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RESEARCH ARTICLE

UNDERSTANDING PSYCHOSOCIAL MATURITY THROUGH DERMATOGLYPHICS: A QUANTITATIVE PERSPECTIVE

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Abstract

Transitioning from adolescence into adulthood, the youth have to face numerous challenges and navigate through adolescence and into their early 20s; in order to do so they have to develop sufficient psychosocial maturity (PM) [5]. However, due to inadequate development during adolescence and early adulthood, the emotional and social aspects of maturity are not well understood [15].This study examines the correlation between a model of psychosocial maturity (PM) [6] and dermatoglyphic patterns. Thus, this study offers a new perspective on the dual role of genetic and environmental factors in the development of maturity [22]. The data was collected from university students, in the age group 18-25 over a three-month period. The factors considered for determining psychosocial maturity include, 'self-esteem', 'openness to change', 'independence', and 'social tolerance'. Dermatoglyphic patterns of the subjects were examined to assess the correlation with these psychosocial traits.The study revealed a considerable correlation between PM and dermatoglyphic patterns. This predicted that the maturity of an individual may be based on genetic predisposition, yet, environmental factors play a much larger role in shaping it. These findings further contribute to the understanding of environmental and genetic factors in social and emotional development.

Introduction:-

An individual's social and emotional growth is a lifelong process which is termed as Psychosocial development. The term psychosocial maturity (PM) focuses specifically on the youth and the challenges they must face to become a successful adult[15]. The adult world is filled challenges that the youth have to face and negotiate to throughout adolescence and into their early 20s; in order to do so they have to develop sufficient maturity [21]. The social and emotionaloutlook of maturity remain poorly understood due to insufficient development[15]. Various factors maylead towards theadverse outcomes for youth as they move into young adult world [15].These include not being able to fulfil the demands of adulthood, such as attaining employment etc.

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Psychosocial Maturity

Biological model of maturity refers to development and growth of those structures which are necessary for the survival and growth of a species and their maintenance. However, the sociological model solely focuses on the survival of individual along with the society. Stable and effective social relationships along with the sharing of values between individuals ensures the survival of the society.

Psychosocial maturity of an individual comprises of both psychological and perception of the individual, i.e. it involves the basic necessities of a society and healthy growth of an individual. The model consists of three general areas of maturity which are applicable to all sorts of society. These include:

1. The ability of an individual to function on its own.
2. The ability to interact properly with other individuals of society.
3. The ability to contribute to social unity and strength.

Table referred from Greenberg and Sorensen[6], comprises of the constituents of the interdisciplinary concept of maturity.

Table 1:- An interdisciplinary concept of maturity.

EFFECTIVE INDIVIDUAL FUNCTIONS
Information
Work related skills and motives
EFFECTIVE SOCIAL RELATIONSHIPS
Predictability
Consistent self-attitude
Shared values
Trust
SYSTEM MAINTENANCE
Reproduction
Investment in socialization of the young
Acceptance of basic value system

In the following pages we shall explain how the content shown Table 1 summarizes the concept of maturity in the society.

Psychosocial Maturity in our Society

Effective individual functioning: It signifies the functioning of an individual with minimal necessary behaviours in isolation from others. The growth and maintenance of environment is achieved by knowledge as in information. Work related skills are also required by an individual for survival of itself as well as the society.

Another major factor of Psychosocial Maturity is formation and maintenance of effective social relationships[6]. It is assumed that social relationships depend upon mutual predictability. But in a large and complex society, where unknown people interact with each other, the consistency in interaction is less expected. Predictability depends on the fact that people must anticipate the values, thoughts and behaviour of those with whom they must interact.

Individual with goals and aims are less likely to show variance in behaviour as they don't change much by external factors. Predictability however cannot be the controlling factor of a long-term relationship as behavioural changes occur time to time due to internal and external factors.

Other than predictability, mutual trust also plays a crucial role in running a relationship. Trust is the belief that even though the behaviour is unpredictable but the acts of the other person won't be such that it affects the individual adversely.

The last dimension in our model of maturity is system maintenance. This involves the continuation of species and society[6]. Out of the three aspects, we are going to focus on the 'basic value system'. Our morals state that the

humanitarian rules that run our society can be changed over time and can be different for different societies. Openness to change seems to be highly necessary for the proper functioning and maintenance of society. “A developmental approach is logically essential to the study of a developmental process, “maturing”.”[6]

“Development of fingerprints of a person is directly associated with the development of the brain, and intelligence is too closely associated with the development of the brain”[18]. Therefore, by this statement by Archana Singh et al in their study, ' Dermatoglyphics: A Brief Review’ we can say that the development of dermatoglyphic patterns is correlated to development of psychosocial maturity.

Dermatoglyphics

Epidermal ridges and patterns are present on the skin of the fingers, palms, toes and soles. The study and analysis of these patterns and ridges is termed as dermatoglyphics[16]. Cummins along with Mildo first gave the term, ‘Dermatoglyphics ' in the year 1926. In the field of advanced Sciences and technology, it is considered as one of the important and interesting branches of study. Each person possesses unique patterns of ridges and their pattern in fingers, palms and soles. These patterns do not change throughout life and are not affected by environmental factors. Due to these qualities, dermatoglyphics play a crucial role in personal identification, racial variation, twin diagnosis, crime detection and have helped in studies of various syndromes and diseases. Since the formation of these patterns is not only determined genetically but also environmental factors play a role in it, it is not affected by kind of external influences. Dermatoglyphics also serve as a means of identification since it is unique to each individual. Palmar Dermatoglyphics refer to the ridge configuration found on the palms and similar the ridge configurations present in the fingers is termed as Finger Dermatoglyphics.

