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Aims & Scope

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Sanitizer a Lockdown Hooch! – A Case Series

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ABSTRACT

What began as a mysterious infectious outbreak in Wuhan in Dec 2019 soon engulfed the entire globe. The whole of India was placed under a complete lockdown (25 March to 14 April 2020) to prevent the further spread of coronavirus disease. In the absence of any definitive drug or vaccine for the disease, people seem to be trying novel methods to contain the virus which is proving fatal. Hand hygiene products are heavily used in community and healthcare settings in everyday life to maintain hand hygiene. During the lockdown period, many alcoholics suffered acute withdrawal and delirium episodes. WHO and FDA recommended alcohol-based hand sanitizers for frequent hand hygiene which contain mainly ethanol, isopropyl alcohol, and hydrogen peroxide in varying proportions¹. Methanol must never be used in such a product because oral, pulmonary, and skin exposure can result in severe local and systemic toxicity and even death². More than 4% methanol must be labelled as poison³. In a recent study by the Mumbai-based Consumer Guidance Society of India, 122 hand sanitizer tested, 37% were of poor quality and 4% contained the toxic chemical methanol⁴. Instead of liquor, these addicts resorted to consuming hand sanitizers. We have encountered six cases of sanitizer poisoning during the lockdown period from 24th March to 3rd May 2020 in KIMS Hubballi, Karnataka. Here we discuss a case series of poisoning due to the consumption of the sanitizer – a novel Hooch in the lockdown period.

Keywords: Sanitizer, Hooch, Lockdown, Poisoning

Introduction

Methanol (CH₃OH), which has long been used in mummification in ancient Egypt, was obtained from the distillation of wood, which in Greek roots was called methylene or wood wine⁹. It is a toxic alcohol used as a solvent or in denatured industrial alcohol. Methanol production reached industrial scale in 1923 and has found wide applications in various consumer industries, such as model cars, airplane fuel, perfumery, copy machine fluid, gas line antifreeze (“dry gas”), etc.¹⁰ Following the coronavirus disease 2019 (COVID-19) pandemic in Iran (February 19, 2020 to April 27, 2020), there has been a significant increase in methanol-induced morbidity and mortality. This was the prevalence of methanol mass poisoning in the country in recent periods. Because methanol is less expensive and more readily available than ethanol, some fraudsters in Iran use it instead of ethanol in homemade alcohol. Therefore, it is important to increase public knowledge about the deadly consequences of consuming fake alcohol sold on the black. The most common cause of methanol poisoning in India is adulteration of alcoholic drinks. These alcoholic drinks are illicit liquor produced by unauthorized persons. Methanol claims to

give early kick when mixed with alcohol. Hence, adulteration is done. Secondly, it is cheaper than ethanol, which makes it suitable for mixing. Methanol ingestion is an uncommon form of poisoning that can cause severe metabolic disturbances, blindness, permanent neurologic dysfunction and death. While methanol itself may be harmless, it is converted in vivo to the highly toxic formic acid¹³. We have encountered cases of sanitizer poisoning during the lockdown period from 24th March to 3rd May 2020 in KIMS Hubballi, Karnataka.

Case series

A 45-year-old male patient presented with complaints of loss of consciousness and vomiting with a history of consumption of hand sanitizer. On examination, the patient was unconscious, with poor respiratory effort and gasping. His vitals were not stable. The patient was intubated immediately and he died within one hour. Postmortem examination findings are mentioned in Table 1. Blood and viscera are preserved and sent to Regional Forensic Science Laboratory (RFSL), reports mentioned in Table 3.

A 42-year-old male patient presented with complaints of loss of consciousness with a history of consumption of hand sanitizer. On examination, the deceased was unconscious, with poor respiratory effort and gasping. At the time of admission, pulse rate was feeble, saturation was 50% in room air and blood pressure was low. The patient was intubated immediately, and despite all the patient died within one hour. Postmortem examination findings are mentioned in Table 1. Viscera are preserved and sent for histopathological examination, reports mentioned in Table 2. Blood and viscera are preserved and sent to RFSL, reports mentioned in Table 3.



