5th INTERNATIONAL FORENSIC SCIENCE CONFERENCE

11th–13th December 2024

Forensic Science without Borders

Bulwagang Kanlahi, Diwa Ng Tarlac, Tarlac, Philippines

AGHAM FORENSIKA
FORENSIC SCIENCE WITHOUT BORDERS

About SIFS

The Sherlock Institute of Forensic Science (SIFS) India was set up in 2006 with the mission to make forensic education available to all and with a vision to make India a crime-free place to live by creating a skilled workforce of forensic experts to assist law enforcement agencies and the judiciary in bringing justice to the table within time. SIFS India offers comprehensive industry-specific and job-ready online and offline courses, trainings, internships, workshops, and research-based projects in the diverse forensic science domains, like cyber law, cyber and digital forensics, fingerprint verification, questioned document examination, and handwriting analysis, to name a few.

It has been a frontrunner in the field of forensic science. It has been conducting various events to maximize the reach of Knowledge of forensic science across the globe. It organizes various Conferences, Seminars and Workshops with the goal of sharing recent advancements and research happening around the globe with students and professionals to boost their knowledge and morale. Forensic science has been growing significantly over the past few decades; the essential demand for progress has been met with bright young minds putting their extensive efforts into advancements in the field.

SIFS India, along with other prominent organizations, have been substantial support pillars in establishing the mark of forensics in India and worldwide. The motive of constant learning and sharing recent studies and advancements has been met constantly with their continuous efforts.

TARLAC STATE UNIVERSITY PHILIPPINES

Tarlac State University is a publicly-funded institution located in Tarlac City, Philippines. Established in 1906, it is the flagship academic institution of higher education in the province and offers a wide range of degree programs through its ten colleges and three campuses. The Tarlac State University aims to set a benchmark for culture and excellence in higher education. Furthermore, the university welcomes international students and has witnessed the graduation of numerous students from countries such as the USA, China, Hong Kong, Korea, and India.

UNIVERSITY OF THE PHILIPPINES MANILA

The University of the Philippines Manila (UP Manila) is one of the eight constituent universities within the University of the Philippines (UP) System. UP Manila is a public, secular institution of higher learning that offers academic and training programs, as well as extension services, primarily focused on the health sciences, health professions education, arts, and sciences. Its mission is to provide transformative health science-focused education, inspiring students to take creative and constructive actions in service to humanity.

UNIVERSITY OF BAGUIO PHILIPPINES

The University of Baguio, formerly known as Baguio Technical and Commercial Institute (Baguio Tech), is an autonomous private university located in Baguio, Philippines. Founded on August 8, 1948, by Fernando Gonzaga Bautista and Rosa Castillo Bautista, it initially had 80 students. As of 2018, the university had approximately 18,000 students at the tertiary level. The institution offers a diverse range of academic programs, including 21 undergraduate programs, 12 graduate programs, and 10 short-term programs across 11 colleges.

HOLY ANGEL UNIVERSITY PHILIPPINES

Holy Angel University is a private Catholic research university in Angeles City, Philippines. Founded in June 1933 by Don Juan Nepomuceno and Fr. Pedro Paulo Santos, who was later named as the Archbishop of Cáceres, is considered the first lay-founded Catholic school as well as the first co-educational Catholic high school.[2] With a student population of over 21,000, it is the largest private institute of education with the largest student population in a single campus in Central Luzon.

Objectives

Showcase Cutting-Edge Research: Provide a platform for forensic scientists and researchers to present their latest findings and technological advancements in forensic analysis.

Foster Collaboration: Bring together professionals from various forensic disciplines, law enforcement, legal, and academic sectors to share knowledge and discuss best practices.

Explore Ethical Implications: Examine the ethical challenges that arise with the application of new forensic technologies, particularly in areas like DNA databasing, digital forensics, and artificial intelligence.

Enhance Investigative Techniques: Discuss innovative methods to improve crime scene investigation, evidence preservation, and forensic analysis to ensure justice is served accurately and fairly.

Promote Training and Education: Encourage the development of specialized training programs for forensic professionals, ensuring they stay up-to-date with the latest tools, techniques, and legal standards.

This conference will provide an invaluable opportunity for the forensic science community to unite, share knowledge, and continue advancing the field, ensuring that innovations in science continue to strengthen justice.

Who can join

This Conference is typically open to a wide range of individuals who have an interest in the field of forensic science and related areas. It aims to provide a platform for professionals, researchers, educators, students, and anyone interested in forensic science to come together, share knowledge, discuss the latest research and developments, and network with others in the field.

- **Forensic Scientists**
- **Law Enforcement Personnel**
- **Researchers and Academics**
- **Legal Professionals**
- **Forensic Analysts and Technicians**
- **Forensic Medicine Practitioners**
- **Crime Scene Investigators**
- **Forensic Psychologists and Behavioral Analysts**

Conference Themes

Crime Scene Investigation and Reconstruction

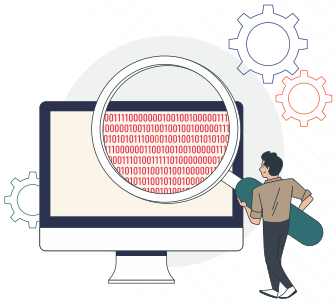
- Crime scene processing and evidence collection
- Bloodstain pattern analysis
- Ballistics and Firearms Examination
- Forensic Anthropology and Human Identification

Forensic Chemistry and Toxicology

- Analytical techniques in forensic chemistry
- Drug analysis and toxicology
- Forensic toxicology in post-mortem investigation
- Emerging trends in forensic drug analysis

Forensic Biology and DNA Analysis

- DNA profiling and forensic genetics
- Advances in DNA sequencing technology
- Forensic entomology and botany
- Wildlife forensics and conservation genetics



Digital Forensics and Cybercrime

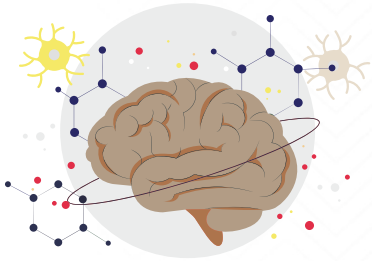
- Computer and mobile device forensics
- Cybercrime investigation and cybersecurity
- Digital evidence acquisition and analysis
- Network forensics and incident response

Forensic Pathology and Death Investigation

- Autopsy techniques and post-mortem examination
- Forensic odontology and bite mark analysis
- Trauma analysis and cause of death determination
- Child abuse and elder abuse investigations

CLICK TO REGISTER

Conference Themes



Forensic Psychology and Behavioral Analysis

- Criminal profiling and offender behavior analysis
- Eyewitness testimony and memory
- Psychophysiological detection of deception (polygraph)
- Mental health assessments in forensic contexts

Forensic Odontology and Anthropology

- Human Teath and skeletal analysis and identification
- Mass disaster victim identification
- Forensic taphonomy and decomposition studies
- Odontological approaches in forensic investigations

Forensic Engineering and Accident Investigation

- Failure analysis and accident reconstruction
- Fire investigation and arson analysis
- Vehicle accident reconstruction
- Structural collapse investigation

Forensic Linguistics and Document Examination

- Linguistic analysis in threat assessment and crime investigation
- Handwriting analysis and document authentication
- Digital document forensics and forgery detection
- Speaker recognition and voice analysis

Ethical and Legal Issues in Forensics

- Expert witness testimony and courtroom procedures
- Ethics in forensic science practice
- Legal challenges in forensic evidence admissibility
- Wrongful convictions and exoneration cases

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PAPER PRESENTATION (PROFESSIONAL CATEGORY)

- **PPA01 | Dr. Karan Pramod**
  The brutality of the world is the challenge to an Autopsy expert: a case report of Female Foeticide
- **PPA02 | Professor Dr. Akhilesh Pathak**
  Strangled Truths: Unraveling the Case of Alleged Self-Strangulation
- **PPA03 | Yakubu Magaji Yuguda**
  Artificial Intelligence-Based Forensic Toxicology and DNA Analysis: Revolutionizing Forensic Science.
- **PPA04 | Dr. Shreekrishna H K**
  Uncovering the silent threat:Aspiration related fatality and crucial role of postmortem examination -A case study
- **PPA05 | Dr. Suchita Rawat**
  Detection of Common Adulterants in Edible Oil Using Chemical Tests and Chemometrics
- **PPA06 | Dr. Veena B Pujari**
  Age Estimation in Indians using Clinical Evaluation of Dental Attrition- A Prospective Study
- **PPA07 | Dr. Parul Garg**
  Histopathological Study on Autopsy Liver Specimens in a Tertiary Care Institute of Punjab
- **PPA08 | Sumi Sundaresan**
  Effective electrochemical detection of Nicotine using Vitamin B12-MoS2 modified gold electrode
- **PPA09 | Dr. Ishwer Tayal**
  Reproductive freedom and allowing Termination of Pregnancy as a result of statutory rape against the will of minor Pregnant woman -A Dilemma for Institutional MTP Board.
- **PPA10 | Od. Thalia Gabriela Alvarez Centeno, MSc.**
  Comparative Analysis of Palatine Rugae in Children Aged 5 to 8 Years: Comparative Analysis by Sex
- **PPA11 | Dr. Neelkamal Sharma**
  Genetic Diversity of Microsatellite Loci of Indian Blackbuck (Antilope cervicapra)
- **PPA12 | Ramos**
  Profiling the Past: Understanding a Human Individual from a 14th-15th Century Archaeological Site in Northern Luzon, Philippines in the Context of Forensics
- **PPA13 | Dr. Raveena Makker**
  Dental Implants in Forensic Odontology: A Breakthrough
- **PPA14 | Dr. Vishal**
  Fallacies in Determination of Sex from Bony Remains in Sub Adult Age Group

- **PPA15 | Samiya Riaz**
  Sex Prediction Potential of the Cusp and Crown Areas of Maxillary Posterior Teeth using 2D-Hirox Stereomicroscope
- **PPA16 | Bidisha Haque**
  Predicting Unconscious Violence: Behavioral Analysis and Threat Assessment
- **PPA17 | Gayathri V**
  A Preliminary Study on Kannada Handwriting Characteristics amongst Karnataka Population
- **PPA18 | Dr. Geetika Saxena**
  The Interplay of Aggression and Emotional Intelligence on the Delinquent Behavior of Juvenile Offenders
- **PPA19 | Kiruthiga U**
  Photoluminescence Spectroscopy for Determining the Age of The Latent Fingerprints: A New Potential Approach
- **PPA20 | Medha Singh**
  Crime Tech Dilemma
- **PPA21 | Dr. Abhimanyu Harshey**
  Forensic Analysis of Inorganic Gunshot Residue for the estimation of Shooting range
- **PPA22 | Dr. Jaspinder Pratap Singh**
  Non-Invasive Prenatal Paternity Testing in Forensic Cases: A Systematic Review and Meta-Analysis with Medicolegal Implications in India
- **PPA23 | Dr. Sourabh Khandelwal**
  A Silent Witness: How dental Implants Aid Forensic Identification - An Innovation
- **PPA24 | Krittika Sood**
  Unveiling Deepfakes: Evaluating Pixel, Forensic, and Voice-Based Detection Amidst Anti-Forensic Manipulations
- **PPA25 | Bhagyashree Kanerkar**
  Decoding Anonymity: From Text to Identity
- **PPA26 | Mr. Dhyeya C Gohil**
  To Examine the Forensic Linguistics Characteristics of Writer Using AI Models

PPA01

THE BRUTALITY OF THE WORLD IS THE CHALLENGE TO AN AUTOPSY EXPERT: A CASE REPORT OF FEMALE FOETICIDE

Dr. Karan Pramod[1], Dr. Ravdeep Singh[2], Dr. Harvinder Singh[3], Dr. Ashwini Kumar[4]

Assistant Professor, Dept. of Forensic Medicine, Christian Medical College, Ludhiana, Punjab, India

Associate Professor, Dept. of Forensic Medicine, Guru Gobind Singh Medical College, Faridkot, Punjab, India

Assistant Professor, Dept. of Forensic Medicine, Himalayan Institute of Medical Sciences, Dehradun, India

Professor, Dept. of Forensic Medicine, Dr. B. R. Ambedkar Institute of Medical Sciences, Mohali, India

Abstract

Female foeticide, a grim reality in many parts of the world, continues to cast a shadow on societies and perpetuate gender discrimination. This abhorrent practice involves the selective termination of female foetuses, largely driven by cultural preferences for male offspring. It reflects a deep-seated bias against women, stemming from entrenched societal norms and economic factors. This abstract provides an overview of the phenomenon, the relative autopsy findings in addition to the ones determining the live/dead birth, viability, and the antemortem/postmortem status of the wounds. This practice stems from deeply ingrained gender biases and patriarchal norms that perpetuate the belief that males are more valuable than females. It perpetuates gender inequality, skews sex ratios, and disrupts the social fabric. Case: In this paper, we present an interesting case of a female child whose barbarically mutilated body was found in the fields of a village in Punjab, India. The dead body consisted of only portion of the abdomen, pelvis and both lower extremities, whereas the head, chest and upper limbs of the body were missing. The umbilical cord was crushed and lacerated. Also noteworthy was the gnawing of wounds which created challenges while formulating opinion on the cause of death. In totality, it was unrealizable to distinguish and differentiate between the aforementioned markers of live/dead birth and antemortem/postmortem status of the wounds. The menace of female foeticide persists as a stark reminder of ingrained gender biases in India and the challenges they throw at a forensic autopsy expert to provide aid justice in time. The future hinges on creating a world where every girl child is welcomed with open arms, celebrated, and given the same opportunities to thrive.