Fundamental principles of fingerprints

It mainly includes the study of patterns on fingers, palms, soles and toes, however traditionally, it has been the most important part of dermatoglyphics analysis. During the late 19th century, the primary features of classification system were formed. These were later integrated by Cummins and Midol into unified systems, by using different works done in this field by other pioneers. The following are the basic principles:

1)All individuals have highly variable epidermal ridge patterns which signifies that these patterns even in small regions of palm, finger etc. are repeated neither in any regions not in any individuals.

2)The configurations present in individual ridges do not change throughout life and are permanent.

3)There are several configuration types present among individuals which are within the limits and follow for systematic characters.

4)The impression of frictional ridges present between actual phalanges of finger and thumb are termed as fingerprints. The impression of fingerprints obtained are reversal of the actual fingerprints of the individual.

Even though all fingerprints are unique they share some common characteristics[4] among themselves. This helps in their classification. These characters include – pattern area, type line, delta and core.

Pattern Area

It is the area enclosed by type lines. It is the area that appear in core, deltas and ridges and are a part of loop and Whorls. Even though it is present in all patterns, it is indefinable in arches.

Type Lines

These are peripheral ridges that enclose the pattern area of loops and Whorls. These need not be continuous always they are often broken. Type lines are absent in arches.

Delta/Triradius

Delta signifies the fourth letter of Greek alphabet and corresponds to the letter D in English alphabet. This letter is triangular in shape. The delta in geography and delta in fingerprint pattern shares great resemblance. When two adjacent ridges bifurcate creating an interspace, delta is formed. It is a triangular plot. Ridge counting starts from the delta in loop patterns. Delta is not found in arches.

Core

Core is referred to as the central point of the pattern. Different patterns have different cores. Arches do not have cores. It is considered to be the landmark of ridge counting by connecting triradius in a straight line.

Classification of fingerprints

Different methods have been proposed by various researchers for the scheme of pattern type. In 1892, for the first time, the three main pattern types were classified by Henry Francis. They include – whorl, loop and arch.

The three main types are further divided into subtypes:

a) Arch
   i. Plain arch
   ii. Tented arch

b) Loop
   i. Radial loop
   ii. Ulnar loop

c) Whorl
   i. Plain whorl
   ii. Central pocket loop
   iii. Concentric Whorls
   iv. Double loop
   v. Accidental whorl

ATD Angle

At the base of II, III, IV and V digits in the palm, tri-radius a, b, c and d are present respectively. On the axis of the digit IV tri-radii t or the axial tri-radii is found. According to Cummins and Midol the axial tri-radii is commonly present near the junction of palm and wrist. The angular triradius (ATD) angle is formed by drawing line from triradius a and d towards tri-radius t.

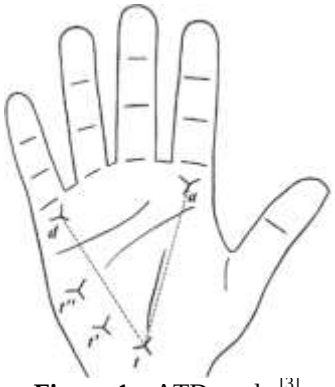

Figure 1:- ATD angle [3]

Objectives:-

1. To measure psychosocial maturity in age group 18-25.
2. To Study psychosocial maturity in both genders.
3. To analyse the psychosocial maturity using different parameters.
4. To study the relationship between psychosocial maturity and dermatoglyphics.

Review of Literature:-

Once a person reaches the adolescence, a certain level of psychological and social maturity is expected from them by the society. The term, 'psychosocial maturity' refers to overall expression of an individual's maturity development, which can be observed in his words and actions. Over the past years there have been multiple studies done related to PM; these include its comparative study with cognitive capacity[11], cynicism[1], offensive behaviour[15] and crime[20] etc. There have also been studies related to status of PM level in orphans[12] and some studies say authoritative parenting facilitates adolescents' academic success[18]. The reduced development of psychosocial maturity in adolescents is due to lack of social skills during childhood[14] and family atmosphere[17]. This article deals with the comparative study between dermatoglyphics and PM levels in university students.

Greenberger Psychosocial Maturity Model[6] [18] [7] [13] [2] served as a basis for the evaluation of the studies done in this report. The major sources of information acquired include the factors and understanding of the psychosocial

maturity. Some of the gaps in the research includes the ignorance of genetic and environmental factors that contribute to the development of PM.

Therefore, the following study focuses on the study of genetic factors and determining its correlation with psychosocial maturity.

Methodology:-

Location

The studies conducted for the presented work was done in Bangalore, Karnataka. The samples were collected from Padmashree Institute of Management and Sciences, Kommaghatta, Kengeri, Bangalore. The pin code for the mentioned location is 560060. It is situated in a small town named Kommaghatta. The target population were university students. Students were selected for the collection of samples, who belong to different parts of country. The students were native to different states including- Karnataka, West Bengal, Maharashtra, Rajasthan etc.

