allotted to them at a nominal price (Sharma, 1992).