Keywords: Female foeticide, mutilated body, inequality, live birth, viability

PPA02

UNDERSTANDING SELF-STRANGULATION: FORENSIC INSIGHTS AND IMPLICATIONS STRANGLED TRUTHS: UNRAVELING THE CASE OF ALLEGED SELF-STRANGULATION

Prof. Akhilesh Pathak[1]

[1]Professor & Head Forensic Medicine and Toxicology at All India Institute of Medical Sciences, Bathinda

Abstract

This case presents the investigation into the death of a 32-year-old female whose body was found with signs of alleged self-strangulation by pulling a metallic chain that was worn around the neck. The victim had a documented history of domestic violence, from her brother reporting that her husband, a drug addict, frequently abused her. Following a five-day hospitalization, she succumbed to her injuries, prompting a forensic examination to determine the cause of death. The post-mortem examination revealed multiple ligature marks around the neck, including three complete and two incomplete marks, and observed subconjunctival hemorrhage, indicating asphyxia. Internal examination revealed contusions in paratracheal muscles but intact hyoid bone and thyroid cartilage. Notably, the son of the deceased provided crucial eyewitness testimony, stating he observed his father dragging his mother by a rope around the neck on the day of the incident. This testimony, combined with forensic findings, raises significant questions regarding the narrative of self-strangulation and suggests the possibility of homicide. The case underscores the importance of thorough forensic investigation in instances of suspected domestic violence, highlighting the need for an intersectional approach that includes psychological, legal, and sociological considerations. This investigation aims to bring justice to the victim and awareness to the complexities surrounding domestic abuse and its tragic consequences.

Keywords: Homicidal strangulation, self-strangulation, testimony of witness, postmortem examination.

PPA03

ARTIFICIAL INTELLIGENCE-BASED FORENSIC TOXICOLOGY AND DNA ANALYSIS: REVOLUTIONIZING FORENSIC SCIENCE

Yakubu Magaji Yuguda[1]

[1]Federal Polytechnic, Kaltungo, Gombe State, Nigeria

Abstract

Advances in Artificial intelligence (AI) is transforming DNA analysis and forensic toxicology by improving the speed, precision, and dependability of evidence interpretation. Artificial intelligence (AI) techniques make it possible to automatically identify hazardous materials and intricate genetic blends that were previously difficult to examine. In forensic toxicology, machine learning algorithms can identify novel chemical compounds and predict their toxicological effects based on available datasets, providing rapid and comprehensive assessments. Meanwhile, Artificial intelligence (AI) in DNA analysis aids in the deconvolution of mixed DNA samples, offering higher sensitivity in detecting low-concentration contributors. This article explores the application of AI in these domains, highlighting recent developments, challenges, and future directions in AI-driven forensic science. Artificial intelligence (AI) has the potential to revolutionise forensic investigations and raise the calibre of criminal justice outcomes through better algorithms and easier access to huge databases.

Keywords: Forensic science, Forensic toxicology, Artificial intelligence, DNA analysis, AI techniques.

PPA04

"UNCOVERING THE SILENT THREAT: ASPIRATION-RELATED FATALITY AND THE CRUCIAL ROLE OF POST-MORTEM EXAMINATION"- A CASE STUDY

ShreeKrishna H.K[1]

[1]Professor and Head, Department of Forensic Medicine and Toxicology, Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India

Abstract

Aspiration of foreign bodies and stomach contents into the airways and lungs can result in sudden death and a variety of pulmonary disorders. These incidents often trigger suspicions of foul play due to the unnatural circumstances surrounding death. Aspiration-related fatalities most commonly affect children and the elderly, particularly those with identifiable risk factors such as alcoholism, neurological disorders, and upper gastrointestinal pathology. Clinicians frequently fail to suspect aspiration as the cause of death, emphasizing the necessity of post-mortem examination for a definitive diagnosis. Case History: We present the case of a 70-year-old retired teacher with a recent psychiatric disorder who was discovered deceased in a remote area beside a roadside after being missing for six days. Following identification by the son, the case was referred to the Department of Forensic Medicine for autopsy examination to determine the cause of death. Autopsy findings confirmed the diagnosis of asphyxia due to the aspiration of foreign material (stones) into the respiratory tract. Additionally, three stones were retrieved from the caecum region. The challenge in assessing the risk magnitude of aspiration incidents lies in their sudden and often unreported nature. Early suspicion, prompt medical intervention, and continuous patient monitoring are essential for preventing such tragedies. This case underscores the vital role of post-mortem examination in definitively establishing the cause of death and emphasizes the importance of vigilance in managing patients at risk of aspiration.

Keywords: Pulmonary disorders, aspiration, Autopsy, Psychiatric disorders

PPA05

DETECTION OF COMMON ADULTERANTS IN EDIBLE OIL USING CHEMICAL TESTS AND CHEMOMETRICS

Dr. Suchita Rawat[1], Drisya Dinesh1, Hana Fathima[2], Arathy N[2]

[1]Kristu Jayanti (Autonomous) College, Bangalore, India

[2]PINKERTON Hyderabad, Telangana, India

Abstract

Edible oil adulteration poses serious risks to public health, food safety, and economic stability. This study examines adulteration in 55 samples of five common edible oils: coconut, mustard, sesame, groundnut, and sunflower. Chemical tests were conducted according to the FSSAI 2021 guidelines, alongside chemometric analysis using ATR-FTIR spectroscopy. The results showed higher adulteration rates in sesame and sunflower oils having the highest levels detected by chemical testing. A hierarchical cluster analysis (HCA), based on the fingerprint region (2000–400 cm^{-1}) and using Ward's linkage method, classified the oils into five distinct clusters. Coconut oil samples demonstrated a high level of similarity within their cluster, whereas sunflower oil samples showed considerable variation. Support Vector Machine (SVM) analysis was employed to evaluate the model's ability to classify adulterated and unadulterated samples. The model achieved a precision of 0.67, meaning 67% of its positive predictions for adulteration were correct. The recall, which measures sensitivity, was 0.80 for unadulterated oils, indicating that 80% of true cases were identified. However, the recall for adulterated oils was 0.50, showing that only half of the actual adulterated cases were detected. The F1-Score, balancing precision and recall, was 0.73 for unadulterated oils and 0.57 for adulterated oils, suggesting room for improvement in detecting adulteration. This study highlights the potential of chemometrics in adulteration detection but underscores the need for better model accuracy.

Keywords: Oil adulterants,Chemical tests, ATR-FTIR spectrum, HCA, SVM

PPA06

AGE ESTIMATION IN INDIANS USING CLINICAL EVALUATION OF DENTAL ATTRITION- A PROSPECTIVE STUDY

Dr. Veena B Pujari[1]

[1]Assistant Professor, SDM College of Dental Sciences and Hospital, Dharwad

Abstract

Evaluation of age of unknown deceased persons is very important in forensic science. The main elements in any forensic investigation are race, sex and age determination in which the most difficult one to determine is the age. In stomatological methods, age estimation from occlusal tooth wear is a very simple and practically convenient method, a low level of accuracy limits its usefulness. However, if a practical scoring system of occlusal tooth wear can easily be applied in a clinical environment, is reliable, has a sufficient accuracy, it would be very useful for age estimation. To determine the correlation of attrition with increase in chronological age and to evaluate the accuracy of clinical evaluation in age estimation. A total number of 200 outpatients were assessed who met the inclusion criteria were selected for the study. The patients were assessed for degree of attrition clinically as well as photographically using a self developed grading system for attrition of teeth. Data was subjected to regression analysis with age as dependent variable and attrition grade as independent variable. According to regression analysis the most important variable to predict age is Maxillary second molar. The study concluded that, attrition of Maxillary Second Molar is a good predictor for age estimation and also, Staging of Attrition using photographs when clinical evaluation is not possible gives the same estimate of age.

Keywords: Dental attrition, age determination, regression

PPA07
HISTOPATHOLOGICAL STUDY ON AUTOPSY LIVER SPECIMENS IN A TERTIARY CARE INSTITUTE OF PUNJAB

Dr. Parul Garg[1]

[1]Associate professor, GGS Medical College and Hospital, Faridkot

Abstract

Autopsy also known as postmortem examination is done to find out the cause of death, time since death and to know the extent of disease. It also helps to identify any undiagnosed disease present in the person which can be confirmed histopathologically. This helps in increasing the knowledge of both pathologist and forensic experts. Liver being the principal site of many metabolic activities, is most frequently injured organ in the body. Various liver diseases are classified as primary and secondary. This study was done to analyse the various disease patterns of liver found at autopsy and histopathologically which either incidental were or were directly related cause of to death. To study the spectrum of liver diseases in autopsy specimen along with histopathological examination. This retrospective study was carried out in a tertiary care hospital in the department of pathology over a period of four and a half years. A total of 110 cases of liver specimens of postmortem cases, received as part of liver or whole liver were included in the study. The specimens were received in 10% formalin. After gross examination, sections from representative area were submitted for histopathological processing. After processing tissues were sectioned and stained with H&E stain. Slides were examined and the findings were noted. Findings were calculated as percentage. Liver diseases are more common in males as compared to females. Out of 110 cases, 86 (78.19%) were males and 24 (21.81%) were females (Ratio M: F 3.5:1). and the most affected age group being 31-40 years. Congestion was seen in maximum number of cases (37.27% cases) followed by fatty change (28.18%) and least were seen with necrosis (0.91%)
This study highlights the importance of histopathological report in liver autopsy cases.

Keywords: Fatty liver, Congestion, Cirrhosis, postmortem, autolysis

PPA08

EFFECTIVE ELECTROCHEMICAL DETECTION OF NICOTINE USING VITAMIN B12-MOS2 MODIFIED GOLD ELECTRODE

Sumi Sundaresan[1], Sowmya Subramanian[1], Vijendran Vijaikanth[1]

[1]Division of Physical Sciences, Karunya Institute of Technology and Sciences, Karunya Nagar, Coimbatore, Tamil Nadu

Abstract

Nicotine is an addictive substance that is present in tobacco products and nicotine poisoning has become one of the major threats. It has been found that over 8 million deaths are occurring in a year globally due to tobacco consumption. Nicotine poisoning occurs due to excessive exposure to nicotine in various forms. Significant health hazards are associated with it including nausea, vomiting, seizures, fast heartbeat, and in extreme situations, respiratory failure or even death. Rapid measurement of nicotine levels in biological samples is essential for prompt medical action since nicotine is a strong stimulant that affects the cardiovascular and central nervous systems. Among the various detection methods, electrochemical techniques are given importance at present due to their high sensitivity and selectivity. To achieve the exact standards of clinical diagnostics, current research is focussed on fabrication of modified electrodes containing nanomaterials to increase sensitivity and to decrease the limit of detection (LOD). In this work, we have prepared an electrochemical sensor using Vitamin B12-MoS2 (VitB12-MS) nanocomposite, coated on a gold electrode for the effective detection of nicotine. The formation of nanocomposite is confirmed using standard techniques like FTIR spectroscopy and XRD and the modified electrode is characterized using electrochemical techniques such as CV and EIS. Three different electrochemical techniques namely CV, DPV, and LSV are used for sensing standard nicotine samples and among them the DPV method yielded the lowest LOD value of 1.6 nM. When the prepared sensor is tested for nicotine in two real cigarette samples, LOD values of 2.43 and 3.21 nM are obtained. Also the sensor provided excellent LOD values of 2.46, 2.71 and 1.74 nM when nicotine is spiked in the biological samples blood, urine, and saliva respectively.

Keywords: Nicotine, Toxicology, Electrochemical sensor, VitB12-MoS2 modification, DPV, biological samples

PPA09

RIGHT TO CHOOSE, REPRODUCTIVE FREEDOM AND TERMINATION OF PREGNANCY AS A RESULT OF STATUTORY RAPE AGAINST THE WILL OF PREGNANT WOMAN -A DILEMMA FOR INSTITUTIONAL MTP BOARD

Dr. Ishwer Tayal[1]

[1]Member-Institutional MTP Board cum Associate Professor, Deptt. of Forensic Medicine, GGS Medical College, Faridkot, Punjab

Abstract

Women must be at least 18 years old to get married in a court in India and Men must be at least 21 years old except for the state of Himachal Pradesh (HP) where Assembly passed the Prohibition of Child Marriage (Himachal Pradesh Amendment) Bill, 2024, to raise the minimum marriageable age for women from 18 to 21 years. According to Section 375 of the Indian Penal Code (BNS Section-64), any sexual activity that occurs before a person is 18 years old, regardless of their consent, constitutes statutory rape as 2013 Criminal Law Amendment Act, raised the age of consent from 16 to 18years. Also, as per the highly protectionist clause of the Protection of Children from Sexual Offences Act (POCSO), 2012 all sexual activity of individuals under the age of 18 years is an offence. But nowadays it's not uncommon for adolescent girls going for non-exploitative consensual sex but later on when parents come to know about such activity and are not willing to accept their relationship, cases are being filed as a case of sexual assault. One similar case of minor pregnant woman was referred for termination of Pregnancy to the Institutional MTP Board (Constituted as per provisions of MTP (Amendment Act-2021), on court order against application moved by her father. After examination by the Medical Board,The adolescent girl was found to be fit for MTP but she refused consent for termination of her pregnancy alleged to be willfully planned after she married with her partner, now accused and under arrest. The right to choose and reproductive freedom is fundamental right under Article 21 of the Indian Constitution. Therefore as the Honorable CJI Chandrachud noted in a case pertaining to the honorable Supreme court "where the opinion of a minor pregnant person differs from the guardian, the court must regard the view of the pregnant person as an important factor while deciding the termination of the pregnancy",. The honorable Supreme court recalled its previous order dated 29th April 2024 for teen's abortion and reversed its earlier order using special powers of Article 142. Two High Courts which have seen several similar cases of non-exploitative consensual sex involving adolescent girls, filed by the police under "sexual assault", had referred this issue to The 22nd Law Commission of India. The commission in its recent 283rd report, offered its recommendation on the question of Lowering the age of consent (AoC) for sexual activity to prevent unnecessary prosecutions and resolve the contradictions in sexual violence laws.

Keywords: Adolescent girl, Sexual activity, Statutory Rape, MTP Act, Age of Consent.

PPA10
COMPARATIVE ANALYSIS OF PALATINE RUGAE IN CHILDREN AGED 5 TO 8 YEARS: COMPARATIVE ANALYSIS BY SEX

Thalia Gabriela Alvarez Centeno[1], Carlos Gustavo Martínez Florencia[2]

[1]Oficial Designation: Dentist, Master in Forensic Medicine, Institution Details: University of Guayaquil, Ecuador

[2]Oficial Designation: Dentist, Master in Forensic Medicine, Institution Details: University of Guayaquil, Guayaquil – Ecuador

Abstract

This study focuses on the comparative analysis of palatal rugae in boys and girls aged 5 to 8, aiming to identify morphological patterns that may aid in forensic identification. Palatal rugoscopy, an increasingly important tool in forensic dentistry, examines palatal rugae—anatomical structures that, due to their stability and uniqueness, can be critical in individual identification. Despite previous studies in adults, pediatric populations have been less explored, highlighting the need for research in this age group. The study was conducted with a sample of 25 children from the Pediatric Dentistry Clinic of the University of Guayaquil, selected based on specific criteria and with parental consent. Extra-hard plaster models were used to capture the rugae, applying Basauri Chávez's classification to categorize each ruga type by form and position, with numerical values assigned to facilitate comparative analysis by gender. Results revealed differences in straight and sinuous rugae, more frequent in girls, while "point" and "curve" rugae were predominant in boys. Independent observers following a blind method increased the reliability of the data. These patterns suggest a possible relationship between gender and rugae morphology, supporting palatal rugoscopy's utility as a forensic tool in children. This research provides significant evidence for using rugoscopy in pediatric forensic dentistry and promotes further studies that consider variables like ethnic origin and environmental factors to enhance identification accuracy.

