INTRODUCTION
The human palmar and planter surfaces are covered with a number of minute ridges. This ridged skin is confined to the palmar finger balls and the digital margins. These ridges form varied configurations which are collectively termed 'dermatoglyphics'. Thus dermatoglyphics can be defined as the study of the delicately sculptured skin surface inclusive of single ridges and their configurational arrangement (Cummins and Midlo, 1961).

Four interdigital, the thenar and the hypothenar regions are available on palmar dermatoglyphic areas. A triradius is located at the base of these digits. The proximal radiants of these triradii demarcate the digital regions, and when the distal radiants of these triradii are traced they form the main lines.

The number sequence, as 1, 2, 3, is used to designate the main lines around the periphery of the palm. The main lines a, b, c and d can be designated as number 12, 10, 8 and 6 respectively. When the lines are traced between the interdigital intervals, they are designated by numbered sequence.

Whenever a proximal line terminates anywhere on the radial side of the axial triradial, it is designated as 1,
and the nearer midpoint of the ulnar border is designated as 4. The number 2 is traced between positions 1 and 3, which is nearer to the midpoint of the bracelet creases.

Position 3 can be determined between 2 and 4. It also includes the proximal half of the ulnar border and the proximal margin of the eminence of the hypothenar. The distal half of the ulnar border is position 5, which is itself divided into two halves, the proximal half being numbered 5' and distal 5".

The axial triradii are found usually at or near the proximal margins between the depression of thenar and hypothenar eminences at the longitudinal axis. Some palms have two or three axial triradii which are available at different levels. If an axial triradius is found near the centre of the palm, it is termed t°, and if its position is at an intermediate level then it is called t'. The triradius or triradii close to the palmar axis are termed axial triradii t. If there is no triradius in this particular case, the symbol 'O' is used. When there are more axial triradii then they are formulated in the proximo-distal order (t t' t")

The whorls, loops and tented arches are primary types of true patterns found in the hypothenar area. Other features, such as the plain arches, open fields, multiplications and vestiges, are not true patterns. The whorls are distinguished
in this area by concentric ridges associated with the three triradii. The symbol for whorl is W. A whorl which is associated with double-looped contour enclosed by a concentric periphery is designated as Ws. A whorl having no more than 8 ridges from the core to the nearest triradial point is called W. Loops in this area have three directions of openings — radial, ulnar and carpel. The symbol for the loops is L, and they are designated on the basis of the direction of their openings as \( L^U \), \( L^U \) and \( L^C \). These loops which do not have more than 8 ridges are formulated as L. Tented arches have three directions of opening in this area. Their direction of opening may be towards ulnar, radial or medial regions. The symbols used are \( T^U \), \( T^R \) and \( T^C \). The plain arches in this area are designated as \( A^U \), \( A^R \) and \( A^C \).

The dermatoglyphic features of thenar and interdigital areas display a great variety of configurations. The patterns available here may be either single or in association with another pattern or vestige. The symbols used are W, L, V, O and their different combinations. A loop without any accessory triradius is classified L, and with its triradius can be designated as D.

**FINGER TIP PATTERN CONFIGURATION:**

Galton (1892) designated the ridge patterns into three
groups: arch, whorl and loops, on the distal phalanges of the finger tip.

An arch is a simple pattern which is formed by more or less parallel ridges. These ridges traverse and form a curve which is concave proximally. The arches are of two types — simple and tented arches. The simple arch has no triradii, and the tented arch is of a tent-like structure. It has one triradius in the middle region of the ridge direction.

The most common pattern is the loop. According to the nature of configuration, loops can be classified into two types which are known as the radial and ulnar loops. When the loop opens towards the radial side it is known as radial loop, and a loop which opens towards the ulnar side can be denoted as ulnar loop. A loop is always associated with single triradius.

A whorl (W), according to Galton's (1892) classification, is any ridge configuration with two or more triradii. One triradius is on the radial and the other on the ulnar side of the pattern. Henry (1937) limited the designation of whorl to those configuration having ridges that actually encircle a core.

The simple whorl arranged as a succession of concentric rings is called 'concentric whorl' (Wc). A simple whorl is
spiral, either clockwise or counter clockwise. This pattern is described as 'spiral whorl' (W).

One can also see a central pocket whorl or loop. It is a loop pattern in which there is a smaller whorl within a bigger one.

Some loops interlock each other. These loops may be either lateral pocket loops (L.P.L.) or twin loops. These two whorls are morphologically similar because they have two triradii. In the twin loop, the ridge core opens towards the opposite margin of the finger and, on this basis, the pattern can be classified as twin loop, and if it opens towards the same margin, it is called L.P.L. Accidental represents a combination of two or more configurations such as loop and whorl and triple loops.