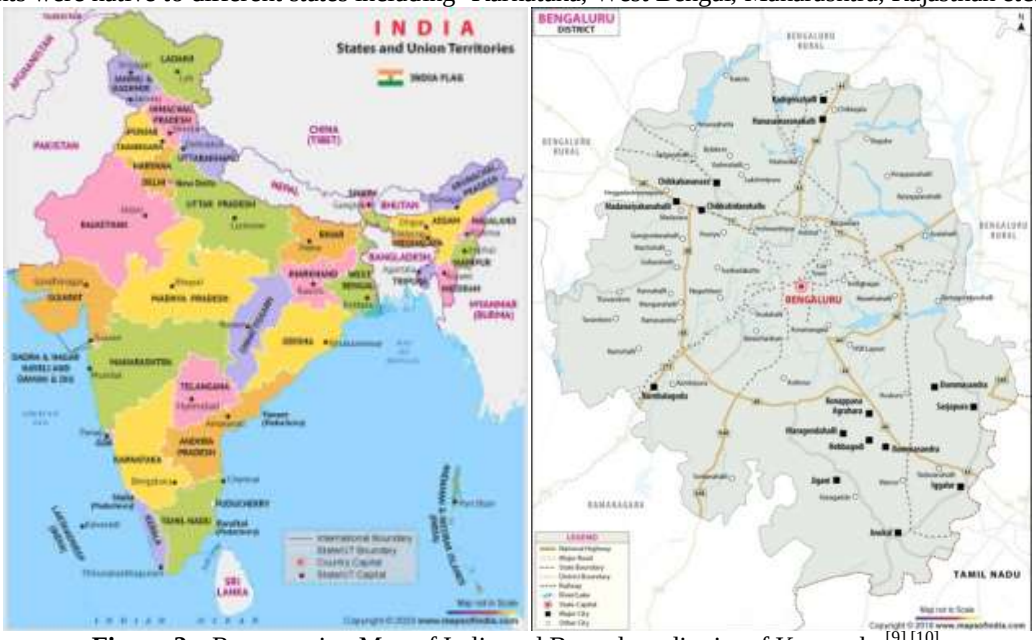

Figure 2:- Representing Map of India and Bangalore district of Karnataka[9] [10]

In order to determine the correlation between psychosocial maturity and dermatoglyphics, data collection of psychosocial maturity was completed. Data collection included self – report questionnaires. Online questionnaires were sent to the participants. University students between the age group 18-25 participated in the research program from various courses. 61% of the participants were female and 39% were male.

PM Self-assessment checklist:

The questionnaire for psychosocial maturity was based on the 4-factors – self-esteem, openness to change, independence and social tolerance [6]. The questionnaire comprised of 20 questions, out of which every 5 question corresponds to a specific domain of PM. Online questionnaire was sent which collected the necessary personal data (Name, age, etc...) and the self-assessment questions. The participants were asked to select an option for each question in accordance with the five-point grade system except for domain 4 which comprised of a 3-point grade system. The collected data was studied and analyzed.

The four domains studied are:
Domain 1 – Self Esteem
Domain 2 – Openness to change
Domain 3 – Independence
Domain 4 – Social Tolerance

Dermatoglyphic sample

Fingerprint samples were collected by Ink and Pad Method:

1. The hands of the participants were cleaned and dried with tissue paper.
2. The ink was smeared over the fingers and palms using ink pad.
3. The terminal knuckles of the finger were held and palm was pressed against the sheet of paper.
4. The back of the fingers was held and the ink smeared tips were pressed against the sheet of paper.
5. The hands of the participants were cleaned afterwards using sanitizer and tissue paper.

Figure 3:- Illustration of Hand Print taken of an individual by inscribing their fingerprint patterns.

Questionnaire Analysis:

Each domain of the psychosocial maturity was evaluated using a rating system to obtain a total for that domain. The scores of all domains are added to obtain the total score of Psychosocial Maturity. The minimum for each domain is 5 and the maximum score for domain – 1, 2 &3 is 25 and the maximum score for domain 4 is 15. Thus, the minimum total score is 20 and maximum total score is 90.

After obtaining scores for individual participants, they were categorized into five categories based on their total PM scores as follows:

Category A (81-90): It includes the participants who scored between 81 and 90.
Category B (71-80): It includes the participants who scored between 71 and 80.
Category C (61-70): It includes the participants who scored between 61 and 70.
Category D (51-60): It includes the participants who scored between 51 and 60.
Category E (41-50): It includes the participants who scored between 41 and 50.

The fingerprint samples collected were then analyzed and categorized into ulnar loops, radial loops, plain arches, tented arches, plain whorls, concentric whorls, central pocket whorls, accidental whorls and double loop whorls.

After categorizing the fingerprints, they were compared to find any recurring patterns of fingerprints in a particular category and domain.

Observation:-

Table 2:- Statistical Analysis: Percentage of individuals occurring in each category.