Keywords: Rugoscopy, Forensic Dentistry, Basauri Chávez's classification

PPA11

GENETIC DIVERSITY OF MICROSATELLITE LOCI OF INDIAN BLACKBUCK (ANTILOPE CERVICAPRA)

Vikas Kumar[1,2], Arun Lohhra[1], Neelkamal Sharma[3], Arun Sharma[4]

[1]Research Scholar, DOFS, MD University, Rohtak, India

[2]Senior Scientific Assistant, SFSL Madhuban, Haryana, India

[3]Associate Professor, DOFS, MDU University, Rohtak, India

[4]Professor, DOFS, NFSU, Gandhinagar, Gujrat, India

Abstract

The Blackbuck (Antilope cervicapra), native to the Indian subcontinent, is the sole extant species of the genus Antilope. Gaining insight into the genetic variation and population structure of this species is crucial for enhancing its conservation strategies and management efforts. In this research, 40 biological samples were collected from various geographic regions within the Abubsahar Wildlife Sanctuary and its surrounding areas in Haryana, India. Eleven microsatellite markers, originally identified in goats, a species within the same family (Bovidae) as the Blackbuck, were assessed for cross-species amplification. Out of these markers, eight demonstrated polymorphism and were subsequently utilized for detailed genetic analysis. Analysis of the eight polymorphic microsatellite markers revealed a total of 42 distinct alleles. The observed heterozygosity varied between 0.400 and 0.591, with an overall mean (± SE) of 0.450 ± 0.02. The expected heterozygosity (He) was calculated to range from 0.505 to 0.716, with a mean value of 0.628 ± 0.02. Polymorphic information content (PIC) averaged at 0.577 ± 0.02. A typical 'L'-shaped distribution in the mode-shift test, along with non-significant heterozygote excess across different models, indicated no recent genetic bottleneck within the declining Blackbuck population. In view of the declining population of the blackbuck in the studied area, immediate scientific management is the need to maintain the genetic diversity to the maximum possible extent. These polymorphic microsatellite loci have offered a valuable tool for the genetic, population, conservation as well as forensic based studies of blackbuck.

Keywords: Blackbuck, Microsatellites, Forensic, Wildlife, Polymorphic, PIC

PPA12

PROFILING THE PAST: UNDERSTANDING A HUMAN INDIVIDUAL FROM A 14TH-15TH CENTURY ARCHAEOLOGICAL SITE IN NORTHERN LUZON, PHILIPPINES IN THE CONTEXT OF FORENSICS

Catherine Alice D. Ramos[1], Mary Jane Louise A. Bolunia[1]

[1]National Museum of the Philippines, National Museum Complex, Philippines

Abstract

This study will attempt to understand I-1964-F-57 (“Bolinao Skull”) in the context of Forensic Science following the basic principles of Human Osteology and Forensic Anthropology. The individual was retrieved from Balingasay archaeological site, a 14th-15th century site in Bolinao, Pangasinan, Philippines. There were few studies about the human sample in the past including the early archaeological report of the National Museum on Bolinao (Legaspi, 1974), studies on body modification and ornamentation (Zumbroich, et al, 2010; Atienza, 2014), biological characteristics (Ramos, et al, 2023), and ethical concerns on the use of human osteological remains from the Philippine national collections in research (Ramos, et al, 2022). The objective is to determine, if not fully establish, the individual profile through non-invasive methods. Morphological characteristics of the cranium, mandible, and teeth were analyzed visually and anomalous features were assessed. Carious lesions, rotation/ movement, and degree of attrition on teeth were noted, these may be indicative of personal habits, behavior, and health status during the individual’s lifetime. Gold discs on the anterior teeth not only reflects a particular period in Philippine society before the Spanish colonization, but it tells us about the individual’s status as well. Results showed us another aspect of Bolinao Skull that somehow gave us ideas on how he had lived in the past, and at the same time giving us a glimpse of Philippine culture and society in Pre-Spanish times. This study also shows that the application of the principles of Forensics in understanding past human life and society is feasible. It has the potential to become a significant tool in solving the mysteries of the past and give us better understanding of our heritage.

Keywords: Pre-Spanish Philippines, Bioarchaeology, Forensic Anthropology, Early Civilization, Profiling

PPA13

DENTAL IMPLANTS IN FORENSIC ODONTOLOGY: A BREAKTHROUGH

Dr. Raveena Makker[1], Dr. Rajeev Srivastava[2]

[1]Professor, Department of Prosthodontics and Crown & Bridge, Index Institute of Dental Sciences, Malwanchal University, Indore (M.P.)

[2]Professor and Head, Department of Prosthodontics and Crown & Bridge, Index Institute of Dental Sciences, Malwanchal University, Indore (M.P.)

Abstract

Forensic dentistry is a critical subspecialty within the field of dentistry that focuses on applying dental science to the legal system. Teeth, due to their durability and unique characteristics, often serve as vital markers for establishing the identity of deceased individuals in cases of disaster, mass casualties, or criminal investigations. A significant development in the field of dentistry has been the widespread adoption of dental implants. They are typically used to replace missing teeth or support oral rehabilitation, and have become a staple in modern dentistry, improving the quality of life for millions of people. However, in the context of forensic science, these implants have also emerged as important tools for human identification, especially in cases of traumatic death where the body may be disfigured or severely damaged. One of the key reasons why teeth and dental implants are crucial in forensic identification is their durability. Teeth are the hardest substances in the human body, capable of withstanding extreme temperatures and pressures that would typically cause other tissues to deteriorate. However, in certain extreme situations, such as fires or explosions, teeth can become brittle and fracture, making traditional identification methods, such as visual inspection or fingerprint analysis, less effective. This is where dental implants play an essential role. Dental implants are made from materials such as titanium, which are specifically chosen for their high resistance to corrosion, structural strength, and high melting points. These physical properties allow implants to remain intact even after incineration or exposure to extreme conditions. Several methods that have been developed for implant identification are Implant Recognition Software (IRS), radiographic recognition of dental implants and assessment of batch number of the dental implant. This review highlights the evolving role of dental implants in forensic identification, underscoring the critical role prosthodontists play in this process.

Keywords: Implant Recognition Software, Forensic dentistry, Dental Implants

PPA14

FALLACIES IN DETERMINATION OF SEX FROM BONY REMAINS IN SUB- ADULT AGE GROUP: A REVIEW OF LITERATURE

Dr. Vishal[1], Dr Gaurav Sharma[2], Dr. Yogender Malik[3], Dr Rishi Rajindran[4], Dr. Mahesh Sharma[4], Dr. Paramveer Singh[5]

[1]PG Resident, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

[2]Professor & Head, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

[3]Professor, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

[4]PG Resident, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

[5]Tutor, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

Abstract

One of the most important factors in forensic anthropology casework is sex determination, which must be taken into account when examining skeletal remains. Given the imperfect development of skeletal and dental traits, forensic experts commonly use morphologic and metric approaches for sex assessment of human remains. This presents considerable issues in the field of forensic anthropology. No difference would be expected because the skeletons of male and female prepubertal individuals serve the same purposes and sex-related hormones have not yet begun to develop. Although there is some sexual dimorphism from an early age, it is not severe enough to allow for precise sexing until pubertal changes have occurred. This comprehensive review aims to summarise existing literature on sexual dimorphism in sub adult age groups and fallacies that used.

Keywords: Sexual determination, Skeletal remains, Dental remains, Sub-adult age group, Hormones.

PPA15

SEX PREDICTION POTENTIAL OF THE CUSP AND CROWN AREAS OF MAXILLARY POSTERIOR TEETH USING 2D HIROX STEREOMICROSCOPE

Samiya Riaz[1,2], Mohd. Fadhli Bin Khamis[2], Wan Mohammad Amer bin Wan Ahmad[3], Johari Yap Abdullah[4], Mohamamd Khursheed Alam[5]

[1]Unit of Oral Biology, Department of Fundamental Dental and Medical Sciences, International Islamic University Malaysia, Malaysia

[2]Unit of Oral Biology, School of Dental Sciences, Universiti Sains Malaysia, Malaysia

[3]Department of Biostatistics, School of Dental Sciences, Universiti Sains Malaysia, Malaysia

[4]Department of Craniofacial imaging, School of Dental Sciences, Universiti Sains Malaysia, Malaysia

[5]Department of Preventive Dentistry, College of Dentistry, Jouf University, Saudi Arabia

Abstract

Introduction: Studies have been conducted for sexual dimorphism in Malay population on tooth size using linear measurement methods while there is lack of data for 2D cusp and crown area measurement. Objectives: To determine the sexual dimorphism and sex prediction potential of the cusp and crown areas of maxillary posterior teeth. Methods: Maxillary posterior teeth of 168 dental casts (84 male and 84 female) were selected for scanning. Inclusion criteria was Malay origin, completely erupted teeth, and teeth with clearly demarcated groove pattern for marking the cusp and crown area outline. Exclusion criteria was maxillary second and third molar, tooth with any anomaly or trauma obscuring the tooth occlusal morphology, restored tooth, , damaged casts and any distorted scanned digital cast. Measurement for cusp area and the crown area was performed using 2D-Hirox KH-7700. Data were analysed using independent t-test and logistic regression analysis. Results: Measurements of all the crown and cusp areas were statistically significantly larger in males than in females ($p<0.001$). Sex prediction accuracy was 80% which is considered very good for forensic investigations Conclusions: Maxillary posterior teeth in Malay population exhibit significant sexual dimorphism, thus may be used for sex determination along with other procedures.

Keywords: Cusp area, crown area, maxillary teeth, 2D, sex prediction, sexual dimorphism

PPA16

PREDICTING UNCONSCIOUS VIOLENCE: BEHAVIORAL ANALYSIS AND THREAT ASSESSMENT

Bidisha Haque[1]

[1]Clinical Psychologist; Behavior Therapist

Abstract

Unconscious violence, characterized by impulsive and unpredictable aggression, poses a significant threat to public safety. Traditional threat assessment methods often rely on overt indicators, neglecting subtle behavioral cues that may precede violent outbursts. This study introduces a novel approach to predicting unconscious violence through behavioral analysis and threat assessment. Utilities were combined with insights from forensic psychology, neuroscience, and machine learning to develop a predictive model identifying high-risk individuals with the analysis of 500 cases of violent offenders, focusing on pre-incident behavioral patterns, and environmental factors. Results indicate that unconscious violence can be predicted with 85% accuracy using a combination of: 1. Behavioral indicators: erratic behavior, emotional dysregulation, and social withdrawal. 2. Environmental factors: traumatic events, social isolation, and substance abuse. Our threat assessment framework, the Unconscious Violence Risk Indicator (UVRI), reliably distinguished between high-risk and low-risk individuals. Notably, UVRI outperformed traditional threat assessment tools in predicting violent behavior. This study contributes to the field of forensic psychology by: 1. Identifying novel behavioral indicators of unconscious violence. 2. Developing a predictive model for unconscious violence. Implications: 1. Enhanced public safety through early identification of high-risk individuals. 2. Improved mental health interventions targeting unconscious violence. Future research directions include: 1. Validating UVRI across diverse populations. 2. Exploring the role of social media and online behavior in predicting unconscious violence. 3. Developing prevention strategies targeting high-risk individuals.
By predicting unconscious violence through behavioral analysis and threat assessment, we can reduce the risk of violent outbursts and promote safer communities.

Keywords: unconscious violence, behavioral analysis, threat assessment, forensic psychology, neuroscience, high risk behavior.

PPA17
A PRELIMINARY STUDY ON KANNADA HANDWRITING CHARACTERISTICS AMONGST KARNATAKA POPULATION

Gayathri V[1], Dr. Manjula[2]

[1]Research Scholar, Jain Deemed-to-be-University

[2]Assistant Professor (Department of Physics), Jain Deemed-to-be-University

Abstract

Handwriting examination is one of the key types of evidence in solving both criminal and civil cases. India is known for its diverse languages with vast scripts across the country. One among the languages is Kannada which is mother language of the state Karnataka with 49 letters and 10 vowels. The study aims to determine the natural variations in Kannada writings by analysing the handwriting characteristics such as letter formations, spacing, pen pressure, slant, and rhythm. A total of 50 samples were collected within the age group of 18-25 from both male and female. A set of 3 writings were collected in different speeds to understand the factor affecting the handwriting. This study sheds light on fostering the differences and similarities in Kannada writings in determining the source of the writing. The study aims at bridging the gap in analysing handwriting by understanding the relationship between language and educational background of individuals.

Keywords: Handwriting, Linguistic, Kannada, Natural Variations, Handwriting Characteristics.

PPA18

THE INTERPLAY OF AGGRESSION AND EMOTIONAL INTELLIGENCE ON THE DELINQUENT BEHAVIOUR OF JUVENILE OFFENDERS

Dr. Geetika Saxena[1]

Abstract

The juvenile justice system emphasizes on comprehending the adolescent's psychological perspective responsible for his or her own latent violent behaviour, which has a substantial negative influence on the juvenile offender's intervention programmes. Aggression and emotional intelligence (EI) are important characteristics in evaluating the psychological functioning of juvenile offenders in forensic psychology as individual dynamic risk factors. Aggression, which is frequently triggered by negative childhood experiences and environmental stresses, exacerbates difficulties with behaviour, resulting in more substantial psychological discomfort. On the contrary, emotional intelligence—comprising self-awareness, emotional regulation, and empathy—has been shown to mitigate these effects, fostering resilience and adaptive coping mechanisms. This study explores the interplay between aggression and EI in shaping the mental health outcomes of juvenile offenders. By analyzing existing literature and conducting quantitative assessments of male juvenile delinquents from Delhi remand homes on a purposive sampling basis within juvenile justice settings. the research identifies how deficiencies in Emotional intelligence and aggression correlate with their delinquent behaviors. These findings underscore to categories offenders who are more susceptible to the risk of recidivism and proposing suitable intervention strategies as a pathway to reduce recidivism and promote mental health.