QUANTITATIVE DERMATOGLYPHIC METHOD:

There are certain specific characters found in dermatoglyphics, which can be quantified. The quantity of these features can be obtained by the number of ridges between successive digital triradii and also by measuring the distance and taking the angular value between the specific points.
PATTERN INTENSITY:

Ridge configuration is not as simple as it is thought. Sometimes it is very complex. This complexity is termed as 'pattern intensity', and it is described as by counting the number of triradii. This intensity can be calculated on the basis of various types of configuration. Regarding arches, the simple arch which has no triradii is designated as 0. If the arch is tented it will have the intensity of 1. The same is also applicable for loops. It is because each of them has one triradius.

DERMATOGlyphICS AND DISEASE:

We have so far dealt with both qualitative and quantitative dermatoglyphic features. It is now essential to study the diseases associated with these features, and finally, an attempt will be made to study the relation, if any, between various dermatoglyphic features and disease.

The anomalies or irregularities in the skin pattern are due to several reasons. The most important cause for this condition is a disorder caused by burns or skin disease. These anomalies may be inborn. They may also appear in the aberration of the papillary ridge patterns. It is found in some cases that such an anomaly is associated with some affliction. Some individuals have imperfect ridges by birth. This imperfection
or mutilation in the ridges takes place when the human embryo is in the stage of development. It only happens when there are disturbances in the embryo. Abel (1936) noticed some irregularities within the epidermal tissue occurring between the second and fourth fetal months. Hirsch and Schweichel (1973) have suggested that irregularities of ridge pattern can be secondary. It is the result of disturbance in the nervous system. There is a distortion both qualitative and quantitative, in the sub-epithelium. In this disturbance or distortion, the nerve branches do not take the normal cause but rather deviate, therefore, there is a ridge disturbance. The cause of this may be traced to the special arrangement of the nerves.

There are reasons for disturbance in the pattern of the epidermis, when disruptive factors start working. The conclusion is drawn only by seeing and observing the type of damage done in the dermatoglyphic pattern. The unusual formation of the ridge pattern does not confine itself to a particular size of pattern-breaks. It has been observed that these may be as small as a dot and sometimes they may envelop the entire surface of the ridge skin of fingers, palms, toes and soles.

There are several reasons such as congenital malformation of the epidermal ridges. One of these is decidedly ridge aplasia. It is, however, very rare. Wherever this happens,
the absence of ridge over the entire volar surface of hands and feet is observed. This phenomenon was observed by Baird (1964, 1968).

Cook (1955) also made a very remarkable observation. A severe hand malformation is seen in a person, it was noticed that there were obvious dissociated and missing ridges on the tip of fingers. There is totally no forms or pattern.

The distortion is not confined to a particular area. It can be observed in any dermatoglyphic region. These dissociated ridges can affect any epidermal area, and may differ in size. Sometimes it takes the form of a nominal or minimal lesion which occur in a very small area within the pattern (Cummins, 1968, 1970a; Nettles, 1963; Safari, 1969). This may increase; sometimes it has been found on the total volar surface of the fingers, palms and soles and toes (Cooke, 1950, 1962; Cummins, 1970a; Dodinval, 1972).

Abel (1936) found a very interesting fact about dissociated ridges. According to him, there is a close relation between ridge distortion and the individual finger tip. Furuya (1961) found among normal Japanese population that the decreasing frequency of finger tip is II, III, IV, V, but he observed that this order changes in person who are of unsound mind or mentally deficient. The sequence among the afflicted
individuals is V, II, III, IV. Large families were found to have tapering finger nail dystrophy, and very troublesome and painful chapping of finger prints. This anomaly become hereditary and was transmitted to successive generations.

The ridge dissociation is always associated with certain disorders. Abel (1936) found some connection of aberrant ridges with certain diseases. These are albinism, oxycephaly, malformation of the extremities (e.g., polydactyly, syndactyly, oligodactyly, perodactyly) spina bifida, deafmutism, familial amaurotic idiocy and mental deficiency. Other investigators have also done considerable work in this field. The important work among these, those by Schade (1937), and Grebe (1940). They found that people having aberrant ridges were suffering from limb malformation or unspecified mental retardation. Thus they confirmed Abel's (1936) findings.

It can be now said with confidence that people who are having dissociated ridges suffer from various medical disorders, but the evidence available from the above statements, it cannot be inferred that a certain type of epidermal anomaly is always the result of a certain disease.

