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Epistemic review amongst the gender binary population in forensic odontology

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Abstract
The population of transgender people totally was estimated around 0.49 million (Census of India, 2011). Also the transgender population is a marginalized group of society and have created their own way of developing their community. In forensic anthropology, the estimation of skeletal sex results in a dichotomous outcome- Male or Female. This poses challenges when dealing with identification of transgender individuals. A very limited studies and literature available on transgenders in Forensic Odontology. This brings the need to conduct more research for identification and documentation of the above population.

Keywords: Transgenders, forensic odontology

1. Introduction
According to Human Rights Campaign, The word "transgender" term for people whose gender identity is different from the sex assigned to us at birth. Although the word "transgender" and our modern definition of it only came into use in the late 20th century as people who would fit under this definition have existed in every culture throughout recorded in the history. Their existence as the third gender has been a part of Hindu Vedic literature for eons. This population is heterogeneous. It also forms a unique gender group with diverse gender identities. The total population of transgender people was estimated at around 0.49 million (Census of India, 2011). Also the transgender population is a marginalized group of society and has created their own way of developing their community [1].
In forensic anthropology, the estimation of skeletal sex results in a dichotomous outcome as male or female. This poses challenges when dealing with identification of transgender individuals. A very limited studies and literature available on transgenders in Forensic Odontology.

2. Discussion
Teeth are the hardest and most robust tissues in the human body. They are resistant to decomposition in many exposures like major accidents, crime, burial, and to other severe exposure to the elements. Each individual has different dental patterns. They are unique to every individual. This uniqueness is also due to the variety of treatments given by the Dentist. Therefore dentition of a person is very useful for identification of an individual and also in comparison, if records exist for such purpose [2].
Forensic dental identification plays a very vital preliminary role in the identification of remains. This invalidates the use of visual or fingerprint method during in postmortem changes, traumatic tissue injury, or lack of fingerprint record [3]. The history of forensic odontology goes long back. In the courts, the dental evidence has been used for the past many years. The techniques used in forensic odontology has evolved through the evolution of humankind [4].
There are 3 major areas in Forensic odontology for utilization as follows:
1. Diagnostic and therapeutic examination
a) Valuation of injuries to jaws, teeth, and oral soft tissues.
2. The identification of individuals
a) Especially in casualties in criminal investigations
b) Mass disasters.

3. Identification, examination, and evaluation of bite marks
a) Sexual assaults.
b) Child abuse cases.
c) Personal defense situations [5].

The regular methods used for individual identification are using visual identification, personal information that includes height, build, age, presence or absence of hair. Next is medical information like scars, tattoos, birthmarks, implants, amputations, prosthesis, footprint records from a chiropodist or podiatrist, clothing, personal effects, fingerprints, DNA profiling and later comes the dental identification. Forensic dental identification in most of the times are dependent on the availability, accuracy and adequacy of antemortem dental records. However maintenance of such diligent confidential dental records is the duty of a dentist and is also a very essential component in serving as an information source for the dentists and the patients especially in medico legal, administrative and for forensic purposes [6].

Dental imaging can be used in the cases where previously maintained records are not available for comparison. In such times an alternative aid used for individual identification is the radiograph. These radiographic images of the deceased can be obtained and compared with the available antemortem radiographic images of the suspected individual [7]. Analysis of Bite marks on human tissues can be observed in incidences involving violence including sex related crimes or child abuse cases, and in offenses that involve physical altercations, such as homicide. This can be seen in instances when the attacker bites the victim or the victim bites the attacker as an act of defense. It should be also remembered that the bite victim could be the suspect in the cases. The anatomical location, the severity, the pressure applied and quality of the bite marks have significance in the identification of the individual. The information like demographic data including name, age, sex, date, location, size, shape, color, type of injury, and swabs should be collected from the victim [8].

In the field of Forensic Odontology a new tool is DNA analysis. It has gained at most importance when conventional identification methods fail due to the unavoidable effects of heat, traumatism or autolytic processes, distortions, and other difficulties in analysis. There are many biological materials such as blood, semen, bones, teeth, hair, and saliva. These can be used to accomplish DNA typing [9]. Cheiloscopy is another part of forensic investigation technique that deals with identification of humans based on the traces of their lip prints. While using teeth as an antemortem record we might sometimes observe loss of teeth and destruction of restorations. These may lead to difficulty in comparing the antemortem records and postmortem records. Rugoscopy, another similar methology in case of teeth loss, due to various reasons such as trauma, palatal rugae pattern serves as an alternative method for identification as it has its uniqueness. Rugae is internally placed in the oral cavity and is well protected by tongue and buccal pad of fat. , It remains undisturbed from heat and other physical and chemical assaults. Rugae patterns change with age and other environmental influences such as orthodontic movements, tooth extraction.or surgeries for cleft palate, periodontal surgery, and impaction of canines of maxillary arch [10].