Keywords: Aggression, Emotional Intelligence, Delinquent Behaviour, Juvenile Offenders

PPA19

PHOTOLUMINESCENCE SPECTROSCOPY FOR DETERMINING THE AGE OF THE LATENT FINGERPRINTS: A NEW POTENTIAL APPROACH

Kiruthiga U[1], Dr. G Rajesh Babu[2]

[1]Lecturer, PhD Scholar, National Forensic Sciences University, Tripura

[2]Professor, National Forensic Sciences University, Gujarat

Abstract

Photoluminescence spectroscopy is the method used to measure the amount of light emitted by a material after it has absorbed photons. The skin is composed of many components that exhibit fluorescence properties. The components include proteins, lipids, and other chemical substances. Over time, the chemical composition or structure of the luminescent substances in latent fingerprints may change. Environmental exposure and individual conditions may affect the presence or concentration of certain substances. This work uses photoluminescence spectroscopy to measure the intensity of light emitted by residual fingerprint traces after exposure to light. This investigation involves subjecting the fingerprint to ultraviolet (UV) light with a wavelength of 296nm and measuring the intensity of the fluorescence produced as a consequence. In order to verify the theory, a total of 1600 samples were used, spanning several categories. The emission intensities were then assessed and compared, taking into account both the highest and lowest values. The research showcased positive results, confirming the effectiveness of Photoluminescence spectroscopy in estimating the age of latent fingerprints. On comparing the samples, it was found that the controlled female and male samples had higher emission intensity over time compared to the uncontrolled female and male samples exposed to environmental conditions. This study included controlled and uncontrolled samples as reference and comparative samples. Upon analysis using Photoluminescence Spectroscopy, the uncontrolled samples exhibited emission fluctuations that were comparable to those of the controlled samples, with the main difference being the strength of the emissions. The female samples under controlled conditions release the highest amount of radiation at a rate of 6341168 CPS (counts per second), whereas the uncontrolled samples emit radiation at a rate of 5431940 CPS. The variation in emission intensity showed its efficiency in being a marker to estimate the age of the latent fingerprints.

Keywords: Photoluminescence Spectrometry, Spectrofluorimetry, UV-Vis Spectrometry, Latent Fingerprints, Age Estimation; Dactylography

PPA20

CRIME TECH DILEMMA

Ms. Medha Singh[1], Dr Aaeen Alchi[2]

[1]Lecturer, National Forensic Sciences University, Gandhinagar

[2]Assistant Professor, National Forensic Sciences University, Gandhinagar

Abstract

The transformative power of artificial intelligence (AI) is reshaping forensic science and its role in the justice system. With the increasing reliance on digital forensics in law enforcement, AI offers unprecedented advancements in analyzing and interpreting evidence, enhancing both efficiency and reliability in criminal investigations. However, this progress comes with significant ethical considerations, such as ensuring transparency, reducing bias, and safeguarding data privacy. These challenges underscore the need for a balanced approach to integrating AI into forensic practices. This paper explores the implications of AI in digital forensics, its impact on justice delivery, and the ethical framework required to guide its use responsibly. Examining the intersection of technology and law provides insights into creating a fair and inclusive system that embraces innovation without compromising justice.

Keywords: Artificial Intelligence, Justice System, Ethical Framework, Forensic Science

PPA21
FORENSIC ANALYSIS OF INORGANIC GUNSHOT RESIDUE FOR THE ESTIMATION OF SHOOTING RANGE

Dr Abhimanyu Harshey[1]

[1]Assistant Professor, School of Forensic Science, National Forensic Sciences University, Gandhinagar, Gujarat

Abstract

The Gunshot Residue (GSR) analysis holds distinguished evidential significance for exploratory forensic investigations. The SEM-EDX is considered as gold standard method for the GSR analysis. The characterisation of inorganic markers offers the means for range of fire estimation and shooting range reconstruction. This study explores the non-destructive approach for the particle and bulk analysis of GSR samples. Subsequent chemometric analysis provided the insights of the differences in GSR Samples from different firearms discharged at various ranges. This method was also found capable to differentiate the country-made/improvised firearms and their standard counterparts. The chemometric analysis offered the estimation of shooting range with remarkable high accuracy. It offered enhanced specificity, selectivity, robustness of the analysis and provided significant findings that may effectively contribute towards the different aspects of crime scene reconstruction such as shooting range estimation, etc.

Keywords: Gunshot Residue; Forensics; Range of Fire; SEM-EDX; XRF; Chemometrics.

PPA22

NON-INVASIVE PRENATAL PATERNITY TESTING IN FORENSIC CASES: A SYSTEMATIC REVIEW AND META-ANALYSIS WITH MEDICOLEGAL IMPLICATIONS IN INDIA

Dr Jaspinder Pratap Singh[1]

[1]Assistant Professor, Department of Forensic Medicine, Adesh Institute of Medical Sciences, Bathinda

Abstract

Non-invasive prenatal paternity testing (NIPPT) is a ground breaking technology that determines paternity using cell-free fetal DNA (cffDNA) from maternal plasma, enabling safe and accurate results as early as the first trimester. This meta-analysis evaluates the accuracy, sensitivity, and fetal fraction requirements of NIPPT in forensic contexts, with a specific focus on its potential use in India. In cases of sexual assault, where paternity testing traditionally occurs post-abortion or post-birth, NIPPT offers a timely alternative that can streamline judicial proceedings and reduce the emotional burden on survivors.

A systematic search of PubMed and related databases identified nine studies meeting the inclusion criteria. Pooled analysis revealed an accuracy rate of 99.98% (95% CI: 99.96-100%) with sensitivity and specificity values of 99.7% and 99.6%, respectively. NIPPT maintained high reliability even with fetal fractions as low as 4%. These results affirm NIPPT's robustness for forensic use, particularly in early pregnancy. India's current legal framework restricts paternity testing in rape cases to post-abortion or childbirth, delaying justice and increasing survivors' distress. Integrating NIPPT into forensic practice could address these gaps, provided ethical safeguards, such as informed consent and data privacy, are rigorously enforced. Additionally, the existing use of NIPPT in obstetrics for fetal anomaly detection demonstrates its feasibility and scalability in the Indian context.

Keywords: Non-invasive prenatal paternity testing (NIPPT), Rape survivors in India, Cell-free fetal DNA (cffDNA), Forensic paternity testing, Medicolegal implications.

PPA23

A SILENT WITNESS: HOW DENTAL IMPLANTS AID FORENSIC IDENTIFICATION - AN INNOVATION

Dr. Sourabh Khandelwal[1]

[1]Index Institute of Dental Sciences, Malwanchal University, Indore

Abstract

Forensic odontology plays a critical role in the identification of individuals, particularly in cases involving severe trauma, decomposition, or when other identification methods are insufficient. One of the most significant advancements in recent years has been the role of dental implants as key identifiers in forensic investigations. I have developed an innovative dental implant design that significantly enhances the identification process, offering unparalleled precision and efficiency." Dental implants, often tailored to the specific needs of patients, provide a permanent, distinct marker that can survive the ravages of time, trauma, and decomposition. Unlike natural teeth, which can decay or be destroyed, implants remain intact long after other forms of identification may fail. This paper discusses the various ways in which dental implants serve as silent witnesses in forensic investigations, offering critical clues when traditional identification methods, such as DNA analysis or visual identification, are not possible. By examining real-world cases, the paper illustrates how dental implants have been used successfully to identify victims in mass disasters, criminal investigations, and cases of unknown remains. Furthermore, it explores the technological advancements in implant dentistry and their implications for forensic science. The paper also emphasizes the importance of maintaining accurate dental records, as detailed information on the materials and placement of implants can be crucial for comparison in forensic contexts.
Ultimately, this innovative approach to forensic identification highlights the growing integration of dentistry and forensic science, demonstrating how my innovative dental implant design can provide an invaluable tool for forensic odontologists in solving complex identification challenges.

Keywords: Dental Implant, Forensic Identification, Forensic Odontology, Dental Implant Identification, Victim Identification.

PPA24

"Unveiling Deepfakes: Evaluating Pixel, Forensic, and Voice-Based Detection Amidst Anti-Forensic Manipulations"

Krittika Sood[1], Dr. Surbhi Mathur[1]

[1]National Forensic Sciences University, Gandhinagar, Gujarat

Abstract

The rise of deepfake technology has introduced unprecedented challenges in the realm of digital media authenticity, posing threats to privacy, security, and trust in online platforms. This research focuses on the analysis and detection of deepfakes using images and videos collected from publicly available web sources and aims to understand the accuracy of pixel, forensic & voice based analysis for the identification of deepfakes. A sample size of 128 multimedia files (101 images and 27 videos) were used for the study. Anti-forensic techniques like recapturing deep fake videos and images using screen recorder, transcoding & addition of synthetic voice in videos was conducted on the collected deepfake material to understand whether such manipulations can hinder the analysis of deep fakes.The results of the study demonstrate high accuracy in detecting manipulated deepfake media, highlighting specific patterns and artifacts that remain challenging for current generation methods to obscure. This research provides valuable insights into the evolving landscape of deepfake technology and provides an understanding on the effect of various manipulation techniques on deepfake media can pose difficulties in their forensic analysis. The study highlights that the most effective method to detect deepfakes and manipulated deepfakes is by examining subtle inconsistencies and artifacts in the pixel structure. Forensic analysis of manipulated deepfakes fails to provide accurate result.

Keywords: Deepfakes, voice analysis, pixel analysis, manipulations, recapturing

PPA25

"DECODING ANONYMITY: FROM TEXT TO IDENTITY"

Bhagyashree Kanerkar1, Dr. Surbhi Mathur[1]

[1]National Forensic Sciences University, Gandhinagar, Gujarat

Abstract

The rise of anonymity in online communication has led to increased misuse of digital platforms for unethical and illegal activities, including cyberbullying, online trolling, propaganda dissemination etc. Authorship attribution addresses this challenge by identifying individuals based on their unique writing and communication patterns. This study investigates a comprehensive framework for identifying authorship in online texts, on social media platforms. By leveraging linguistic and stylistic features, the research aims to establish a systematic approach to linking online behavior to individuals. Drawing on established research in authorship attribution, the study incorporates feature selection techniques focusing on vocabulary richness, syntactic patterns, structural layouts, and idiosyncratic elements such as abbreviations, misspellings, repetitive punctuations, use of emojis etc. Data collection involves textual samples from various online platforms, encompassing diverse writing styles and contexts. The studies demonstrate that integrating lexical, structural, and content-specific features enhances the accuracy of authorship identification, even in multilingual and short-text scenarios. This approach allows for creating detailed user profiles that capture communication habits, social media interactions, and stylistic patterns. These profiles are valuable for tracing fake accounts, identifying malicious actors, and promoting accountability in digital spaces.
This research has significant implications for combating cybercrimes and fostering ethical online behavior. By addressing the growing need for accountability in digital interactions, the study provides a foundation for further exploration in multilingual authorship attribution and cyber forensic innovation.

Keywords: Authorship attribution, stylometric features, textual analysis, digital communication, online behavior analysis

PPA26

"TO EXAMINE THE FORENSIC LINGUISTICS CHARACTERISTICS OF A WRITER USING AI MODELS LIKE CHATGPT & BLACKBOX.AI"

Dhyeya Gohil[1], Dr. Deepak Mashru[1]

[1]National Forensic Sciences University, Gandhinagar, Gujarat

Abstract

This study investigates the application of AI models, specifically ChatGPT & Blackbox.ai, in analysing the forensic linguistics characteristics of written texts. Forensic linguistics, a field at the intersection of language and law, traditionally focuses on identifying authorial markers such as vocabulary usage, syntactic patterns, and discourse features. With advancements in AI, AI models are now equipped to offer a novel approach to computationally evaluating these characteristics, which can be used by forensic linguistics in analysing various linguistic evidence to establish an individual's identity. This research begins with a comprehensive review of the literature on forensic linguistics and AI's role in authorship attribution. Whatsapp chats of 25 subjects were extracted and subjected to the AI models, ChatGPT & Blackbox.ai, to understand what kind of information can be deduced by the AI models regarding the conversations. The findings highlight the potential of AI in assisting forensic experts while raising ethical considerations regarding its misuse. This study concludes by comparing the information that can be extracted using the mentioned AI models. It also suggests integrating AI tools and their responsible use in forensic linguistic investigations.

Keywords: Forensic Linguistics, Author identification, Authorial Markers, ChatGPT, Blackbox.ai

PAPER PRESENTATION (STUDENT CATEGORY)

- **SPA01 | Dr. Ankit Mittal**
  A Case Report: Determining the Cause of Death in a Decomposed Body - Traumatic Injury or Drowning?
- **SPA02 | Dr. Anila Karunakaran**
  Non-metric Dental Crown Traits in a Distinct Tribal Ethnic group in South India: A Pilot study
- **SPA03 | Chavda Bhumit Govindbhai**
  The Impact of Protein Biomarkers on Time Since Death Estimation Using Diverse Molecular Techniques
- **SPA04 | Dr. Treasa James**
  Unveiling the Genetic Mystery: Challenges in Forensic Genetic Testing for Sudden Infant Death in a Twin.
- **SPA05 | Nupoor Gopal Neole**
  Ruthenium–based Molecular Electrocatalysts Derived from Pyridine Substituted 1,2,4–Triazol–5–ylidenes for the Ultra Trace–level Detection of Date Rape Drugs
- **SPA06 | Dr. Anupama C**
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- **SPA09 | Kruthi V**
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- **SPA18 | Minha Gupta**
  A Comparative Analysis in Age Estimation Methods using Chaillet and Morris Method in Saurashtra Population: A Gender Specific Bias

SPA01

TITLE: A CASE REPORT: DETERMINING THE CAUSE OF DEATH IN A DECOMPOSED BODY - TRAUMATIC INJURY OR DROWNING?