Figure 1: Petechial haemorrhage in the left ventricle

Figure 2: Stomach contains green colour fluid



Figure 3: Mucosa of stomach - Congested

Figure 4: Section from coronaries showing occlusion



Figure 5: Section from myocardium showing waviness of fibres

Figure 6: Section from lungs showing pulmonary oedema

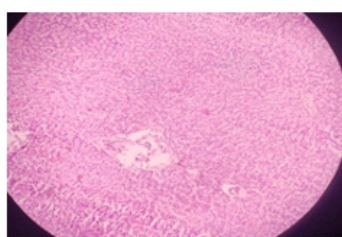


Figure 7: Section from liver showing fatty liver with portal hepatitis.

A 47-year-old female patient presented with complaints of loss of consciousness and convulsion with a history of consumption of hand sanitizer. On examination, the patient was unconscious and gasping. His vitals were not stable. The patient was intubated immediately, and despite all efforts, the patient died within four hours. Postmortem examination findings are mentioned in Table 1. Viscera are preserved and sent for histopathological examination, reports mentioned in table-2. Blood and viscera are preserved and sent to RFSL, mentioned in Table 3.



Figure 1: Hand Sanitizer.



Figure 2: Stomach contains reddish colour fluid.

Figure 3: Mucosa of stomach- Haemorrhagic.

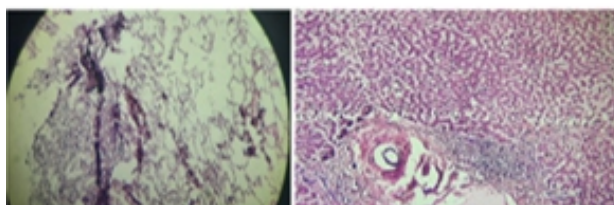


Figure 4: Section from lungs shows Interstitial Pneumonia.

Figure 5: Section from liver shows Acute hepatic injury.

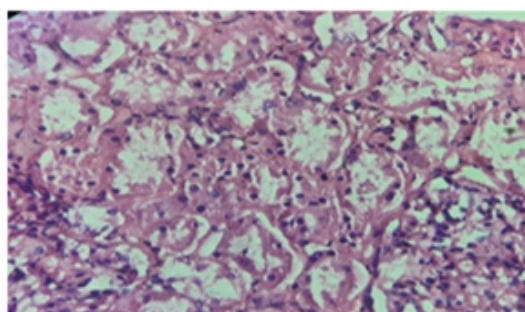


Figure 6: Section from kidney shows Acute tubular necrosis.

A 45-year-old male presented with complaints of loss of consciousness, convulsion and syncope with a history of consumption of hand sanitizer. On examination, he was unconscious and had poor respiratory effort. His vitals were not stable. The patient was intubated immediately, and despite all efforts, the patient died after 1 day. Postmortem examination findings are mentioned in Table 1. Blood and viscera are preserved and sent to RFSL, reports mentioned in Table 3.

A 50-year-old male presented with complaints of convulsion, gasping and syncope with a history of consumption of hand sanitizer. On examination, he was unconscious, with a feeble pulse, saturation not recorded and poor respiratory effort. The patient was intubated immediately, and despite all efforts, the patient died within two and a half hours. Postmortem examination findings are mentioned in Table 1. Blood and viscera are preserved and sent to RFSL, reports mentioned in Table 3.

A 29-year-old male patient was admitted with a history of consumption of hand sanitizer. On examination, the patient was conscious and stable. He was admitted for 3 days in our hospital and went against medical advice. Then he was admitted to a rehabilitation centre for withdrawal symptoms and recovered spontaneously.

Table 1: Postmortem findings.

	Case 1	Case 2	Case 3	Case 4	Case 5
Larynx & Trachea	Froth present.	Congested	Congested	Congested	Yellowish discolouration of epiglottis.
Lungs C/S	Voluminous & congested. Blood stained frothy fluid.	Voluminous & congested. Blood stained frothy fluid.	Voluminous & congested. Blood stained frothy fluid.	Voluminous & congested. Minimal blood stained fluid.	Congested. Blood stained frothy fluid.
Heart	Congested	Congested	Surface shows petechial spots.	Enlarged.	Congested
Stomach	150ml of watery fluid.	100ml of brown colour fluid	100 ml of green colour fluid	250 ml of watery fluid.	50 ml mucoid dark fluid
Smell	Present	Present	Present	Absent	Present
Mucosa	Congested	Haemorrhagic	Haemorrhagic	Congested	Thinned out at greater curvature.
Liver	Fatty changes	Congested	Congested	Congested	Fatty changes

Table 2: Histopathological findings.

