

# A Study on The Presence of Medulla Types of Hair Among the Young Jaat Residents of Western Uttar Pradesh



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## Abstract

In forensic science, Evidences are generally examined and comprised by the forensic investigators or experts, often to deliver significant and associative information related to the crime. The amount of deliberation given to the evidences relay on whether evidences has potential or not? Hair is the types of evidence which is recovered from the scene of occurrence and have been utilized for investigations for over a century. The systematic examination procedure of hair can not only help in determining the identity of an individual involve in a crime but can also reveal the information related to species, gender, age, part of body and polymorphic genetic markers. This study was carried out to determine the presence of medulla among the young jaat residents of western Uttar Pradesh among the age group of 20-50 years. As a resultant of the analysis of 100 samples including males and females, it was concluded that medulla was absent in 61.80% of youngsters while it was fragmented in 19.50% and absent in 17.30% of samples. This study can be used for the purpose of investigation, or to determine the origin of suspect/to determine the age of an individual involve in a crime.

**Keywords:** Hair; Medulla; Types; Young; Residents; Investigation Etc

## Introduction

Evidence can be demarcated as something legally deposited to the court of law as a means of decisive factual [1,2]. Physical evidences deal with the evidences/ any substances which may be the important clue collected from the scene of occurrence and a link between the suspect and victim [3-5]. These evidences include not only fingerprints, footprints but also hairs, fibers, blood arson accelerants or anything that can be deposited for a mean of identification [6,7]. Evidences, which bears the individual features can be definitely a source to nab the culprit if sufficient examination and analysis can be done [8-10]. Hairs are readily accessible for transfer, easily transferred and resilient. The examination of hairs may be used for associative and investigative resolutions and to provide facts for the crime scene reconstructions [11-14]. Hair is often found in many crime cases such as rape, murder, etc [15]. Systematic examination of hair can not only help in determining the species origin, sex, site (part of the body), race (population), and the polymorphic genetic markers including the Keratin Protein Types and the DNA profiles which can be of immense help in the conclusive elimination of the innocents [16-22].

Medullary index has been in use for determining the species origin of hair; the index is 0.3 or less in human hairs; in animals it is more than 0.3 [23,24]. The medulla in human

hairs is generally amorphous in appearance whereas in animals it is regular and well defined [25,26]. In cases where medulla is absent medullary index cannot be calculated and hence recourse must be taken to other criteria such as scale type for species identification [27]. In recent years studies on the medulla have shown that the medulla types vary from one population to another and that its development seems to be age dependent [28]. In actual identification of a specific individual as has been shown by a number of researchers/ scientists/workers i.e. Aitken, and Robertson (1986), Banerjee and Das Chaudhuri (1969), Barnett and Ogle (1982), Beeman (1942), Berg (1977), Bhatia and his colleagues (1976), Bhattacharya (1972,1975), Bisbing (1982), Bisbing and Richard (2002), Brown (1942), Brunner and Codman (1974), Chowdhuri, S. (1963) Chowdhuri and Bhattacharya (1964), Cottingham and co-workers (1977), Das Chaudhuri (1976), Davis (1962), De Forest, P.R. (1969).

Deadman (1985), Duggins and Trotter (1985), Gaensslen (1983), Garn (1951), Gaudette (1999), Gaudette and Keeping (1974), Gyoten (1957), Hamilton (1951), Hicks (1997), Kaur and Kumar (2000), Kaur and her colleagues (1993), , Kind, S. S. and Owen, G.G.(1976), Kolowski, J.C and his fellows (2004), Kumar and his colleagues (1989), Lee, H. and De Forest, P.R. (1984), Longie (1966), Mistry (2010), Porter and Fouweather

(1975), Higuchi (1988), Houck, M.M. and Bud Owle, B. (2002), Robertson and Aitken (1986), Robertson (1982), Sharma et al. (2002), Singh and Jindal (1992), Tandon and Chattopadhyay (1999), Wickenheiser, R. A. and Hepworth, D. G. (1990), Wittig (1982) etc [29-37]. Even this study was carried out to determine the types of medulla among the youngsters of Western Uttar Pradesh. All the subjects were selected from the age group of 20-50 years only by keeping one point in mind that this may be the specific age group in which youngsters get involve or commit mostly crime. Only by the hair (medulla) examination, will it be possible to determine the age of an individual or to determine the origin/ place of residence. It will be a milestone to establish the identity of an individual from the evidences (hairs) and the suspect can be put behind the bar.