Dr. Ankit Mittal[1], Dr. Gaurav Sharma[2]

[1]PG Resident, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

[2]Professor & Head, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

Abstract

Drowning, a phenomenon typically occurring in aquatic settings, continues to be a significant public health issue, transcending socioeconomic boundaries. A substantial portion of water-related fatalities are the result of accidental drownings, with a smaller yet notable percentage being attributed to suicidal or homicidal acts. Additionally, some drowning incidents are compounded by factors such as injury, intoxication, or exposure to extreme environmental conditions. Diagnosing death by drowning in forensic medicine is particularly challenging, especially when the body is discovered in a state of decomposition, as traditional signs may not be evident. A comprehensive forensic examination, encompassing external, internal, and laboratory analyses, is crucial for determining the cause of death. This case report presents an unusual instance where the autopsy surgeon faced a diagnostic dilemma, having to discern whether the cause of death was drowning or another external event leading to a fatal outcome.

Keywords: Drowning, injury, intoxication, decomposition, autopsy surgeon, fatal outcome.

SPA02

NON-METRIC DENTAL CROWN TRAITS IN A DISTINCT TRIBAL ETHNIC GROUP IN SOUTH INDIA: A PILOT STUDY

Dr Anila Karunakaran[1]

[1]Prof and Head, Dept of Dentistry, Institute of Integrated Medical Sciences (Govt Medical College), Palakkad

Abstract

Dental morphology is understood to be strongly heritable and selectively neutral. Non-metric dental traits (NDCT) have been widely used as a tool in population and individual identification. The singularity of NDCT is based on their distinct expression and the frequency of occurrence. Rationale: Of the multifarious population groups in India relatively few have been subjected to NDCT studies. Reports on NDCT in tribal population of India are minimal. Several authors have recommended scoring of NDCT to aid in determination of ancestry and population identification. Introduction: In this study, Irula tribals of Palakkad district in Kerala who comprise a distinct ethnic population of South India were assessed for non-metric dental crown traits in an attempt to use the findings as an adjunct in population and sex identification. Materials and Method: A total of 200 subjects, with equal numbers from each gender of age 18 to 60 were taken. Alginate impressions are prepared and stone plaster casts were prepared. The Arizona State University Dental Anthropology System (ASUDAS) which is a popular and reliable instrument for recording NDCT is used in this study. Twenty- two maxillary crown traits, twelve mandibular crown traits and two traits common to both jaws were examined on the plaster casts themselves as they are found to be more effective than scanned digital casts for visualising NDCT. Magnifying hand lens was used and the casts were examined under direct natural light. Only five casts are measured at a time to prevent errors due to fatigue. The mean values of each gender will be compared pairwise using SPSS Statistical Software Package for Analysis of Variance. The study is ongoing at present.

Keyword: Non-metric dental traits, Dental morphology

SPA03

THE IMPACT OF PROTEIN BIOMARKERS ON TIME SINCE DEATH ESTIMATION USING DIVERSE MOLECULAR TECHNIQUES

Bhumit Chavdal[1], Dr. Kapil Kumar[1], Dr. Saumil Merchant[1]

[1]Department of Biochemistry and Forensic Science, Gujarat University, Ahmedabad, India

Abstract

The estimation of time since death (TSD) is a critical component of forensic science, aiding in criminal investigations and legal proceedings. Accurate estimation involves considering factors such as Algor Mortis, Rigor Mortis, Lividity (Livor Mortis), chemical changes, metabolic processes, RNA, DNA, protein degradation, and radiological imaging systems. Because they offer particular biochemical or molecular signs that can be examined in both human and animal tissues, biomarkers are essential for determining the time since death (TSD). In this situation, forensic scientists can more precisely evaluate the post-mortem interval (PMI) using various protein estimate methodologies. This study explores the role of biomarkers, specifically proteins, in determining TSD through various analytical techniques applied to human and animal tissues. As decomposition progresses post-mortem, specific biochemical changes occur, allowing for the identification of reliable biomarkers. Certain biochemical alterations take place as post-mortem decomposition advances, making it possible to identify trustworthy biomarkers. We examine well-known techniques such as Immuno-histochemical (IHC), ATR-FTIR, Mass spectrometry, liquid chromatography, Western blotting, and enzyme-linked immunosorbent assay (ELISA), emphasizing how well they measure the composition and degradation of proteins. We show how the identification of protein biomarkers can improve the precision of PMI estimates by combining various methods. Biomarkers and protein estimation techniques are invaluable in forensic science for estimating the time since death. By concluding, we can understand the biochemical changes that occur post-mortem and employing advanced analytical techniques, forensic scientists can provide more accurate TSD assessments, aiding investigations and legal proceedings. The different techniques were used widely in which SDS-PAGE, Gel Electrophoresis, Western Blot were used mostly due to their precise estimation of protein level.

Keywords: Protein estimation, PMI, Biomarkers, Molecular Techniques, Time Since Death estimation.

SPA04

UNVEILING THE GENETIC MYSTERY: CHALLENGES IN FORENSIC GENETIC TESTING FOR SUDDEN INFANT DEATH IN A TWIN

Dr. Treasa James[1], Dr Akhilesh Pathak[2]

[1]Junior Resident, Department of Forensic Medicine and Toxicology, AIIMS Bathinda

[2]Prof. and Head of Department, Department of Forensic Medicine and Toxicology, AIIMS Bathinda

Abstract

Genetic testing plays a crucial role in understanding underlying causes of sudden infant death (SID), particularly in cases with complex family histories and unusual postmortem findings. This case report highlights a unique forensic case involving a 54-day-old infant who succumbed to sudden death, with the autopsy revealing a mediastinal mass and a notable family history of multiple pregnancy losses in the mother. The infant, one of a set of twins, presents a challenging scenario where a genetic evaluation could provide insights into potential hereditary or de novo mutations contributing to the fatal outcome. Despite its potential utility, genetic testing for forensic samples in India poses significant obstacles. There are limitations due to the lack of established protocols for genetic analysis in postmortem samples, as well as restricted access to specialized laboratories equipped to handle forensic DNA and next-generation sequencing for infants. The associated high cost further complicates the viability of genetic testing in such cases. Consequently, even though a histopathological examination of the mediastinal mass was undertaken, a comprehensive genetic investigation was unattainable, constraining the depth of diagnostic understanding. This case underscores the pressing need for accessible and affordable genetic testing facilities tailored to forensic and pediatric samples. It emphasizes the importance of incorporating genetic insights into forensic medicine to elucidate possible genetic etiologies in sudden, unexplained infant deaths. The findings encourage policymakers to address existing gaps, which could improve diagnostic outcomes and contribute to better prevention and intervention strategies in cases with a familial predisposition to adverse perinatal outcomes.

Keywords: sudden infant death; genetics, postmortem

SPA05

RUTHENIUM–BASED MOLECULAR ELECTROCATALYSTS DERIVED FROM PYRIDINE SUBSTITUTED 1,2,4–TRIAZOL–5–YLIDENES FOR THE ULTRA TRACE–LEVEL DETECTION OF DATE RAPE DRUGS

Nupoor Gopal Neole[1]

[1]Research Scholar, Centre for Nano and Material Sciences, JAIN(Deemed-to-be University), Jain Global Campus, Bangalore, India

Abstract

The paper explores the creation of a sensor designed to identify predatory drugs, such as ketamine, scopolamine and gamma–butyrolactone, using ruthenium(II) NHC complex. Detecting these substances is vital in understanding drug–facilitated sexual assaults, where they are often administered with alcoholic beverages. Current methods for detecting these drugs and their metabolites are time–consuming and require enhanced sensing applications. Ruthenium(II) NHC complex has shown great potential in electrochemical applications and has been utilized to develop a sensor with superior sensitivity (269.41, 33.38 and 61.97 μA μM–1 cm–2) and selectivity for detecting these drugs, with a limit of detection of 0.14, 1.44, and 2.22 nM for ketamine, scopolamine and gamma–butyrolactone, respectively. The sensor has the potential to provide valuable tools for forensic investigations and addresses the urgent need for real–time detection of date rape drugs. The article emphasizes the importance of developing non–enzymatic, environmentally friendly and cost–effective sensors for on–site applications.

Keywords: Date rape drug; Ruthenium(II) NHC complex; Ketamine; Scopolamine; Gamma–Butyrolactone.

SPA06

UNCOVERING THE TRUTH: THE VITAL ROLE OF PROSTHODONTICS IN FORENSIC ODONTOLOGY

Dr. Anupama C[1]

[1]Assistant Professor, Dept of Prosthodontics and Crown & Bridge

J S S Dental College and Hospital, A Constituent college of JSSAHER, Mysuru

Abstract

Forensic odontology is the forensic science that is concerned with dental evidence. It is a relatively new science that utilizes the dentist's knowledge to serve the judicial system. The most common role of the forensic dentist is the identification of deceased individuals. Dental structures are the hardest and most resilient tissues of the human body. Teeth on exposure to post mortem influences will survive longer than other body tissues as the materials used to restore damaged teeth are extremely resistant to physical, chemical, and biological destruction. Forensic identification based on assessment of prosthodontic appliances is assuming greater significance, as labelling of dentures and other prosthetic appliance could provide vital clues for patient identification. The most common role of the forensic dentist is the identification of deceased individuals. Forensic identification based on assessment of prosthodontic appliances is assuming greater significance, as labelling of dentures and other prosthetic appliance could provide vital clues for patient identification. Various recommendations have been made concerning the importance of denture identification. This paper presents a review of available literature highlighting the fact that how a prosthodontist can play a key role in identification of a deceased individual if trained to do so.

Keywords: Prosthodontics, forensic odontology, denture labelling, Palatal rugoscopy, custom restorations.

SPA07

CYBERPSYCHOLOGY IN FORENSIC SCIENCE

Sanskriti Rani Sharma[1]

[1]2nd year, B. Sc. Forensic Science and Criminology, Annai Fathima College of Arts and Science

Abstract

Cyberpsychology is the study of psychological processes related to underlying, all aspects and features of technologically interconnected human behavior. In other words, we can term it as psychology of cyberspace that focuses on the intersection of technology and human behavior. This will tell us about the differences that occur in a human behavior from offline interactions to online interactions. We came across positive and negative aspects of the fact that how this online platform is affecting the human completely. We can relate this with forensic aspects, as now - a – days crimes are also being advanced and using some new digital ways to protect themselves and to commit the crime. They make a world of virtual reality that is consiced into social media platform. We all came across that our life is revolving around social media only; Instagram, Twitter, Whatsapp, Facebook and many more such sites and apps. Further, we will be encountering the cyber cases that are being handled and the use of cyberpsychology for the same. We would be talking about the e- therapy also known as online counseling that is a therapeutic counseling service provided to a patient over the internet. But not only the positive aspect is being considered, we would be also talking about the ethical and legal considerations that need to be considered as it is still a controversial aspect. There is still many misconceptions that are prevailing in between the people about the cyberpsychology as we already know that psychology is something that is not very openly discussed till now of having so many advancements and being in a digital era. We would be exploring the methods and techniques that are newly incorporated with cyberpsychology.

Keyword: Cyberpsychology, Virtual reality, therapeutic counselling

SPA08

SYSTEMATIC REVIEW OF HEART BIOMARKERS USED FOR POST-MORTEM INTERVAL

Feny Puvar[1], Dr. Ankita Patel[1], Dr. Kapil Kumar[1], Dr. Saumil Merchant[1]

[1]Department of Biochemistry and Forensic Science, Gujarat University, Ahmedabad, India

Abstract

One of the main objectives of medico-legal investigations is to accurately determine the time since death. Recent developments in methodologies for measuring time since death have allowed as to better determine the PMI. We have collected data for this review paper from many sources like PubMed, Google Scholar, Research Gate, etc. Scientists have been developing various techniques to ascertain PMI. Since the 1850s body cooling, rigor mortis, ocular changes, putrefaction, supravital reactions, and stomach contents were the foundations of earlier techniques. This method is relatively crude and only an approximate time could be estimated. Recent approaches emphasis has now switched to biochemical approaches due to the of precision. Since there is less of an impact from outside factors. The biochemical approaches which are founded on systematic pathos physiological alterations are proven to be more accurate. The aim of this present study involved cardiac troponin T & I, and creatine kinase MB (CK-MB) are the most accurate biomarkers in the heart to determine PMI. In this review paper, we studied the most accurate methods to use to assess the sensitivity and specificity of biomarkers present in heart tissue. The main aim of this study is to compare the sensitivity and specificities of cardiac troponin T, troponin I, and CK-MB. Troponin T and I give more accurate and precise post-mortem intervals than CK-MB.

Keywords: PMI, Medico-legal, Cardiac Troponin T & I, CK-MB, Heart

SPA09

A PRELIMINARY STUDY TO DETERMINE THE SOURCE OF WRITER IN TWO DIFFERENT SCRIPTS KANNADA AND TELUGU.

Kruthi V[1], Gayathri V[2]

[1]Student (5th semester B.Sc. Forensic Science), R R Institute of Management studies

[2]Assistant professor (Department of Forensic Science), R R Institute of Management Studies

Abstract

Signature Analysis helps in identification of an individual's ans is accepted under the court of law. Signature in India is found in various scripts based on this region. Kannada and Telugu are two prominent scripts of Southern India belonging to Karnataka, Telangana and Andhra pradesh. The current study aims at identifying the source of writer by comparing signatures made in Kannada and Telugu language. Handwriting characteristics are analyzed and an opinion is framed based on the 50 Samples. Collected within the age group of 18-50 years. This approach provides an insight into the examination of multi-lingual scripts and helps in understanding the importance of scripts in Signature Analysis.

Keywords: Handwriting Analysis, Multi-lingual, Signature Analysis, Forensic Linguistics, Questioned signature.

SPA10

DEVELOPMENT OF AGED LATENT FINGERPRINTS FROM NON-POROUS SURFACES USING MOLYBDENUM DISULPHIDE

Mohammed Suhail[1], Gayathri V[2]

[1]Student, 5th Semester B.Sc. Forensic Science,
RR Institute of Management Studies, Bangalore

[2]Assistant Professor, Department of Forensic Science,
RR Institute of Management Studies, Bangalore

Abstract

Molybdenum disulfide (MoS_2) is perhaps one of the most widely used small particle reagents (SPR) for developing latent fingerprints on wet non-porous surfaces such as glass, metal, steel, aluminium, and plastic. Due to its high concentration on the surface, lubricative properties, and the very good adhesive qualities with fingerprint residues, MoS_2 possess a unique advantage over all the surfaces that could otherwise be slippery or too reflective in nature and are unresponsive to traditional fingerprint powders. The current study aims to develop latent fingerprints from various non-porous surfaces that have been exposed to sunlight, submersed in water, and immersed in soil. The samples were collected on the non-porous surfaces and were exposed to environmental conditions. A sample size of 40 was collected in total to determine the efficiency of MoS2 at different time intervals. The study aims at determining the efficiency of MoS2 in aged fingerprints.