	CASE 2	CASE 3
Heart	Myocardial infarction of left ventricle. Pericardium- Dense areas of haemorrhage. Coronary arteries- Occluded (Figure- 4)	Unremarkable.
Lungs	Pulmonary Oedema with early changes of acute lung injury. (Figure- 6)	Interstitial pneumonia. (Figure- 4)
Liver	Fatty liver with portal hepatitis (Figure- 7)	Acute hepatic injury (Figure- 5)
Kidney	Acute tubular necrosis	Acute tubular necrosis (Figure- 6)

Table 3: Methyl alcohol in blood.

	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5
RFSL REPORT	Methyl alcohol- 82.26mg/100ml blood. Ethyl alcohol- 12.53mg/100ml blood(8 & 1/2hrs after death)	Methyl alcohol- 53.95mg/ml blood.(18hrs after death)	Methyl alcohol- 71.75mg/100ml blood.(10hrs after death)	Negative (11hrs after death)	Phenol (12hrs after death)

Discussion

Alcohol-based hand rubs should not contain methanol for obvious reasons. The unexpected presence of methanol poses a series threat to public health. During the lockdown period, many alcoholic dependents suffered acute withdrawals and delirium episodes. Some of them struggled hard to fight their addictions to alcohol as all liquor shops have been closed down¹⁴. Instead of liquor, these people had resorted to hand sanitizers as novel hooch. Methanol has a weak ability to kill viruses but can be toxic to humans. When a is exposed to methanol, it is absorbed through the skin, stomach, or lungs. Methanol itself is not highly toxic, but it is metabolised to toxic metabolites. 10 – 30ml of methanol can lead to death for an adult. It is fatal due to CNS depressant properties and effects of metabolites. Formic acid inhibits mitochondrial cytochrome C oxidase causing the symptoms of hypoxia at the cellular event and also causing metabolic acidosis. After ingestion, CNS depression, headache, dizziness, nausea, lack of coordination and confusion begin. Once initial symptoms passed second set of symptoms arose 10 to 30 hours after initial exposure to methanol including blurring of vision, loss of vision and acidosis. These symptoms result in the accumulation of toxic levels of formic acid in the blood and may progress to death by respiratory failure. Health authorities and manufacturers repeatedly remind consumers that alcohol-based hand rub is for external use only. The consumption of surrogate alcohol is a major health problem. When taken by mouth, methanol, if ever as a substitute for isopropyl alcohol or ethanol, in the hand rub will cause much greater mortality and morbidity¹⁵. We have encountered six cases of sanitizer poisoning during the lockdown period. In case number 1, 2, and 3, a high amount of methyl alcohol was found in the blood. But in case number 4 it was negative. In case number 5, though a history of hand sanitizer poisoning, however, phenol was identified in the blood. In Canada, Two Ontario residents had died after ingesting a hand sanitizer⁵. In USA, a 42 years old man died after ingesting a hand sanitizer⁶. In China, a hospital mistakenly purchased industrial alcohol for surgeons to disinfect the hands before surgery. It was used 3-5 sessions per week. There was soon skin dryness and desquamation of the areas exposed to the hand rub. Six months later, 5 surgeons in the same unit developed erythema and rash in the affected areas. Four surgeons stopped using this product and recovered spontaneously. The fifth surgeon had further exposure and he developed mild visual impairment which gradually improved after stopping this product. The sixth surgeon continued to use the hand rub until blurred vision occurred⁷. During the COVID 19 pandemic, Iranian media reported that nearly 300 people had died and over a 1000 fallen ill after consuming methanol amid false rumours that it can help cure the disease caused by coronavirus⁸. In our cases, specific therapy was not initiated because the physician did not think of methanol poisoning in a hand sanitizer.