### Methodology

For this present study, Hair samples were collected from the villages of Rajala, Kirthal, Barout, Sarupur of district Baghpat of the western population of Uttar Pradesh and Northern population of India. To carried out this research, 100 samples including; 50 males and 50 females have been collected from the age group of 20- 50 years. All the subjects were informed and well explained about the purpose of the study and consent was taken prior to the work of hair collection.

### Material

During this study, all the samples have been collected since January 2018 to February 2018 at when the temperature was in between 30 C to 210 C. Although each subject was asked to donate at least five hairs, but in a few cases (06 subjects), the number of hairs was only four. Every care was taken to include in the study unrelated subjects only. All subjects were requested to pluck 5 to 6 hairs from the head (scalp) and place them in a serially marked envelope. The details such as name, age, gender, and address about the subject were recorded in a register bearing the same number as the envelope containing the hair sample. The collected hair samples were then treated for examining the medulla types.

### Method

To extract the medulla information or medulla types from the hair samples, following procedure was adopted to examine -First of all, the hair sample(s) were kept in acetone for 1 to 2 minutes. Then, the hair samples were taken out from the acetone by the help of forceps and placed on a filter paper for a few minutes for drying. Now, 2-3 drops of distilled water to which 2-3 drops of ammonia and 3-4 drops of hydrogen peroxide were followed at a glass microscopic slide. The dried hair sample(s) were placed on the microscopic glass slide for about 30 minutes to remove the pigments. After this process, the hair samples were dried by use of a filter paper. Each hair strand was then mounted on a microscopic slide, covered with a cover slip and examined under the microscope. Each hair sample after analysis was photographed with a digital Camera from the base (root) to

the tip some of which are given in figures and the position of the hair at which the photograph was taken. All the samples were photographed by use of a Samsung 7Si model with 16-megapixel camera. For the preparation of table in this study, Microsoft excel sheet was used.

### Results and Discussion

**Table 1:** Medulla types among young jaats residents.

No. of Hair Analyzed	Absent	Fragmented	Discontinuous	Continuous
495	306	97	86	5
Percentage	61.80%	19.50%	17.30%	1.0%

**Table 2:** Frequency of medulla types in different age groups.

Age (Years)	Absent	Fragmented	Discontinuous	Continuous
20-25	82 (16.56%)	32 (6.46%)	18 (3.64%)	00 (0.0%)
26-30	94 (9.94%)	28 (5.65%)	26 (5.25%)	05(1.0%)
31-35	50 (10.10%)	06 (1.21%)	08 (1.61%)	00 (0.0%)
36-40	54 (10.9%)	15 (3.03%)	21 (4.24%)	00 (0.0%)
41-45	18 (3.63%)	12 (2.42%)	10 (2.02%)	00 (0.0%)
46-50	06 (1.21%)	04 (0.80%)	03(0.60%)	00 (0.0%)