Keywords: MoS2, fingerprint, non-porous surfaces, ageing studies, latent prints.

SPA11

ESTIMATING POST-MORTEM INTERVAL OF A HUMAN CADAVER THROUGH FORENSIC ANALYSIS OF MAGGOT DEVELOPMENT: A CIVIL CASE STUDY NASHIK.

Dr. Bharati G. Kolhe[1] and Nikita R. Jawale[1]

Dept of Zoology, GES's HPT Arts and RYK Science College, Nashik

Abstract

The present study aims to determine the Post Mortem Interval (PMI) of a human carcass discovered near Gangapur Dam, Nashik on 13th October 2022 and subsequently taken to a civil mortuary for further investigation. The developmental stage and type of maggots found on the corpse, collected from various parts of the body, aided in estimating the post-mortem interval (PMI). The Accumulated Degree Hour (ADH) method were used to estimate PMI and studied the developmental stage and type of maggots found on the corpse, collected from various parts of the body. For forensic analysis Temperature modeling at the crime scene is a critical factor in determining the minimum post-mortem interval (minPMI), as the life cycle of insects found on the corpse can act as a precise clock to estimate the time since death. The study identified second and third instars larvae of Chrysomya megacephala and Chrysomya rufifacies, indicating that the mortality occurred 72 hours prior. The maggot masses were preserved in absolute alcohol, and live samples were collected for further identification and life cycle study at laboratory. The study emphasizes the importance of conducting comprehensive surveys in the Nashik region to obtain accurate PMI estimates.

Keywords: Post-mortem interval (PMI), Accumulated Degree Hour (ADH) method, Maggots, Temperature modeling, Chrysomya megacephala, Chrysomya rufifacies.

SPA12

UNMASKING THE MENTAL HEALTH CRISIS: A RESEARCH STUDY ON PSYCHOLOGICAL DISORDERS IN ATHMA MIND CARE HOSPITAL TRICHY, TAMILNADU FROM THE YEAR 2020 - 2023

Syed Akram. S[1]

[1]Student, B.Sc., Department of Forensic Science, Srinivasan college of Arts and Science (affiliated to Bharathidasan University), Perambalur, Tamil Nadu, India

Abstract

A retrospective review study was conducted at Athma Hind Care Hospital, Trichy, analyzing mental disorder cases from 2020-2023. Data from medical records revealed 6,310 cases, with males comprising 71.2% (4,490) and females 28.8% (1,820). The age range spanned 13-87 years. The study aimed to identify patterns among hospitalized patients with mental disorders. Results showed a significant prevalence of psychological disorders, emphasizing the need for continuous research and integrating mental health care into general health services. The findings indicate a substantial burden of mental health issues, particularly among young individuals, potentially linked to modern lifestyle and stress factors. This study underscores the importance of addressing surrounding issues and promoting mental well-being. The hospital's data suggests a growing concern requiring collaborative efforts to provide comprehensive mental health care.

Keywords: Retrospective view, psychological disorders, hospital data analysis, mental health research, prevalence of mental health issue.

SPA13

DEVELOPMENT OF FORENSIC TOXICOLOGICAL LIBRARY USING CHEMOMETRIC TECHNIQUES FOR PLANT TOXINS

Dipak Kumar Mahida[1], Ankita Patel[1], Kapil Kumar[1], Mebin Wilson Thomas[2]

[1]Dept of Biochemistry and Forensic Science, Gujarat University, Ahmedabad, Gujarat, India.

[2]Dept of Forensic Science, JAIN (Deemed to be University), Bangalore, Karnataka, India.

Abstract

The establishment of comprehensive forensic toxicological libraries is pivotal in advancing toxicological investigations, particularly in cases involving plant-based poisons. This study focuses on a chemometric-based approach to create a forensic toxicological library of plant toxins, facilitating rapid identification and classification. Ten well-documented poisonous plants were selected for this study, emphasizing their forensic significance. Toxins were extracted using the maceration method with methanol as a solvent to ensure efficient extraction of bioactive compounds. The extracts were subjected to UV-Vis spectrophotometric analysis to obtain detailed spectral profiles, capturing unique absorbance patterns indicative of their chemical compositions. The spectral data were processed using advanced chemometric methods, including Principal Component Analysis (PCA) and Hierarchical Clustering Analysis (HCA). PCA reduced data dimensionality while preserving variance, aiding in the differentiation and visualization of plant toxin profiles based on their spectral characteristics. HCA was employed to cluster the toxins based on similarity, revealing distinct groupings that correspond to plant species and toxin classes. These chemometric analyses enabled the construction of a library that integrates spectral data with statistical interpretation, enhancing the accuracy and reliability of toxin identification. The results demonstrated significant variation in UV-Vis spectra among the ten plant extracts, reflecting their diverse phytochemical compositions. PCA effectively separated the extracts into distinct clusters, and HCA corroborated these findings by forming clear hierarchical groupings. The combined use of these methods proved robust in distinguishing closely related toxins, ensuring the forensic library's precision and applicability. The established library provides a reliable tool for rapid screening and identification of plant toxins, offering significant utility in forensic and clinical investigations. This methodology not only enhances the objectivity of toxicological analyses but also underscores the potential of chemometric techniques in expanding forensic applications. Future research should focus on incorporating additional analytical techniques and expanding the library to encompass a broader spectrum of toxins, fostering advancements in forensic science and toxicology.

Keywords: Forensic toxicology, chemometric technique, Principal Component Analysis

SPA14

INK ANALYSIS IN QUESTIONED DOCUMENTS: ADVANCEMENTS IN SOPHISTICATED TECHNIQUES IN FORENSIC SCIENCE WITHOUT BORDERS

Pearl Sharma[1]

[1]NIMS University

Abstract

Ink analysis is essential in questioned document examination since it provides important evidence in cases involving questioned documents. This field determines the chemical and physical properties of inks to tell their origin, age, and authenticity. Thanks to improvement sophisticated techniques, forensic science has become more effective across borders, helping scientists to achieve better accuracy and make it reliable in solving complex cases. This paper put lights on the importance of ink analysis in detecting forgeries, confirming authenticity, and identifying any tampering in legal, financial, and criminal investigations. It also showca how forensic techniques used globally to go through cross-border crimes. The literature shows how methods, such as thin-layer chromatography (TLC) and spectrophotometry, have evolved into more modern techniques like Raman spectroscopy, liquid chromatography-mass spectrometry (LC-MS), and hyper-spectral imaging. These innovations have significantly enhanced the sensitivity, non-destructive capabilities, and accuracy of ink analysis, allowing for the beneficial differentiation of inks, even those produced by the same manufacturer. Moreover, the incorporation of artificial intelligence (AI) and machine learning in forensic science has taken ink analysis to the next level, making it more precise and advanced. The conclusion highlights how these advancements are effectively transforming the lands of forensic science, turning it into an important resource for criminal justice systems worldwide. By welcoming new technologies and encouraging global cooperation, ink analysis is breaking down geographical and jurisdictional barriers, promoting a more relevant approach to justice. However, it's essential to recognize that establishing standardized protocols and databases are important for the effective incorporation of these techniques across different countries. This abstract highlights the vibrant relationship between science and technology in enhancing forensic methodologies, highlighting ink analysis as a fundamental aspect of modern forensic science across the globe.

Keywords: Raman Spectroscopy, Thin-Layer Chromatography (TLC), Hyper-spectral Imaging, Document Forensics, Non-Destructive Analysis, Ink Aging, Forensic Innovation ,Artificial Intelligence in Forensics

SPA15

EXPLORING EMOTIONAL INFLUENCES ON SPEECH THROUGH FACIAL LANDMARK ANALYSIS: APPLICATIONS IN FORENSIC SCIENCE AND AFFECTIVE COMPUTING

Vernika Mehta[1], Dr. Surbhi Mathur[2]

[1]Research Scholar, School of Doctoral Studies and Research, National Forensic Sciences University, Gandhinagar, Gujarat

[2]Associate Professor, School of Forensic Science, National Forensic Sciences University, Gandhinagar, Gujarat

Abstract

This study explores the intricate relationship between emotions and facial expressions, specifically focusing on the dynamic changes in facial landmarks during speech. By analyzing variations in facial landmarks as speakers express different emotions, we aim to understand how these emotions influence the articulation of various vowels. Utilizing a comprehensive dataset of facial coordinates, we conducted a detailed examination of the facial movements associated with specific emotional states. The results highlight the potential of facial landmark analysis as a tool for emotion detection and contribute to the broader understanding of the physiological manifestations of emotions in speech. This research not only advances the field of affective computing but also opens new avenues for applications in areas such as human-computer interaction, psychological assessment, and forensic analysis. The findings of this study have significant implications for forensic investigation. By establishing a reliable method for emotion detection through facial landmark analysis, forensic experts can enhance the accuracy of witness testimony analysis, deception detection, and psychological profiling. The ability to discern subtle emotional cues from facial expressions during speech can provide critical insights in forensic investigations, particularly in cases where verbal and non-verbal cues play a pivotal role. This research underscores the potential of integrating advanced affective computing techniques into multimedia forensics, thereby improving the robustness and reliability of forensic analyses.

Keywords: Facial Landmarks, Emotions, Facial Expressions, Speech, Emotion Detection, Multimedia Forensics

SPA16

INSTRUMENTAL ANALYSIS TO DETERMINE THE CHEMICAL COMPOSITION OF LATENT FINGERPRINT RESIDUE

Vartika Khare[1], Anu Singla[2]

[1]Research Scholar, Dr. A.P.J Abdul Kalam Institute of Forensic Science, Bundelkhand University, Jhansi, Uttar Pradesh

[2]Associate Professor, Dr. A.P.J Abdul Kalam Institute of Forensic Science, Bundelkhand University, Jhansi, Uttar Pradesh

Abstract

Identification of individuals through latent fingerprint pattern comparison has been a valuable forensic tool for over a century. Latent fingerprint evidences remain unexploitable to identify a suspect if they are smeared, blurred, and more importantly if the intact fingerprint pattern is absent from the police databases. Therefore, in the last decade, analytical technologies have been developed to increase the amount of information recovered during an investigation by providing additional circumstantial evidences. The residue transferred from the fingertip to a surface, can provide additional chemical information related to the suspect. Many studies describe the composition of sweat residue as a complex mixture of numerous fatty acids, inorganic compounds, amino acids, and over 400 polypeptides. From the chemical point of view, a fingerprint is a complex emulsion composed by water, endogenous organic, and inorganic compounds secreted by the eccrine glands, sebaceous components and several exogenous contaminants that adhere to the surface of skin. The main goal of this study is to highlight the presence of the endogenous and exogenous substances in an individual's fingermark to infer a contact, or activity by the aid of Gas Chromatograph-Mass Spectrometer (GC-MS) instrument. A total of fifty fingerprint samples were taken to determine the individual's respective lifestyle. The fingerprint samples were taken on the substrate of Grade-1 Whattman filter paper. The samples were dissolved in the solvent system of Chloroform and methanol which was prepared according to literature for the extraction of the chemical constituents of the fingerprints. The aliquot of the sample was then analysed in GC-MS instrument. Positive results were obtained conforming to the results of other researcher's who performed similar analysis in related Mass Spectrometric techniques. The analysis of fingerprints in providing chemical information about the donor's age, ethnicity, gender, lifestyle and occupation is an important aspect of fingerprint examination. Detailed information is required to study the effects of influence factors on the fingerprint's constituent in order to determine the reaction mechanism for the analytical techniques.

Keywords: Latent fingerprint residue, component recognition, chemical imaging, exogenous substance, forensic identification.

SPA17

SUSTAINABLE NANOTECHNOLOGY IN FORENSICS: THE ROLE OF GREEN CARBON DOTS IN FINGERPRINT DEVELOPMENT

Rahul Ravindra Darunde[1], Hansi Bansal[2], Nirmiti Mate[3]

[1]Department of Forensic Science, Medi-Caps University, Indore

[2]Department of Forensic Science, Government Institute of Forensic Science, Nagpur

[3]Nirmiti Mate, Indian Institute of Technology, Indore

Abstract

The incorporation of sustainable nanotechnologies into forensic science is revolutionizing the detection and analysis of latent fingerprints. In all nanomaterials studied, green carbon dots (C-dots) have secured special emphasis because they could be synthesized in a green way and possess exceptional optical properties. This approach will not only improve visualization of latent fingerprints but will also be the latest trend toward sustainability in practice. A comprehensive literature review has been conducted through searching different academic databases, such as PubMed, Scopus, and Web of Science. The first inclusion criteria were studies published in the last decade, which used C-dots in fingerprint detection, particularly those derived from green sources. The exclusion criteria were studies in languages other than English, articles that had no empirical data, and studies utilizing C-dots produced via normal chemical routes. In this way, the systematic method ensured the strong relevance of the remaining studies for analysis. Such evidence suggests that, despite a dramatic increase in fingerprint-imaging quality due to the use of C-dots, difficulties continue to arise in their application on different surfaces and under different environmental conditions. Future efforts to optimize these nanomaterials will enhance their efficacy in forensic applications. Carbon dots are definitely by and large a green breakthrough for detection of latent fingerprints in forensic science.

Keywords: Latent fingerprint development, carbon dots, green synthesis, forensic science, nanotechnology.