Conclusion

The government should have made alternate arrangements to handle withdrawal cases. Encourage people to use soap instead of hand sanitizer. Strictly regulate and monitor commercially available hand sanitizer. Avoid locally available hand sanitizer. Awareness among healthcare professionals will facilitate the early detection, management, and prevention of poisoning incidents of public health significance. Appropriate public education is mandatory to fight the misinformation that is being spread through social media.

Conflict of Interest: Nil

Financial support & sponsorship: Nil

Ethical Clearance: Nil

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A Case report of Unknown Identity: Investigating a Death on Railway Tracks

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ABSTRACT

Unidentified bodies pose substantial challenges in forensic and medico-legal investigations, requiring a thorough and multidisciplinary approach. This case report discusses the forensic investigation of an unidentified male, approximately 40 years old, discovered deceased on the railway tracks. In this case, severe traumatic injuries were observed, particularly to the head and face, suggesting a high-impact collision, likely with a moving train. However, the absence of personal identification documents complicated the process of establishing the individual's identity. The forensic examination revealed multiple traumatic injuries, including a crushed head, fractures in the upper limbs, and significant abdominal lacerations. Internal findings such as congested organs, ruptured spleen, and lacerated liver supported the high-impact trauma hypothesis. The presence of post-mortem staining and rigor mortis provided further insight into the timing of death. Notably, a tattoo in Urdu and circumcision suggested the deceased's religious background, aiding in preliminary identification efforts. This case highlights the complexities involved in distinguishing between pre- and post-mortem injuries, and emphasizes the importance of forensic techniques such as DNA profiling and dental record comparisons in resolving cases involving unknown victims. The investigation underscores the need for a comprehensive, multidisciplinary approach to railway fatalities, combining scene analysis, autopsy, and ancillary testing to determine the cause of death and support identification efforts. Such cases necessitate coordinated efforts among forensic experts, law enforcement, and medical examiners.

Keywords: Unidentified Male, Railway Tracks, Forensic Investigation, Blunt Force Trauma, Autopsy Findings, Medico-Legal Examination

Introduction

The discovery of unidentified bodies poses significant challenges in forensic and medicolegal investigations, demanding a meticulous and multidisciplinary approach to determine the cause of death and establish the identity of the deceased [1]. This case report details the investigation of an unknown

male, approximately 40 years old, found dead on the railway tracks in a capital city of a state. Railway-related fatalities can result from various scenarios, including accidental deaths, suicides, and homicides, each requiring distinct investigative strategies [2]. On the morning, the lifeless body of the unidentified male was discovered on the railway tracks, triggering a comprehensive forensic examination. The initial assessment suggested severe traumatic injuries consistent with a high-impact event, likely involving a moving train. However, the lack of identification documents or personal belongings at the scene necessitated a thorough investigation to rule out foul play and uncover the victim's identity.

This report aims to provide an in-depth analysis of the forensic procedures undertaken, from the scene investigation to the autopsy findings and subsequent ancillary tests. It highlights the complexities involved in distinguishing between pre- and post-mortem injuries and emphasizes the role of toxicological analysis in understanding the victim's state at the time of death.

The identification process, including the use of advanced forensic techniques such as DNA profiling and dental records, is also discussed. Through this case report, we aim to shed light on the investigative challenges and underscore the importance of a coordinated effort among forensic experts, enforcement, and medical examiners in resolving cases involving unidentified victims on railway tracks.

Case Description

An unidentified male, approximately 40 years old, was found deceased on the railway tracks. The following observations and findings were noted during the forensic examination:

Physical Characteristics

- **Build:** Average build, weighing approximately 80 kg and measuring 180 cm in height.
- **Rigor Mortis:** Rigor mortis had passed from both the upper and lower limbs.
- **Post-Mortem Staining:** Present on the back.
- **Identifying Marks:** A tattoo mark on the dorsum of the hand with an Urdu word (Figure: 1) and a circumcised penis, suggesting the deceased was of Muslim religion.