Category	Range of score	Percentage of individuals
A	81-90	3
B	71-80	20
C	61-70	57
D	51-60	19
E	41-50	1

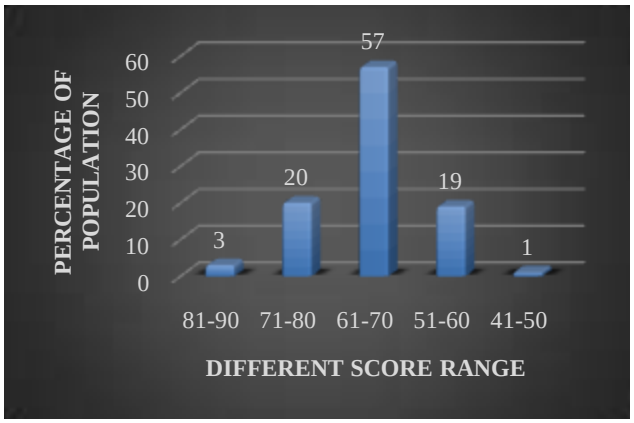

Figure4:- Percentage of individuals in different categories based on PM scores.

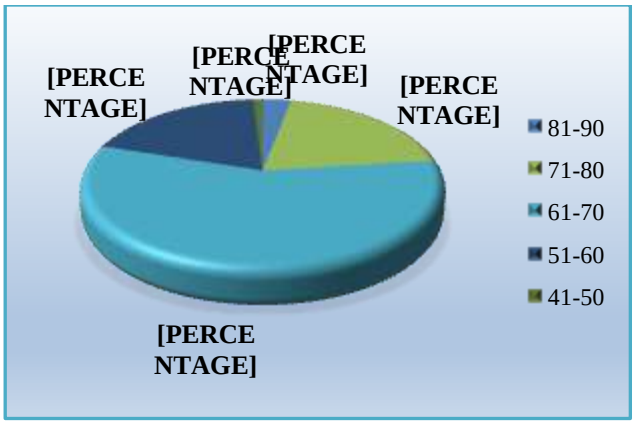

Figure5:- Percentage of individuals in different categories based on PM scores.

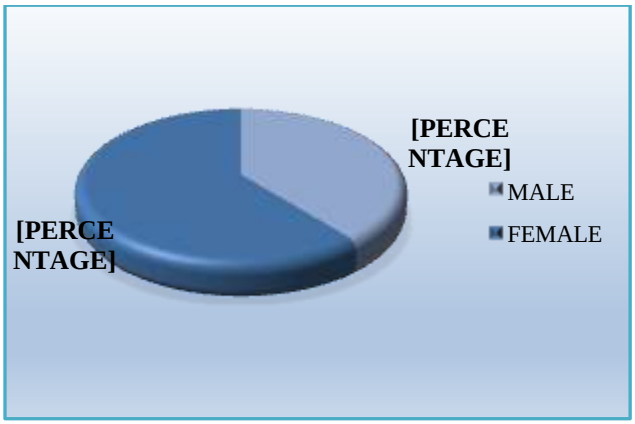

Figure6:- Percentage of Male and Female participants in different categories.

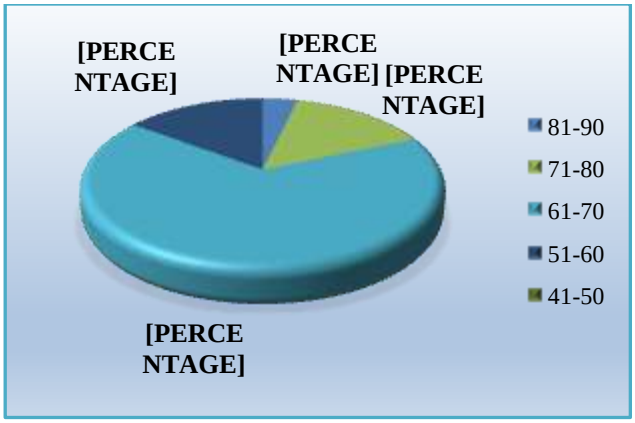

Figure7:- Percentage of male participants in different categories based on PM scores.

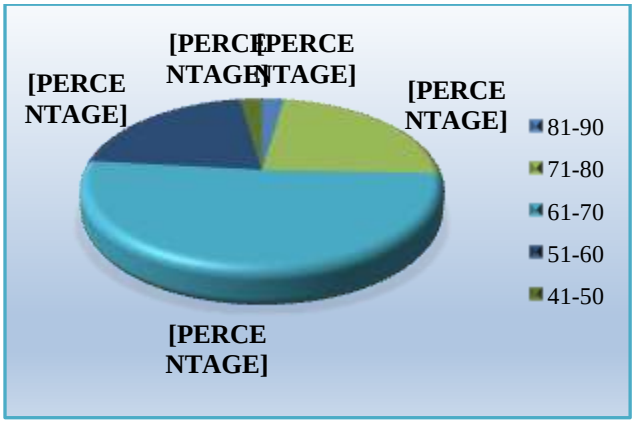

Figure8:- Percentage of female participants in different categories based on PM scores.