SPA18

A COMPARATIVE ANALYSIS IN AGE ESTIMATION METHODS USING CHAILLET AND MORRIS METHODS IN SAURASHTRA POPULATION- A GENDER SPECIFIC BIAS

Minha Gupta[1]

[1]Department of Oral Medicine and Radiology, Government Dental College and Hospital, Jamnagar, Gujarat, India

Abstract

Accurate estimation of age is paramount in various fields such as forensic anthropology and legal contexts, where it plays a crucial role in identification and decision making processes. This study aims to assess the accuracy and variability of age estimation methods, the Chaillet and Morris methods, across gender groups. Ramhari S. Sathawane has researched on Applicability of Chaillet-Demirjian's and Willem's age assessment methods in Chhattisgarh population. Not much research has been done on the comparative evaluation of the Challet and Morris methods on the population of Gujarat. Therefore, we have chosen this study for our population. The study population consisted of individuals whose age was assessed using the Chaillet and Morris methods, as well as individuals with known actual ages. The sample included a total of 150 people males (82) and females(68). This is a retrospective study. The radiographs were taken from the archive of our institute. This study used ANOVA and t tests to analyze age estimation data obtained from the Chaillet and Morris methods, alongside actual ages, across male and female groups. Descriptive statistics including mean, median, standard deviation, and range were calculated to provide detailed insights into the distribution of age estimates. A comparison between males in Chaillet vs Morris method and between females in Chaillet vs Morris method was done. Thus, the result showed that ANOVA revealed significant differences in age estimates between the Chaillet and Morris methods, as well as actual ages, for both males and females ($P < 0.05$). However, t tests did not indicate statistically significant gender differences in age estimates from either method. A significant difference was observed in actual ages, with males having lower ages on average than females. Descriptive statistics showed consistent underestimation of actual ages by both estimation methods, with females exhibiting higher actual ages compared with males. So we conclude that this study underscores the importance of considering gender specific biases and variations in age estimation methods.

Keywords: Age estimation, ANOVA, Chaillet method, descriptive statistics, forensic anthropology, gender differences, Morris method, t tests

POSTER PRESENTATION (PROFESSIONAL CATEGORY)

- **PPO01 | Prof. Pushparaja Shetty**
  Pathological Limitations in Forensic Dental Identification
- **PPO02 | Dr. Vikram S. Amberkar**
  Dormant Fingerprint Identification through AI- Driven Analysis: Innovation and Application in Forensic Science
- **PPO03 | Dr. Rudrakshi Chickanna**
  Bitemark and its Collection

PPO01

PATHOLOGICAL LIMITATIONS IN FORENSIC DENTAL IDENTIFICATION

Prof .Pushparaja Shetty[1]

[1]Professor Nitte (Deemed to be University), AB Shetty Memorial Institute of Dental Sciences, Mangalore, India

Abstract

There are a number of scientific challenges that could affect the precision and dependability of forensic odontology, or the use of dental evidence in criminal investigations. The validity of dental evidence in forensic identification can be strongly impacted by pathological disorders that affect the teeth and jaw. Dental caries, periodontal diseases, attrition, abrasion, erosion, developmental abnormalities, oral pathologies, tumours, and more are examples of prominent pathological limitations. This review discusses these limitations in details and some suggestion to overcome. These limitations highlight the importance of using dental evidence in combination with other forensic techniques, such as DNA analysis and fingerprinting, to increase accuracy in forensic identification.

Keywords: forensic odontology, dental evidence, dental caries, periodontal diseases, developmental anomalies

PPO02

DORMANT FINGERPRINT IDENTIFICATION THROUGH AI- DRIVEN ANALYSIS: INNOVATION AND APPLICATION IN FORENSIC SCIENCE

Dr. Vikram S. Amberkar[1]

[1]College of Dental Sciences

Abstract

AI has revolutionized fingerprint matching, addressing accuracy, speed, and scalability challenges of traditional techniques. Dormant fingerprint are critical in forensic science but often pose challenges when print are of poor quality, incomplete or deteriorated. Traditional methods, while reliable, can be time consuming and prone to errors, especially in complex cases. AI, including machine learning and deep learning, has become a powerful tool for improving traditional fingerprint matching. AI algorithms can learn from large datasets, identifying patterns that may elude human analysts. This makes AI well-suited for enhancing the accuracy, speed, and scalability of fingerprint matching. AI improves the speed and scalability of fingerprint matching. Traditional AFIS systems struggle with large databases, but AI algorithms can process vast data quickly. AI-driven systems filter out irrelevant matches, speeding up identification, which is crucial for time-sensitive criminal investigations. AI is also being used to predict criminal behaviour and identify potential threats. By analysing patterns in fingerprint data and other biometrics, AI algorithms can identify trends and correlations that may indicate criminal activity. This predictive capability allows law enforcement to take proactive measures and potentially prevent crimes.

Keyword: Fingerprint identification, AI algorithms, Biometrics

PPO03

BITEMARK AND ITS COLLECTION

Dr. Rudrakshi Chickanna[1]

[1]Reader, Department of Periodontology, Krishnadevaraya College of Dental Sciences, Via Yelahanka Post, Hunasamaranahalli, MVIT campus

Abstract

Bitemark have been referred to as ‘Dental fingerprinting’. Evidence collection and presentation forms important part of identification. Each human dentition is unique, even in identical twins. Human and animal bitemarks differ in the form of an arch. Bitemark analysis is demanding and complicated. Human Bitemark is a dynamic biological structure where impression of the tooth marks deteriorates and change rapidly. This review gives history, includes major landmark study and its opinion with knowledge of characteristics, classifications, documentation and description of bitemarks for assessment of ‘Bitemark’. Focuses on standard guidelines for photographs and bitemark evidence collection. Photographs and impressions of bitemarks will be stressed upon. In the process of evidence collection, swabbing for bite marks and handling the tissue samples will also be high lightened. So, it is important for the Dental/Forensic expert to the sufficient knowledge of its assimilation to effectively aid in identification process. This poster will highlight the role of ‘Bitemark and its collection’ methodology in an effective way.

Keywords: Bitemark, Dental fingerprinting, Forensic expert

POSTER PRESENTATION (STUDENT CATEGORY)

- **SPO01 | Chandreyee Roy**
  Understanding the cognitive mechanisms in eyewitness memory: A systematic review of computational modeling literature

- **SPO02 | Angelina Arora**
  A Comprehensive Study of Stereotype-Based Victimization and Its Impact leading to Criminal Behavior in University students.

- **SPO03 | Dr. Kethosino Thou**
  Blunt Force Trauma A Case Report on Type 1 Hinge Fracture of Skull

- **SPO04 | Arpita Priya**
  Driven to Danger: The Hidden Impacts of Drugs on Driving Performance

- **SPO05 | Mukul Jha**
  Importance of CT Scan and Its Role in Age Estimation

- **SPO06 | Harshal Agre**
  Mobile Security Application (Breach Barrier)

- **SPO07 | Ankush Chatterjee**
  Pet Tracker App: Enhancing the Safety and Well-being of Stray Animals on Campus

- **SPO08 | Navneet Kumar**
  Tracing the Invisible: Using eDNA in Combatting Wildlife Trade and Poaching of Indian turtle species in Aquarium Shops

- **SPO09 | R Abissekh**
  Sexual Dimorphism and Determination through Adult Foot Morphology: A Comprehensive Review

- **SPO10 | Anitta Joseph**
  Determining Hand of Origin from Fingerprint Features: A Scoping Review Nikita Vadadoriya

- **SPO11 | Metagenomes and Anti-microbial Resistance Gene as a Potential Biomarker for Forensic Geolocation**

- **SPO12 | Lakshmi S. Panicker**
  Existing Approaches for Quantification of DNA Methylation for Age Estimation of Individuals

SPO01

UNDERSTANDING THE COGNITIVE MECHANISMS IN EYEWITNESS MEMORY: A SYSTEMATIC REVIEW OF COMPUTATIONAL MODELLING LITERATURE

Chandreyee Roy[1], Dr. Sameer Ahmed[2]

[1]Junior Research Fellow, IIT(ISM), Dhanbad

[2]Faculty in Humanities and Social Sciences Department, IIT (ISM) Dhanbad

Abstract

Eyewitness testimony involves complex cognitive processes of encoding, storage, and retrieval under conditions of variable stress and attention. Computational modelling provides significant advantages in elucidating these mechanisms by mathematically simulating the encoding, storage, and retrieval stages, allowing researchers to analyse how factors like attention allocation and memory decay impact recall accuracy. This study aims to examine key information processing models in eyewitness memory, an area often overlooked in recall accuracy research. The review underscores the importance of computational models in eyewitness memory. Marr's Trilevel Hypothesis and Pylyshyn's tiers (Marr; Pylyshyn) frame cognitive processes, while Signal Detection Theory and the WITNESS model address lineup bias and decision-making (Clark, 2008; McCormick, 2022). Mathematical tools like ROC analysis translate theories into measurable variables (Palminteri et al., 2017), and the TBRS model elucidates memory dynamics (Oberauer & Lewandowsky, 2010). Despite gaps in applying these frameworks (Tunnicliff & Clark, 2000; Juslin et al., 2003; Sporer, 2016), they significantly advance legal and psychological research. Using the PRISMA method for systematic review, this study analysed seven core studies, highlighting Signal Detection Theory's (SDT) role in capturing the complexities of eyewitness memory beyond basic identification. The study reviewed seven papers on computational models in eyewitness memory, highlighting Signal Detection Theory (SDT) and Time-Based Resource Sharing (TBRS) for their insights into memory dynamics and decision-making. Key variables include lineup bias, filler equivalence, and retrieval effort, with studies on response latency (Gustafsson et al., 2019) and mediation tasks (McAdoo et al., 2019) showing their impact on accuracy and confidence. Memory interactions (Burgess & Hitch, 2005) further underline the models' significance. Limitations include small samples, limited real-world integration, and insufficient focus on emotional factors, urging future research to leverage tools like explainable AI for broader applicability.

Keywords: Computational Model, Mathematical Model, Time-Based Resource Sharing, Working Memory, Signal Detection Theory, Eyewitness Identification.

SPO02

STEREOTYPES, BULLYING, AND CRIME: A COMPREHENSIVE STUDY OF STEREOTYPE-BASED VICTIMIZATION AND ITS IMPACT LEADING TO CRIMINAL BEHAVIOR

Angelina Arora[1]

[1]Uttaranchal University, Charu Saklani, Assistant Professor, Uttaranchal University, Premnagar, Dehradun, Uttarakhand.

Abstract

India is known for its incredible diversity in culture, traditions, beliefs, languages, and Religions. Yet stereotypes often lead people to judge others based on preconceived Notions about certain social groups. Stereotypes are often created by assumptions or bigotry which are based on a person's language or accent, appearance, background, appearances, religion, region and race. It destroys their mental health. They will slowly damage their self-worth and devalue themselves leading to lowered self-esteem and the negative thoughts results in depression. They isolate themselves from others results in poor academic or job performance. They can experience PTSD (Post Traumatic Stress Disorder), anxiety attacks, hyper vigilance, trauma and nightmares. The problems caused by these stereotypes -based bullying can at times contribute to social seclusion, extreme rage that can extend to criminal activities, especially when there is a lack of emotional support. Repetitive disclosure to discrimination in the long run can result in the loss of empathy in the person making them people having the potential to cause harm. Their desire for power and control increased as they've experienced being controlled and victimized. This chapter is extensively concentrating on how the bullying based on stereotypes can fuel in criminal behavior and measures to be followed if any individual gets bullied basing upon stereotypes and making sure they will not get strayed in a wrong way.

Keywords: stereotypes, criminal behavior, bullying, discrimination.

SPO03

BLUNT FORCE TRAUMA: A CASE REPORT ON TYPE 1 HINGE FRACTURE OF SKULL

Dr. Kethosino Thou[1], Dr. Rishi Rajindran[1], Dr. Kapil[1], Dr. Gaurav Sharma[2], Dr. Yogender Malik[3]

[1]PG Resident, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

[2]Professor & Head, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

[3]Professor, Department of Forensic Medicine, Bhagat Phool Singh Govt. Medical College, Sonipat, Haryana

Abstract

Severe traumatic injuries, particularly resulting from blunt force trauma, are a significant cause of early mortality, with head trauma being especially fatal. Among such injuries, hinge fractures—a type of transverse fracture at the skull base—are notably severe. This report examines a 26-year-old male involved in a fatal railway track accident. During the autopsy, multiple lacerations were observed on the chest, and the left arm was severed at the shoulder joint. Additionally, lacerations were present behind the right ear and over the left ear. Upon opening the cranial cavity, extensive subdural and subarachnoid haemorrhages were noted across both cerebral hemispheres. A distinctive hinge fracture at the skull base was identified, extending from the right petrous ridge to the left, passing through the sella turcica. This case highlights the immense forces at play in high-velocity collisions, such as those involving trains. Blunt force to the head, whether bilateral or unilateral, can cause significant skull deformation leading to such fractures. The catastrophic potential of high-speed collisions is emphasized by this case, underlining the necessity for detailed forensic investigations to understand the mechanisms of trauma and reconstruct the events leading to such severe injuries.

Keywords: blunt force trauma, hinge fractures, railway accident, autopsy, skull fracture

SPO04

DRIVEN TO DANGER: THE HIDDEN IMPACTS OF DRUGS ON DRIVING PERFORMANCE
ARPITA PRIYA

Arpita Priya[1]

[1]Kristu Jayanti College, Autonomous, Karnataka

Abstract

Driving under the influence of drugs is a significant public health issue that affects road safety and increases the risk of accidents. This poster explores the impact of various substances on driving performance, including prescription medications, over-the-counter drugs, and illegal drugs. The introduction highlights the importance of understanding the effects of these substances on drivers' cognitive and motor skills. A comprehensive review of the literature reveals that drug-impaired driving is associated with delayed reaction times, impaired judgment, and reduced coordination. Data collection was conducted through surveys, interviews, and analysis of traffic accident reports. The methodology involved a mixed-methods approach, combining quantitative data from traffic records with qualitative insights from interviews with law enforcement officials and healthcare providers. Results indicate a strong correlation between drug use and increased accident rates. In particular, the study found that drivers under the influence of stimulants exhibited aggressive driving behaviors, while those on depressants showed significant delays in reaction time. The conclusion emphasizes the need for stricter regulations and public awareness campaigns to mitigate the risks associated with drug-impaired driving. By implementing these measures, policymakers can improve road safety and reduce the incidence of drug-related accidents.