Figure: 1



Figure: 2

Injuries

- **Head and Face:** The head and face were crushed from front to back. All structures above the mandible were destroyed, and the brain was absent from the body bag. (Figure: 2)
- **Right Shoulder:** Swelling was noted. Upon examination, a fracture of the right humerus shaft was found, approximately 5 cm distal to the shoulder joint.
- **Left Forearm:** Swelling was observed. Upon examination, a fracture of the ulna was found, approximately 5 cm distal to the elbow joint.
- **Abdomen:** A laceration measuring 12 x 4 cm was present on the left side of the abdomen, muscle deep, located 1 cm above the iliac crest and 18 cm from the umbilicus. (Figure: 3)
- Multiple contusions of sizes varying from 2x3 cm to 8x4 cm were found on the lateral aspect of the left thigh, along with grease staining. (Figure: 4)

- Multiple graze abrasions are present on the entire surface of the back of the right arm.
- Additionally, multiple abrasions of various sizes and shapes are present on the front of the right knee.



Figure: 3



Figure: 4



Figure: 5

Internal examination:

All internal organs were found to be congested. The lungs showed black pigment deposition and congestion. The spleen was found ruptured, with approximately 500 ml of clotted blood present in the abdominal cavity. Multiple lacerations and ruptures were observed on the anterior surface of the liver. (Figure: 5) The heart was congested, with the right ventricle filled with blood and the left ventricle empty.

Negative findings: There were no signs of respiratory failure, asphyxia, or poisoning, including cyanosis, ligature marks on the wrists and ankles, and hemorrhagic spots in the gastric mucosa.

Discussion

The severe traumatic injuries to the head and face in this case indicate a high-impact collision, most likely involving a moving train. Research by Rupani Raja et al. highlights that facial injuries are frequently seen in railway track accidents (29.72%), second only to road traffic accidents (56.75%) [3, 4]. The presence of rigor mortis suggests that the body had been deceased for a considerable time before being discovered. Additionally, the post-mortem staining on the back implies that the body was lying in a supine position for a period after death. A study by Kumar S. found that out of 20,877 autopsy cases, 3,169 (15.17%) were unclaimed bodies, with railway and road traffic accidents accounting for 516 (68.25%) accidental deaths in males and 301 (88.01%) in females [5]. The presence of a tattoo in Urdu and circumcision offers potential clues regarding the deceased's religious background, which may assist in identification [6]. In such cases, it is crucial that the legal system effectively collects and evaluates forensic evidence found at the scene of the incident to ensure justice [7]. This forensic analysis plays a vital role in bridging the gap between medico-legal investigations and criminal justice, aiding both identification and accountability in trauma-related deaths [8].

Opinion:

The time since death is likely 24 to 36 hours, as rigor mortis has passed, indicating a timeframe

consistent with decomposition. The cause of death appears to be high-impact trauma from a moving train, evidenced by severe head injuries, multiple fractures, and internal organ damage, particularly to the spleen and liver. Identification may be aided by the Urdu tattoo and circumcision, suggesting a Muslim background, but further investigation is needed. Recommended actions include DNA profiling, toxicology analysis, and fingerprint matching, along with a detailed scene investigation to establish circumstances surrounding the death and confirm identity.

Conflict of interest: There is no conflict of interest among the authors.

Source of funding: There is no funding agency to support the study

Ethical clearance: This case report does not require ethical clearance as it is based on a single case analysis.

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Relationship Between Arm Span and Human Stature

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ABSTRACT

Background: Incomplete human remains may be recovered from crime scenes in some cases. Stature estimation from this remains may be very important in the personal identification of the corpse or living. If the stature could be estimated it can definitely narrow down the search in missing individual data base. This study was intended to find out correlation between arm span and human stature and to derive a regression model to find out human stature from arm span.

Materials and methods: This cross sectional study was conducted on 100 subjects, 50 males and 50 females aged between 21 and 60 years in the department of Forensic Medicine in Govt. Medical College, Thrissur.

Results: In females the average arm span is 159.91 ± 5.61 cm, and mean height is 157.44 ± 4.93 cm, correlation coefficient R is 0.8388. In males the average arm span is 173.83 ± 6.02 cm and mean height is 170.85 ± 5.2 cm, correlation coefficient (r) is 0.8934. Thus stature is strongly correlated with arm span. The knowledge of correlation between arm span and stature is important for identification of unknown bodies when a part of body with intact upper extremities on the axial skeleton is available and from that the height of the person can be calculated in situations like mass disasters- landslide, aeroplane crash, railway occurrence, animal attack, homicides with dismembered body etc and a comparison can be made with the available missing persons data. It can also be used for identifying stature in cases like amputation of the lower limb done due to various diseases and spinal deformities.