Ridge dissociation is apparently sometimes reversible. David (1973a) reported complete disappearance of 'dotted ridge' over a period of 6 months in a girl with a small intestinal obstruction. Cook (1958) and David (1971) coined the term
"ridge of the end syndrome" Rosc and Rosc (1970) is inherited as an autosomal dominant trait and is not associated with any medical disorder.

David (1973b) gives an example of another dermatoglyphic syndrome, which he proposed to call the Nelson syndrome. This disease is also inherited as an autosomal dominant trait, the affected person has deep interdigital loop, a distally displaced axial triradius and a vertical crack in the hypothenar area.

There is now quite a good deal of literature available on dermatoglyphic features and disease. On this basis, certain hereditary disorder can be diagnosed. However, it cannot still be said with certainty that a particular dermatoglyphic anomaly will be associated with a particular disease. However, it can be concluded that the dermal features are abnormal among afflicted person. Before arriving at definite conclusion, it should be taken into consideration that dermatoglyphic features exhibit variability in all the various ethnic strains of the world. Thus a definite relationship cannot be formulated. It cannot be said with certainty that an individual having particular dermatoglyphic anomaly will be afflicted with a specific syndrome.

So far some of the recent trends in qualitative and
quantitative dermatoglyphic features of the finger and palmar regions have been dealt. A brief description of the present work is dealt in the following pages and also such type of work available in other population also.

PRESENT WORK:

The present work is based on the qualitative and quantitative dermatoglyphic features among persons who are afflicted with Cancer, Tuberculosis and Leprosy. These features are again compared with normal individuals of the same ethnic strains to find out associations, if any, regarding these features.

Palmar main line formula and various configurations on the palmar and the finger dermatoglyphic regions are dealt here to draw some broad conclusions regarding variability among afflicted and controlled samples.

Sufficient work is not available in the field of palmar quantitative dermatoglyphic and the existing work is restricted to a-b ridge count only. An attempt has been made in this direction to explore the ridge counts of all interdigital areas. Fange (1950) found evidence regarding its relationship with Mongolism. Other studies relating to various afflicted conditions on a-b ridge count include Holt Lindstein (1964), Pfeffelf and Kiera (1968), Cushman (1969), Shione H. and
Kadowaki (1971) and Furuya (1974). These studies have proved certain variations. In the a-b ridge counts among persons who are suffering from various conditions in comparison with the normal individuals. Höfngel and Gerald (1966) found the mean a-b ridge count increased in affected individuals of brachydactyly. Holt (1968), Shiono and Kadowaki (1971) found the mean a-b ridge count of Japanese patients with Down syndrome are slightly lower than in controls, but the differences are not significant. Hunters (1968), Cushman and Soltan (1969) reported significant difference in the a-b ridge counts in xxy patients and the controlled sample.

Many abnormal qualitative dermatoglyphic features were studied by Pfeiffer and Sehattle Berge (1964) among children affected with Thalidomide embryo. They showed decrease in transverse flow of palmar ridges, double digital triradii, abnormal course of main lines, and ridge dissociation. McKusick (1969) and Goodman (1972) reported that the camptodactyly patients displayed vertically oriented main lines.

Erne (1953), Coeffer (1969), Plato (1973), in a study of Down syndrome, have found significant difference in frequencies of hypothenar pattern and ulnar type of pattern. Holt (1968), Shiono and Kadowaki (1971) have observed that the hypothenar area shows an increased frequency of patterns
in the Down syndrome. Many of the patterns are large and often terminate distally in high axial triradius. Batolozzi (1968) noticed high axial triradii among patients with Down syndrome.

According to Holt (1970), the D line terminations could be traced to the radial border of the hand in Down syndrome. Penrose (1963), Forbe (1964), Hunter (1968), Cushman and Soltan (1969) noticed that the palm shows distal axial triradii mostly in t' position among XXY patients. Uchida (1964) found in the hypothenar areas loop carpel and loop radial associated with an ulnar triradius in the patients of Klinefelters syndrome. Penrose (1969), in 18 trisomy patients noticed a decreased in the frequency of pattern in the third and fourth interdigital area. Loesch (1970) found significant difference among XXY patients in the interdigital areas.

The literature on finger dermatoglyphic pattern and disease has been reviewed here briefly. Poll (1935) and Moller (1935) reported slight decrease of arches among Dane schizophrenia patients. Raphael and Raphael (1962) reported an elevated frequency of both whorl and arches, particularly tented ones, among male schizophrenics. Purvis Smith (1972) also observed an increase in finger tip whorl in cytomegalic inclusion patients. Purvis Smith (1969), Rosner (1969), Verbov (1969) reported an increase of arches and decrease of
ulnar loop in the finger tip with case of acute blast cell
leukemia. Purvis Smith (1972) found decreased frequency of
ulnar loop and increased frequency of arches on the finger tip
of male children with acute leukemia, whereas female children
with the same disease had an increase of finger tip whorl and
a decrease of arches.