Keywords: Drug-impaired driving, road safety, cognitive impairment, reaction time, public health, traffic accidents, substance abuse, policy recommendations, driver behavior, mixed-methods research

SPO05

IMPORTANCE OF CT SCAN AND ITS ROLE IN AGE ESTIMATION

Mukul Jha[1], Dr. Saumil Merchant[2], Dr. Ankita Patel[3]

[1]Research Scholar, Department of Biochemistry and Forensic Science, Gujarat University, Ahmedabad, Gujarat, India

[2]Head of Department (Forensic Medicine) Narendra Modi Medical College, Gujarat University, Ahmedabad, Gujarat, India

[3]Assistant Professor, Department of Biochemistry and Forensic Science, Gujarat University, Ahmedabad, Gujarat, India

Abstract

Age estimation is critical in forensic, legal, medical, and administrative fields, addressing issues such as employment regularization, pension claims, criminal investigations, and civil disputes. Accurate age determination is fundamental for decision-making in these areas. Computed Tomography (CT) has emerged as a reliable and advanced tool for age estimation, offering detailed imaging and precise quantitative analysis. CT imaging enables the assessment of key skeletal indicators, such as cranial suture closure, ossification centers, and the articulating surfaces of the pubic symphysis and auricular region. These anatomical features are crucial for evaluating biological maturity, particularly during adolescence and adulthood. In the Indian context, limited studies have utilized CT imaging for age estimation, especially concerning cranial sutures. This gap highlights the importance of exploring CT-based methods to enhance the accuracy of age determination. The study reviews existing literature on CT imaging techniques and evaluates their reliability in forensic applications. Various age estimation methods are discussed, focusing on how CT technology improves the visualization of skeletal maturity indicators. The findings suggest that CT is a promising modality in forensic anthropology, providing a standardized and reproducible approach to age determination. The study also underscores the importance of integrating CT scans into forensic protocols to complement traditional methods, such as macroscopic skeletal evaluations. CT imaging can address traditional techniques' challenges, particularly in complex cases requiring high accuracy. Furthermore, the study emphasizes the need for population-specific research to refine CT-based age estimation techniques, ensuring their applicability across diverse demographics. In conclusion, CT scans have the potential to revolutionize age estimation in forensic practice, offering a precise, non-invasive, and reliable alternative to conventional methods. By adopting CT imaging in forensic investigations, practitioners can achieve greater accuracy and consistency in age determination, ultimately supporting legal and medical outcomes more effectively.

Keywords: CT Scan images, age estimation, cranial suture closure, skeletal maturity, forensic medicine

SPO06
BREACH BARRIER: A COMPREHENSIVE SOLUTION FOR MOBILE APPLICATION SECURITY

Harshal Agre[1]

[1]Bachelors of Technology, National Institute Of Technology Delhi

Abstract

In the digital era, the widespread use of mobile applications has increased the potential of security breaches and data theft. Breach Barrier, an innovative security tool, addresses this vital issue by identifying vulnerabilities and protecting mobile applications from potential attackers. The app uses cutting-edge technology, such as real-time vulnerability scanning and threat detection algorithms, to check programs for security flaws. Breach Barrier provides actionable insights and solutions, allowing developers to proactively solve security vulnerabilities. Its user-friendly interface allows for smooth integration into the development process, assuring full data security. Breach Barrier's powerful analytical capabilities make it an invaluable tool for developers, cybersecurity specialists, and forensic scientists. By automating the identification of security flaws and improving compliance with industry standards, the software makes a substantial contribution to digital ecosystem security. Breach Barrier not only improves application security, but it also serves as an invaluable resource in forensic investigations, allowing specialists to identify and analyze probable attack pathways. Its implementation promises to change the way security is managed, resulting in a safer and more robust digital world.

Keywords: Breach barrier, cybersecurity, cyber tools

SPO07

PET TRACKER APP: ENHANCING THE SAFETY AND WELL-BEING OF STRAY ANIMALS ON CAMPUS

Ankush Chatterjee[1], Harshit[1], Aditya Chaurasia[1], Anurag Gautam[1]

[1]National Institute of Technology, Bakoli, Delhi

Abstract

In an environment bustling with student activity, such as a college campus, tracking and ensuring the well-being of stray animals, like stray dogs, becomes a crucial responsibility. The Pet Tracker App provides a comprehensive platform designed to manage the health, safety, and identity of these animals efficiently. By leveraging advanced technologies like JWT, Bcrypt and OAuth 2.0 and multi-factor security, the app ensures safe and authorized access to animal data. Key features include: Scanner: Instantly access pet details via a built-in QR Scanner, QR Functionality: Each of the QR's will act as an ID card for each animal which makes them easily identifiable, OAuth 2.0 and Bcrypt Implementation: Provides secure and authenticated access for authorized users and Bcrypt provides encryption to user and pet data stored in the database, Health & Vaccination Management: Track vaccinations and medical records, and receive reminders to maintain the animals' health and well-being, Pet Identity: Each animal will have a unique profile containing details such as Name, ID, Age, Breed, and Health Information, easily accessible in emergencies, Data Security: Implements robust encryption and controlled access to safeguard sensitive animal data, Lost Pet Alerts: Receive notifications if a stray animal is found or needs urgent attention, ensuring prompt action, Add New Animals: Students can add newly discovered animals or update existing profiles, making the platform collaborative and up-to-date for the entire campus community. The Pet Tracker App successfully adds new pets and retrieves existing pet details upon request, working seamlessly in APK form on personal devices as well as on Android virtual devices via Android Studio software. The QR code scanning feature works seamlessly on the personal devices of users via their device camera after permission is granted by the user. The app combines convenience, security, and functionality to foster a compassionate and responsible environment for students and stray animals alike. It empowers users to manage the well-being of these animals proactively, ensuring peace of mind through secure authentication and comprehensive animal profiles.

Keywords: Pet tracker, OAuth 2.0, Bcrypt

SPO08

TRACING THE INVISIBLE: USING EDNA IN COMBATTING WILDLIFE TRADE AND POACHING OF INDIAN TURTLE SPECIES IN AQUARIUM SHOPS

Navneet Paarcha[1], Dr. Shweta Sharma[1]

[1]Department of Forensic Science School of Bio-Medical Science Galgotias University Uttar Pradesh

Abstract

This study looks at how we can use environmental DNA, or eDNA, to find and keep an eye on wildlife. Isn't that cool? Instead of needing to see or catch animals, researchers can check DNA traces in water, soil, or even air. This way, they can track different species without bothering them may this can super helpful in stopping illegal wildlife trade & poaching. The research focuses on Indian turtles species. These turtles are frequently taken because many people want them as pets. The study shows how eDNA can help tackle these unlawful activities in aquarium shops. The results, well we show that eDNA really works we can identify these turtle species just from water samples collected at aquarium stores. This means we get important proof without having to catch the animals. Overall, using eDNA makes it easier for conservationists & law enforcement to watch over wildlife trafficking. They can safeguard endangered species and improve rules to protect them. All of this helps with bigger goals keeping our planet diverse and fighting against illegal wildlife trade in the pet industry.

Keywords: Wildlife Forensic, eDNA, Poaching, Wildlife Trade, Aquarium Setups.

SPO09

SEXUAL DIMORPHISM AND DETERMINATION THROUGH ADULT FOOT MORPHOLOGY: A COMPREHENSIVE REVIEW

R Abissekh[1]

[1]Kasturba Medical College / Manipal Academy of Higher Education

Abstract

Foot morphology is a significant area of study in forensic science due to its potential for sex determination. Numerous studies have explored dimensions, indices, foot length and foot width to establish sexual dimorphism and develop reliable methods for identification. This review consolidates findings from multiple studies to highlight the role of foot-based metrics in forensic applications. Objective:To analyse the effectiveness of foot dimensions, indices and derived metrics as tools for determining sex in various populations. Methods: This review examined 20 studies focussing on foot measurements, footprints and indices used for sex determination. Data from diverse populations were complied, including metrics such as the Foot Index, Heel-Ball Index and footprint angles along with imaging techniques like radiographs and 3D scans. Results: Sexual dimorphism in foot dimensions including length and breadth was consistently observed with males generally having larger feet than females, Indices such as the Foot Index and Heel-Ball index demonstrated high accuracy of these (70-90%) in sex determination, Population-specific variations influenced the accuracy of these methods, underscoring the need for regional calibration, Imaging-based studies provided more precise measurements, enhancing identification reliability. Conclusion: Foot morphology is a reliable parameter for sex determination, with indices and footprints offering effective tools for forensic applications. Further studies are encouraged to develop standardized models applicable across diverse populations.

Keywords: Sexual dimorphism, foot morphology, sex determination, forensic anthropology and footprint analysis.

SPO10

"DETERMINING HAND OF ORIGIN FROM FINGERPRINT FEATURES: A SCOPING REVIEW"

Anitta Joseph[1], Dr. Subbulakshmi Ganesan[2]

[1]Research Scholar, Department of Forensic Science, Jain Deemed to be University, School of Sciences, Bangalore

[2]Assistant Professor, Department of Chemistry and Biochemistry, Jain Deemed to be University, School of Sciences, Bangalore

Abstract

Determining hand origin from fingerprints is vital in forensic science, aiding in criminal investigations, victim identification, and legal processes. Identifying whether a fingerprint belongs to the left or right hand provides essential insights for reconstructing crime scenes, validating witness statements, and narrowing down suspects. This distinction is significant when dealing with overlapping or partial fingerprints. Beyond forensic applications, this knowledge also strengthens biometric identification systems, enhancing security measures. Key parameters, such as the slope of the apex ridge, delta-to-core distances, mid-core and loop positions, and ridge tracing, have been investigated for their role in determining hand origin. However, these features can vary due to factors like sex and population diversity, emphasizing the need for systematic reviews. Advances in computational approaches, including machine learning, offer new opportunities to improve reliability and accuracy of hand origin determination. This scoping review synthesizes current evidence, identifies gaps, and provides insights into the forensic applicability of fingerprint parameters for determining hand origin. Objectives: 1. Identify and analyze fingerprint parameters that are indicative of hand origin. 2. Identify emerging technologies that improve the accuracy of hand determination. Methodology: A systematic search of Scopus, PubMed, and Web of Science databases was conducted using targeted keywords to identify studies on fingerprint-based hand determination. Results: Studies indicate that the slope of apex ridges, delta-to-core distances, loop and mid-core positions in twinned loops and axis slants in whorl patterns are significant indicators of hand origin. Moreover, integrating biometric systems and advanced statistical models, such as the likelihood ratio (LR), has enhanced the accuracy of fingerprint analysis. However, methodological inconsistencies and limited population diversity were common limitations across studies. Conclusions: While fingerprint parameters are valuable in hand determination, further standardization and validation are essential. Expanding research across diverse populations and leveraging computational tools can advance the field.

Keywords: Hand of origin, Fingerprints, dactyloscopy, Ridges, side determination

SPO11

METAGENOMES AND ANTI-MICROBIAL RESISTANCE GENE AS A POTENTIAL BIOMARKER FOR FORENSIC GEOLOCATION

Nikita Vadadoriya[1], Dr. Poonam Gupta[1]

[1]School of forensic science, National forensic sciences university, Gandhinagar, Gujarat

Abstract

Microbiome includes all the microorganisms such as bacteria, fungi, viruses, algae and other small protozoa alongwith their genomes in given habitat. Advancement in the molecular techniques and bioinformatic tools have made the study of microbiome easier for applications in forensics analysis. Environmental samples such as water, soil and plants can provide many important clues for forensic investigation. Studies on environmental microbiology have shown variety of microbes present in water and soil. Strains and species vary from region to region on the basis of various environmental factors. Location specific microbes and their metabolic gene such as antimicrobial genes can be used as a biomarker for forensic geolocation prediction. Antimicrobial resistance (AMR) is a significant global public health threat. There are different sources for AMR; including agriculture, farming and livestock in rural and suburban areas, household and industrial sewage, usage of antimicrobials and human and animal waste, all these factors contribute to the complexity of AMR transmission. Studies have observed that the geographical location influence the resistome patterns and the microbiota composition were further influenced. Metagenomic methods enable nearly real-time monitoring of organisms, AMR genes and pathogens as they emerge within a given geographical location using various molecular technologies such as terminal restriction fragment length polymorphism (TRFLP), denaturing gel electrophoresis (DGGE), ribosomal intergenic spacer analysis (RISA) and NGS (16S rRNA gene, 18S rRNA gene, metabarcoding and shotgun metagenomics) for Forensic geolocation application. Here in this review, microbiome application for forensic geolocation inference and different methods used for the same has been discussed.

Keywords: Microbiome, Metagenomics, Anti-microbial resistance, NGS, forensic geolocation

EXISTING APPROACHES FOR QUANTIFICATION OF DNA METHYLATION FOR AGE ESTIMATION OF INDIVIDUALS

Ms. Lakshmi S. Panicker[1], Dr. Poonam Gupta[1]

[1]School of Forensic Sciences, National Forensic Sciences University, Gandhinagar, Gujarat

Abstract

The identification of the contributor, who may be the crime's perpetrator or victim, is greatly aided by biological evidences in forensic sciences. Any information derived from the evidence that can be interpreted in the case of unknown individuals may be helpful in generating appropriate leads for the investigation. Age estimation is considered to be one such biological profiling that could be useful in narrowing down the search. Traditionally, morphological techniques including bone traits and dental characteristics were used to estimate age; however, these techniques also have certain shortcomings. Recent years have shown great promise for the application of epigenetics in the forensic sciences. It is a field of biology that investigates the causal relationships that result in phenotypes between genes and their products. One process that falls under the umbrella of epigenetics is DNA methylation. The procedure of estimating age may benefit from knowing the degree of methylation at particular genes. According to the literature, certain genes found in human DNA have demonstrated the ability to be utilized as indicators of age by establishing a correlation with the degree of methylation observed in the genes' promoter region. There are many different techniques that have been found to be useful for DNA methylation studies. Reviewing the existing approaches for this purpose and highlighting their many benefits and drawbacks is the goal of the current paper. Methylation-specific PCR (RT-MSP), methylation-specific high-resolution melting (MS-HRM), pyrosequencing, EpiTyper, droplet digital PCR (ddPCR), SNaPshot sequencing, and next-generation sequencing are some of these different techniques. Understanding the approaches and reviewing them according to how they are used in regular forensic casework were made easier by the review. The cost-effectiveness, accuracy rate, analysis duration, and method complexity are some of the factors that are taken into account for appropriate procedures.

Keywords: Epigenetics, DNA methylation, age estimation, biological profiling, Quantitation.

Address : Bulwagang Kanlahi, Diwa Ng Tarlac, Tarlac, Philippines
Mobile : +91-98188 77002
Email : forencon2024@gmail.com

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