Tongue is another unique identifier to each person in its shape and surface textures and is the only internal organ that can be protruded from the body and easily exposed during the time of inspection. Use of tongue prints for forensic identification is at a budding stage currently. For this technique to be successful, the antemortem photograph or impression of the tongue should be mandatorily available. The lingual morphological aspects can be preserved by using the alginate molding technique for duplicating the intricate details which are unique for each and every individual [11].

Dentistry for the third gender

Human teeth have substantial overlap in shape and position in relation to gender. In one study, the general public and even dental professionals had a worse than chance record for identifying the assigned sex of human teeth from photographs. Dentistry for transgender people In many places, cultural norms identify stereotypically as “masculine” and “feminine” teeth.

Amongst trans-men

a) Increased susceptibility to plaque, gingivitis, and periodontal disease
b) Xerostomia – caries, periodontal disease
c) Use of tobacco causing decreased sense of taste
d) Cosmetic- square or less rounded teeth via recontouring or veneers

Amongst Trans women

a) Estrogen may affect TMJ issues
b) Estrogen plus progesterone can lead to increased plaque sensitivity and gingivitis
c) Esthetic- more rounded teeth with less wear on incisal edges.
d) Reduce philtrum length to show more lip and teeth.12

Oral health has many barriers towards transgender population. Discrimination either real or perceived, which is not only limited to societal and familial settings. But it has also been known to occur in health care environments. Literature has proved that the transgender people have been denied the access to medical treatments and received substandard care. This results in many antemortal records. 13 Statistically significant difference with regard to some parameters like in rugae- the number of rugae, fragmentary rugae, wavy rugae, curve rugae, forwardly directed, and backwardly directed rugae between transgender and other gender groups were noted. Very less research are conducted on the transgender population resulting in limited literature. The difference in the parameters of pattern on the palatal rugae amongst the transgender population and the other gender groups is attributed to be the genetic makeup and sexual dimorphism was observed in a study conducted in Bhopal City India. 14 A comparative study on analyzing the size of mental foramen in Male, Female, and amongst transgender using cone beam computed tomography CBCT showed that Mental foramen is the anatomical landmark which is oval in shape and is present in the mandible and shows sexual dimorphism in the variation in size and also the position. Study also observed that significant difference in size of the MF in male, female, and transgender.15 Stress and stress related diseases have far reaching consequences in both personal and in the professional life. Analysis on the Saliva has become very interesting in comparison to other detection methods as its a non-invasive sampling methology. This study which aimed at assessing the Correlation between stress, discrimination and salivary stress biomarkers level among Transgender and Gender Non-Conforming population in chennai, India showedstatistical significant difference with $p>0.05$.16

Statistics documenting transgender people's experience of sexual violence pointed out on shockingly high levels of sexual abuse and assault. One in two transgender individuals are sexually abused or assaulted at some point in their lives. Few reports also estimated that the transgender survivors may experience rates of sexual assault up to 66% often coupled with physical assaults or abuse. This indicated that the majority of transgender individuals are living with the aftermath of trauma and the fear of possible repeat victimization.

In forensic Anthropology, the estimation of skeletal sex results in a dichotomous outcome of male or female population. This expressed challenges when dealing with transgender individuals' identification.

Forensic anthropologists have only recently begun to grapple with the binary nature of sex assessment, advocating for a more inclusive methodology for sex estimation. This must involve the variability found in transgender individuals. This estimation can be challenging, as solely the skeletal features can be evaluated and no specific reliable tool is available to assume a gender identity.17 A Study on homicides mentioned that information for injury and prevention of violence, researchers have to improve reporting of transgender status in the medical records and in the local trauma registries [18].

3. Conclusion

World has witnessed many disasters including man made and natural. Identification of the human remains is a main, important and a very challenging job for the Forensic Odontologist. Third gender also needs their identity to spend their life respectfully and even after death. Although a study on a limited sample indicated that measurements of pelvic may reveal a shift towards amongst the male metric configuration in transgender individuals. While there is variable evidence regarding the interplay between hormone therapies and also the bone tissue, how gender transition will affect the skeleton is still poorly understood. More research is needed on the above subject to better understand the effects of hormone replacement therapy and gender confirmation surgeries on the skeleton. Investigating specific changes in the density of the bone, structure and growth resulting from these treatments could potentially reveal identifiable markers for transgender individuals. To overcome such difficulties with dental records, research on Odontology among these individuals could make a very big impact on documentation and identification of transgender individuals. More studies are required to be carried out for documentation of transgender population for antemortem records.

Conflict of Interest
Not available

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