Bellelli (1939), Jones and Thompson (1973) found three
radial loops on the finger tips of a patient with triphalangeal
thumbs and congenital hypoplastic anemia. Stern (1970) found
increased frequency of finger tip arches in a family with the
hand foot uterus syndrome. Degenhardt and Geipel (1954)
noticed that in brachydactyly patients there is an increase
of arches and whorls on the finger tip whereas the ulnar loops
were considerably diminished in frequency among affected
members of the family. Alter (1965) observed a somewhat
increased frequency of finger tip arches in xxy patients.
Shiono (1971) pointed out that the increased frequency of whorls
finger patterns among Rubinstein-Taybi syndrome patients.

As said earlier that the present work deals with the
nature of distribution of various pattern types among the
patients afflicted with cancer, tuberculosis and leprosy and
also on the controlled sample to study variation, if any, in
the normal and afflicted individuals regarding these traits.
Finally, a brief description of these diseases is dealt to
study association, if any, available regarding their pathology.
There are many factors responsible for cancer, such as chemical reaction (hydrocarbon benzpyrene), radiation, special type of viruses, hormones, environmental and occupational factors as working in radium factory, tobacco-smoking, etc.

Anderson (1977), Borgaonkar (1977), Chernozemsky, Petkova (Bocharova, Nikolov and Stoyandv (1978), Lych, Lynch and Bardeniri (1977) have proved that there is a genetic factor involved in the transmission of this disease from one generation to the next.

It has already been established and shown that Xeroderma pigmentosa, Retinoblastoma and multiple polyposis of the colon are due to strong hereditary factors. The cancer of breast, uterus, rectum and leukemia also shows marked hereditary tendencies.

Cancer has no direct or indirect relationship with T.B. and Leprosy. The worst thing about cancer is that it is a chronic disease and it is diagnosed in the later stage of the affected person.

Leprosy and Tuberculosis both are chronic granulomatous diseases which are caused by the organism of same group, Mycobacterium leprae and M. tuberculosis respectively.

The pathogenicity of both disease is different. The
resemblance of these diseases can be shown on the basis of Tubercular Lesion and Lesion of Tuberculoid Leprosy; where there is infiltration of epitheloid cell and Langheris giant cells. Both mentioned bacteria come from the same group having same properties.

Hansen Norsk Mag (1874) discovered Mycobacterium leprae resembles with Mycobacterium tuberculosis in morphology and staining; but it can be decolorized more easily by acid than M. tuberculosis.

Several factors are believed to account for the variation in susceptibility to leprosy, e.g., nutrition, occupation, hygiene (personal and domestic), economic status, family size and inherent factors, such as constitutional differences, familial predisposition and heredity.

Many reports from different countries have emphasized that leprosy have a heritable role and it can be transmitted from one generation to the next (Muir, 1927; Aycock, 1940, 1941, 1948; Cochrone Rajagopalan, 1964; Noordeen and Mohamed Ali, 1964; and Beiguelman, 1967).

Spickett (1962) pointed out that there is a single irregularly dominant gene controlling the susceptibility of a person with Leprosy and in one population he pointed out that the gene penetrance was 83.3%.
Lowe (1938), Cochrane (1935) have studied among Indian and Chinese living in Maaya. The prevalence of Tuberculoide Leprosy was high as 75% among Indians, but only 33% among the Chinese. These data suggest that, to some extent, Leprosy and Tuberculosis have a definite association.

Pyrie (1948), Lowe (1938), Cochrane (1935), Hansen (1874), Friedmann (1945), Koch (1889) and Konno (1953) have proved that Leprosy is associated with Tuberculosis.

Regarding Tuberculosis William Boy (1961) reported individual immunity seems to be largely genetic in character. The chance of developing tuberculosis increase in proportion to the degree of genetic relationship with an affected individual. Thus, it is known that the chances of developing the disease is more than 3 times as high in twins when the relation is uniovular (identical twins) rather than bivovular.

We have so far dealt with the disease and dermatoglyphic characters to study affinity, if any, regarding any traits available among normal and affected persons. It can further be added that the present study deals with the diseases and palmar and finger dermatoglyphic features among various ethnic strains of Hindu society of India with a view to studying the nature of distribution of these features.

The findings regarding variations of the dermatoglyphic characters among the normal and affected individuals are finally summed up.