Key Words: Stature, arm span, upper extremities, forensic anthropometry, identity

Introduction

Stature estimation from various skeletal elements has been an area of vital interest among researchers.¹ Many varieties of mathematical techniques were developed to derive stature from both living, dead and skeletal remains. Trotter and Gleser method is among the mostly used techniques.²⁻⁴ Identification and identity establishment makes an autopsy complete.

The need of stature identification becomes necessary in mutilated fragments, shattered remains, amputated and decomposed bodies collected from mass disasters like tsunamis, bomb blast, earthquakes, road traffic or aeroplane crash, war, landslide, flood etc. The importance and significance of cephalometry, craniometry, somatometry and osteometry for the identification of human remains have been described and later on a new term 'Forensic Anthropometry' was coined.

The foundation from which anthropology has evolved includes the big 4s Age, stature, sex and race.⁶ The key methods used for stature estimation are Mathematical and Anatomical methods. In the mathematical method it takes advantage of higher linear correlation between stature and long bones. One can use a regression equation with long bone as the independent or dependent variable that reflects

the relationship between an individual's stature and the chosen bone. In anatomical method, which is commonly known as "Fully's method", stature is reconstructed by summing the measurements of skeletal elements which contribute the height and a correction factor is added for the soft tissues.⁷

Stature estimation from bones is a time consuming process which involves the preparation, cleaning and washing of bones. Because of this reason Forensic anthropologists are using percutaneous measurements instead of bone measurement. The measurement of arm span for identifying human stature can be added to the arsenal and the correlation between arm span and stature was found to be most reliable.⁸

Arm span is the maximum distance between the tips of the longest fingers of both hands when the person extends both arms at the level of the shoulders. Stature is the distance measured from the point where the heel touches the floor to the highest point of head when the person is in erect position.⁹ This study was done to find out the relationship between arm span and human stature. Another purpose of the study was to derive a regression equation to find out stature from arm span. Studies had been conducted by Agnihotri AK et al, Sen J et al and Saco-Ledo G et al to know the correlation between stature and foot length, stature and foot breadth, stature and tibial length.¹⁰⁻¹² Investigators like Gardasevic J et al, Arifi F et al and Supare MS et al had conducted studies to find out relationship between arm span and stature.¹³⁻¹⁵ Study by Mohan Kumar S and Kamate V among farm workers of North Karnataka region shows that there were differences in body dimensions from the anthropometric data of other part of India.¹⁶ We have conducted this study among students and staff at Govt. Medical college, Thrissur, Kerala to find out correlation between arm span and stature and to find out a regression formula to detect stature from arm span.

Objectives:

1. To find out relationship between arm span and stature of an individual.
2. To formulate a regression model to predict stature of an individual from arm span.

Materials and Methods

This is a cross sectional study on 100 subjects, 50 males and 50 females aged between 21 and 60 years in the department of Forensic Medicine in Govt. Medical College, Thrissur. Sampling technique used was simple random sampling. Subjects were taken in the age group of 21-60 years as to include the persons whose ossification centres are completely fused.

Inclusion criteria:

All Staffs and post graduate students over age 21.

Exclusion criteria:

1. Subjects with apparent symptomatic diseases, deformities, fracture, amputation or history of any surgical procedures of upper limbs.
2. Who are not willing to participate in the study.