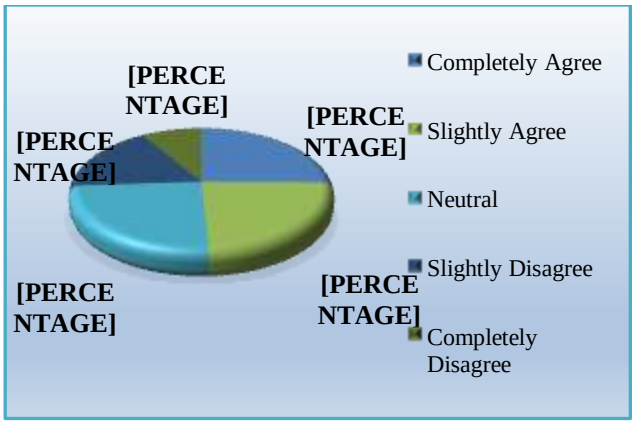

Figure9:- Percentage of answers opted for the questions for domain – Self Esteem.

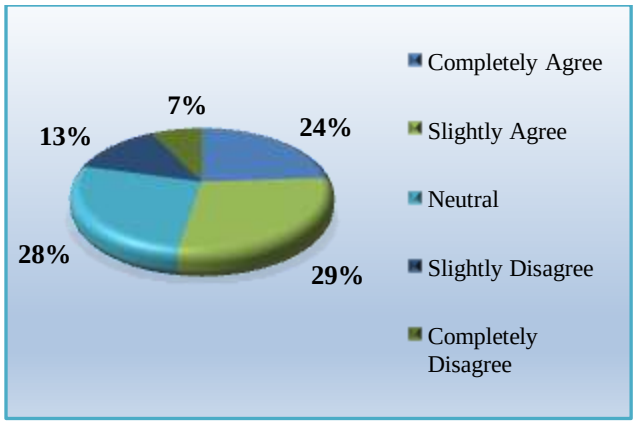

Figure10:- Percentage of answers opted for the questions for domain – Openness to Change.

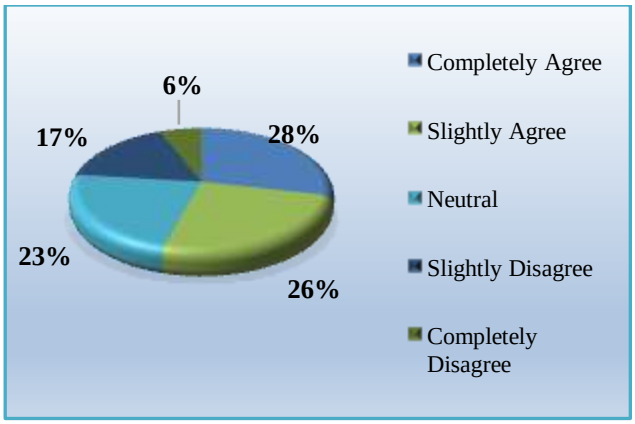

Figure11:- Percentage of answers opted for the questions for domain – Independence.

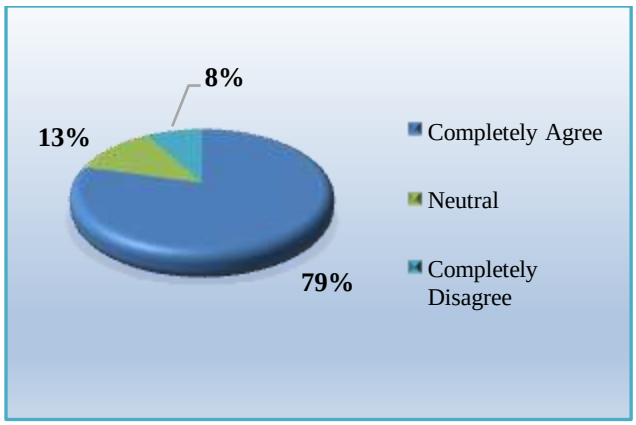

Figure12:- Percentage of answers opted for the questions for domain – Social Tolerance.

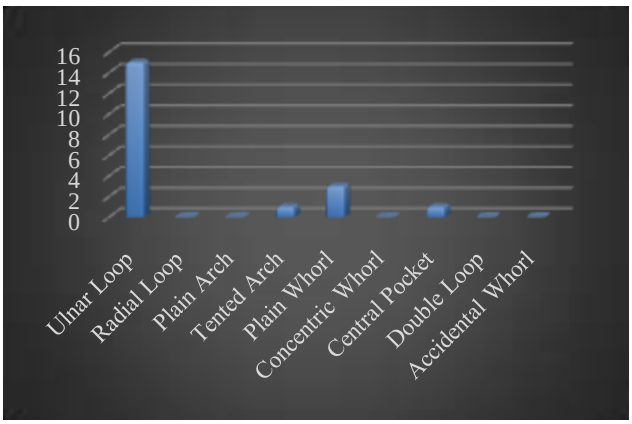

Figure13:- Incidence of fingerprint patterns in participants of category A.

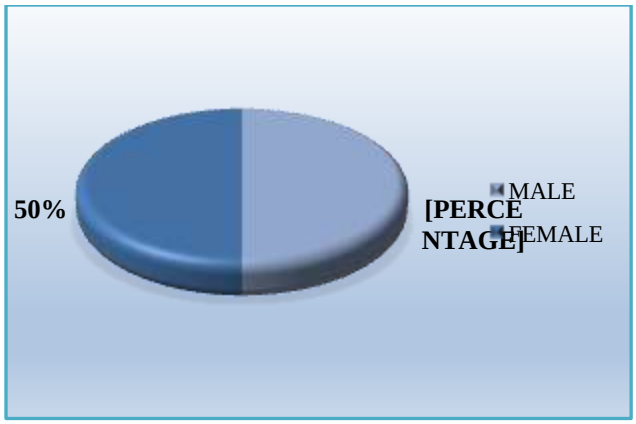

Figure14:- Percentage of Male and Female participants in category A.