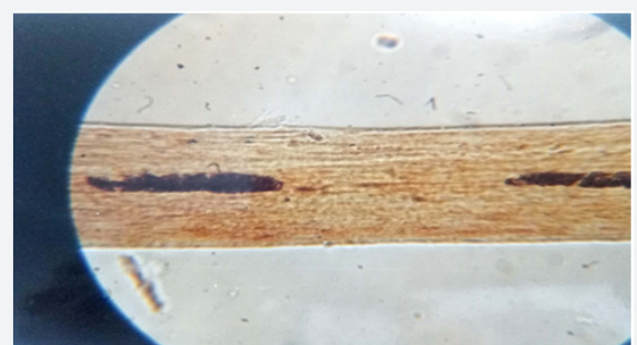
Four hundred and ninety-five hair samples of the young local jaat residents have been analyzed for the presence of their medulla types. During this analysis process, medulla was absent in higher number of samples-306 (61.80%) which is quite higher. While the fragmented samples were 97 (97.50%), discontinuous medulla was observed in 86 samples of 17.30% and in final; continuous samples were very less. It was found only in 5 samples which is approximately 1% of the total samples. The Absent type has been found to be the commonest while the Continuous type is the least. The order of preponderance of the medulla types is Absent > Fragmented > Discontinuous > Continuous as is evident from Table 1. The frequency of the medulla types is given in Table 2. It was very clear that the medulla types (presence in hair) are affected by age. The Absent type is more in the lower age groups while there is an increase of the fragmented and the discontinuous type with increase in age. Frequency of absent medulla types was quite high in age groups of 26-30 years. During the analysis of hair samples various types of medulla i.e. absent types of medulla, fragmented types of medulla, discontinuous types of medulla and continuous types of medulla were observed. The figures of all types of medulla are given below in Figures 1-4. All hairs showing a particular medulla type has been observed in twenty-nine individuals. Out of 29 samples, twenty-seven samples were showing the absent type while the other two showing discontinuous type. The detailed information is given below in Table 3.

**Table 3:** Individual showing the same medulla types.

Types	Total no. of individual studied	Percentage
Absent	27 samples	27%
Discontinuous	2 sample	2%



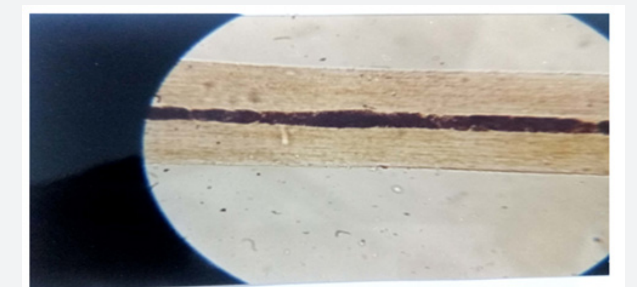
**Figure 1:** Absent types of medulla.



**Figure 2:** Fragmented types of medulla.



**Figure 3:** Discontinuous types of Medulla.



**Figure 4:** Continuous Types of medulla.

Each and every hair strand has been studied for their medulla types from the root to the tip and photographed. In all the hairs where medulla have been found to be present, it occurs as a single or multiple fragment at various location of the hair as demonstrated through photographs a, b, c, d and e taken from the root to the tip. From this it seems probable that

the hair medulla develops from one or more sites which may join together or remain separated to give rise to different types of medulla. Various physical properties of the hair are used for identification which play an important and vital role. Kirk (1940) used the refractive index and density to establish the identity of an individual from hair. By following the individual features, numerous biochemical and serological studies from hair concluded with immense values for identification purpose. Implementing the above statement, this study was carried out to distinguish among the young residents and to determine the higher percentage of the presence of medulla in a specific age group. Even it has been suggested by various researchers that the presence of medulla may differ from place to place and age to age, yet work can be used to minimize the number of suspects involve in any case. Event this study suggests that the age group of 20-35 years has higher chances that show the absence of medulla.

### Conclusion

Medulla types of hair have been determined from four hundred and ninety-five hairs collected from the Young local jaat residents of the population of Western Uttar Pradesh, India. The order of preponderance of the medulla types is Absent> Fragmented > Discontinuous > continuous. It seems probable that the medulla develops from one or more sites which may join together or remain separated to give rise to different types of medulla. Hair samples are closely overlap with related species and within the individual of same species. Therefore, it has not only become a necessity to determine the characteristics which should not only be ubiquitous but also homogenous. By the observation of this study, it is characterized that various morphological features i.e. nature of medulla, medullary index, scale pattern, scale count, nature of hair root and tip etc. can play a vital role in the forensic analysis/ comparison of hair recovered from the scene of occurrence.

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