Measurement of stature:

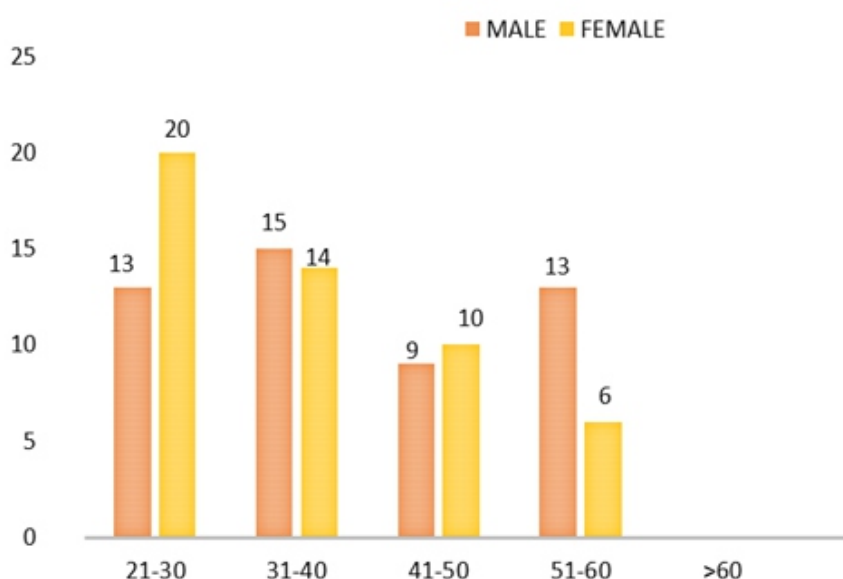
The subjects were asked to stand erect with their heel together and backs straight as possible so that the heels, buttocks, shoulders and the head touch the rod of stadiometer (in Frankfurt plane). The arms were hung freely by the sides. Reading was taken from the stadiometer scale at the vertex point (highest point on their head) with sensitivity 0.5 cm. The reading was taken three times and their average value was taken.

Measurement of arm span.:

It was measured using a measuring tape up to 5mm accuracy. Arm span was measured as the distance between tip of middle fingers on the stretched upper limbs.

Results**Table 1. Total study population**

Individuals analysed	
No. of males	50
No. of females	50
Total	100

**Figure 1: Age wise distribution of study population.**

The age group of the female subjects ranged from 21 years to 60 years with the mean age of 35.54 ± 8.49 SD. The age group of male subjects ranged from 21 years to 60 years with the mean age of 37.39 ± 9.58 SD. Majority of the subjects belongs to the age group 21-30 years. Even though there are more women in the 21-30 age group and less women in the 51-60 age group this would not have impact on the finding because of the fact that in both these cases ossification centres are fused and height and arm span remain constant.

Arm span and height were calculated by standard procedure.

The height of subjects varies from 144 cm to 183 cm with mean height of 164.15 ± 8.42 SD

Arm span varies from 146 cm to 185 cm with mean of 166.87 ± 9.08 SD.

Correlation between arm span and stature

In males the mean arm span is 173.83 ± 6.02 cm.

Correlation coefficient (r) is 0.8934

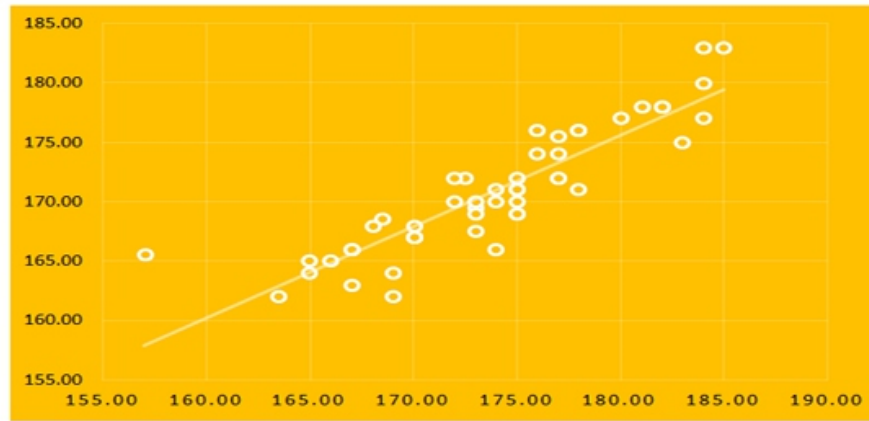


Figure 2. Correlation between arm span and stature in males

In females the mean arm span is 159.91 ± 5.61 cm.
Correlation coefficient (r) is 0.8388.