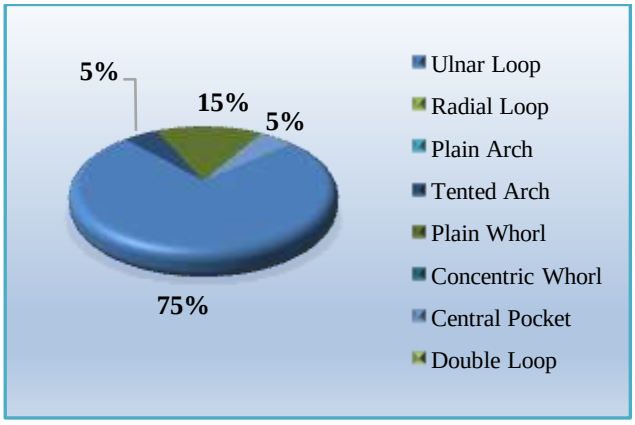

Figure15:- Percentage of incidence of fingerprint patterns in participants of category A.

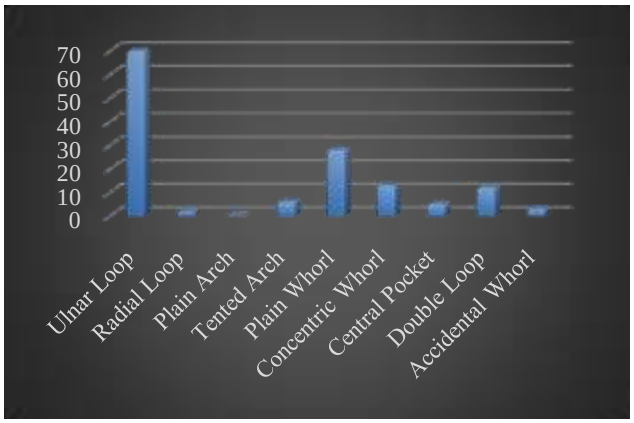

Figure 16:-Incidence of fingerprint patterns in participants of category B.

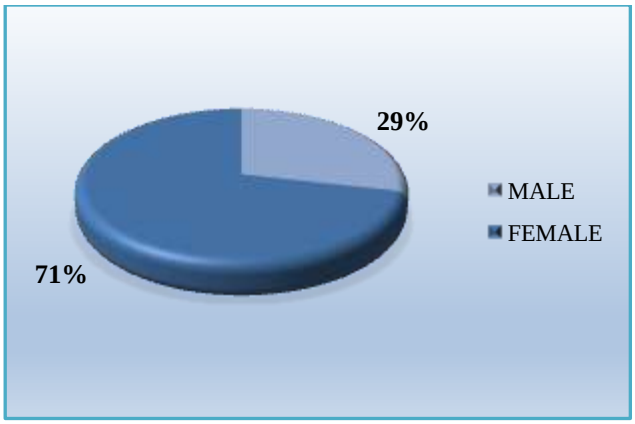

Figure 17:-Percentage of Male and Female participants in category B.

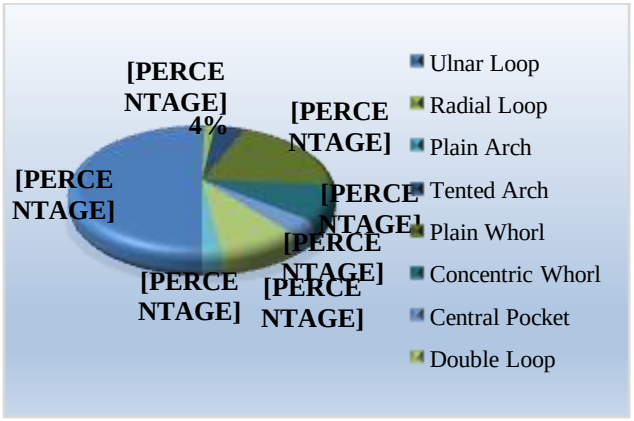

Figure 18:-Percentage of incidence of fingerprint patterns in participants of category B.

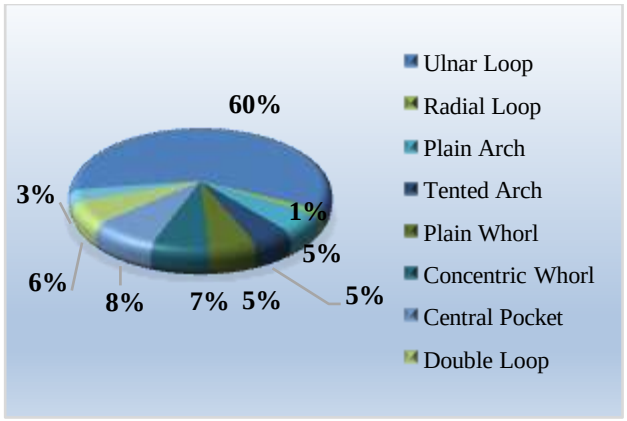

Figure 19:-Percentage of incidence of fingerprint patterns in participants of category C.

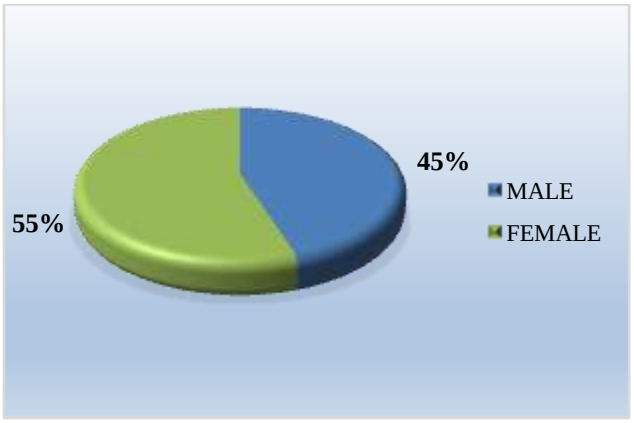

Figure20:-Percentage of Male and Female participants in category C.

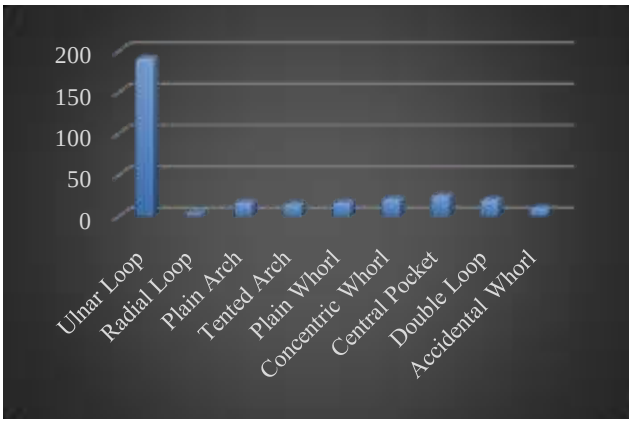

Figure21:-Incidence of fingerprint patterns in participants of category C.

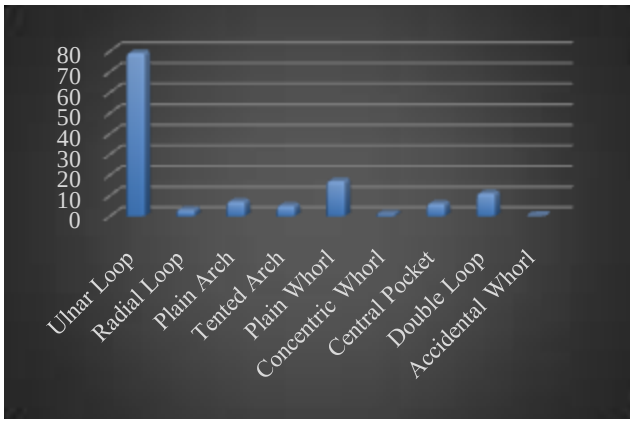

Figure22:-Incidence of fingerprint patterns in participants of category D.

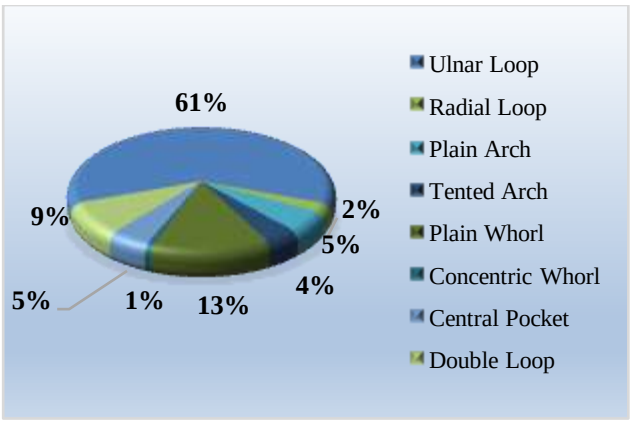

Figure 23:-Percentage of incidence of fingerprint patterns in participants of category D.

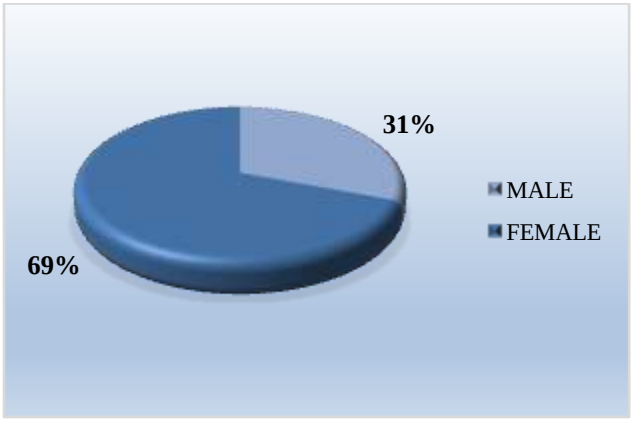

Figure 24:- Percentage of Male and Female participants in category D.

Results:-

The PM scores of all subjects in the age group 18-25 years, were calculated, analyzed and categorized as mentioned above. The fingerprint patterns obtained were categorized into – Ulnar loops, Radial loops, Plain arches, Tented arches, Plain whorls, Concentric whorls, Central pocket whorls, Double loops and Accidental whorls.

The scores of the PM self-assessment test were categorized and tabulated (Table 2, Figure4).

Based on the PM scores, percentage of individuals in each category was depicted (Figure5). It was found out that maximum percentage of population belonged to category C. And the minimum percentage of population was observed in category and A and E which was almost equal. Category B and D also showed similar percentage of population.

The ratio of male and female participants was calculated (Figure6). The no. of female participants was observed higher in comparison to the no. of male participants. The percentage of female subjects was 61% and that of male was 39%.

Figure7&8 show the percentage of male of female participants in different category based on their psychosocial maturity. It was observed that both male and female individuals in category A and E were less compared to other categories. Maximum no.of individuals was present in category C.

The answers opted for assessment of specific domains were studied to analyze the development each domain in an individual (Figure9,10, 11 and 12). 'Self-esteem', 'Openness to change', 'Independence' and 'Social tolerance' were individually studied in Figure9, 10,11 and 12 respectively. In Figure9 equal percentage of participants scored "5",

"4" and "3" in the 5-pointer grade system for domain 'Self-esteem'. Very few percent of population scored 1 for the same. Similar results were observed after analysis of domain - 'Openness to change' and 'Independence'. For the analysis of 'Social tolerance', a 3-pointer grade system was chosen out of which 79% of population scored 3.

The percentage of incidence of different fingerprint patterns in category A is depicted in Figure 13& 15. The percentage of ulnar loops was found to be maximum, i.e. 75%, followed by plain whorl, i.e. 15%. Central pocket whorl and tented arch - both account for 5% each. Other fingerprint patterns were not found in category A.

Figure 14 shows the gender ratio in category A which was found to be equal.

Figure 16& 18 depicts the incidence of different fingerprint patterns in category B. The maximum fingerprints were found to be ulnar loop and no plain arch was found. The gender ratio of category was showed in the Figure17 which was found to be 71% females and 29% males.

Figure 19&21 depicts the incidence of different fingerprint patterns in category C. The maximum fingerprints were foundto be Ulnar loop. The gender ratio of category was showed in the Figure 20 which was found to be 55% females and 45% males.

Figure22& 23 depicts the incidence of different fingerprint patterns in category D. The maximum fingerprints were found to be ulnar loop and no accidental whorl was found. The gender ratio of category was showed in the Figure17 which was found to be 69% females and 31% males.

Fingerprint patterns in different categories:
In category A individuals' fingerprints, the no. of ulnar loops was maximum followed by plain whorls. Central pocket whorl and tented arch was also observed in less number;however, no other fingerprint patterns were observed.

In category B individuals' fingerprints, the no. of ulnar loops was maximum followed by plain whorls. It was followed composite whorl patterns;however, no plain arches were observed in individuals in category B.

In category C individuals' fingerprints, the no. of ulnar loops was maximum and all other patterns were observed in less number except for radial loop which was only 1%.

In category D individuals' fingerprints, the no. of ulnar loops was maximum followed by whorls (plain whorl & double loop). However, no accidental whorls were observed in individuals in category D.

Discussion:-

The percentage of individuals in different is depicted by a bar graph in Figure4 which shows a bell curve. This bell curve represents the normal distribution of population in the analysis as per Hardy-Wienberg law. Therefore the no. of individuals with average scores is very high compared to that of other categories. Thus, the scores obtained for most of the individuals were between '61-70' (Category C).

Despite the difference in the ratio of male and female participants the ratio of individuals in different categories of score range was almost the same for all categories between male and female individuals as seen in Figure7&8.

In Figures. 9-11, the percentage of individuals who opted for 'Completely Agree' shows the percentage of individuals in a population who have these domains developed. the percentage of individuals who opted for 'Completely Disagree' shows the percentage of individuals in a population who have these domains under developed. The individuals with developed PM domains are more in number compared to individuals with underdeveloped domains. When the scores of each domain are compared, it was found that 79% of population have social tolerance whereas for other domains approximately 50% of population only has those domains developed.

Upon analysis of fingerprint patterns of population, it was found that all categories show maximum no.of ulnar loops followed by plain whorls. The arches were found in least numbers. Plain arch was only found in lower category individuals. In higher category individuals plain arch is not found.

The above data shows that there is very less correlation between the psychosocial maturity and dermatoglyphic patterns.

Conclusion:-

This paper started with the discussion of psychosocial maturity in youth and adolescents of the society. The objective of the paper was to find any correlation between the dermatoglyphic patterns and psychosocial maturity in humans. Many studies were conducted to choose appropriate factors for determining PM scores. There are multiple factors affecting the PM out of which only few were chosen to analyze the PM level of an individual. Various methodologies were followed to collect the dermatoglyphic patterns and analyze the psychosocial maturity of individuals. Post analysis of the data collected it was found that there was no particular correlation found between the two. Individuals of each category had almost similar fingerprints and ATD angle. This led the conclusion that psychosocial maturity is not necessarily inherited through genes from parents but rather acquired by an individual through experiences in life. And even if it is acquired from parents, the genetic factor does not influence it as much as it is influenced by the environmental factors. Since genetics of a person does not affect the PM of a person much, it can be enhanced by taking part in various social activities, socializing more and trying and experiencing new things in life.

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