Figure 3. Correlation between arm span and stature in females

In males and females combined, the mean arm span is 166.87 ± 9.08 SD
Correlation coefficient is (r) is 0.9483

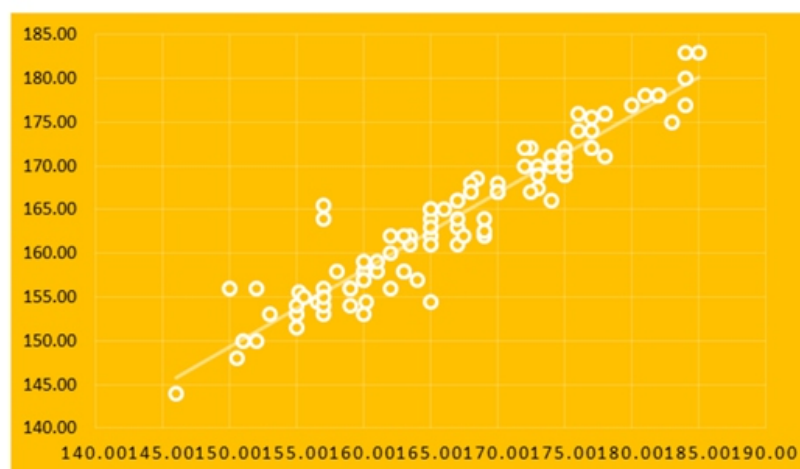


Figure 4. Correlation between arm span and stature in males and females combined

Table 2: Correlation coefficient of males and females

Correlation coefficient (r)	
Correlation coefficient (r) in males	0.8934
Correlation coefficient (r) in females	0.8388

REGRESSION EQUATION

- The Regression equation

Height of individual (Y) = intercept (a) + slope (b) x X,

Where, X = Arm span

Y = Height of individual

- The regression equation for individuals (including both males and females) was found to be:

Height of individual = $17.475 + 0.87895 \times X$ P values, $P < 0.001$, SE for intercept (a) = 4.966, SE for slope (b) = 0.03

Regression equation for males

$$Y = 36.788 + 0.771 X$$

Subject Regression coefficient Standard error p-value

Male 0.771 0.056 < 0.0001

Constant = 36.778, SE = 9.735, $P < 0.0001$

Regression equation for females

$$Y = 39.393 + 0.738 X$$

Subject Regression coefficient Standard error p-value

Female 0.738 0.069 < 0.0001

Constant = 39.393 SE = 11.064, $P < 0.0001$

Discussion

This study was designed to show the relationship between human stature and arm span and also to formulate a regression model to estimate stature from arm span. It was conducted among 100 subjects between 21 and 60 years of age in Govt. Medical College, Thrissur.

50 males and 50 females (total of 100 subjects) were analysed during the study period of one year. The mean age of females in the present study was 35.54 ± 8.49 SD and majority belongs to the age group 21-30 years. The mean age of males in the present study was 39.24 ± 10.30 SD and majority belongs to the age group 21-30 years.

Stature of males varies from 162 cm to 183 cm; the mean stature was 170.85 ± 5.20 SD. The stature of females varies from 144 cm to 167 cm; the mean stature was 157.44 ± 4.93 SD.

The stature of males and females taken together varies from 144 cm to 183 cm and the mean stature of the same was $164.15 \text{ cm} \pm 8.42 \text{ cm}$.

The arm span ranges from 146 cm to 185 cm with mean of $166.87 \text{ cm} \pm 9.08$ SD. The arm span in females

ranges from 146 cm to 172.50 cm with mean of 159.91 ± 5.61 SD.

The arm span when the males and females taken together ranges from 146 cm to 185 cm with mean of $166.87 \text{ cm} \pm 9.08$ SD.

The present study showed that there is statistically significant correlation between stature and arm span in both sexes. The correlation coefficient (r) in males is 0.8934. The correlation coefficient in females were 0.8388. The correlation coefficient when males and females taken together is 0.9483.

The presence of sexual dimorphism of anthropometric parameters were considered in the study and the results in this study showed that there was statistically significant difference in mean value of the measurement. Different regression equations are necessary for estimation of stature from arm span in both sex groups. Sexual dimorphism in height and arm span measurements can be due to environmental, hereditary or other hormonal impacts. Estrogen and progesterone play a vital role in closure of growth plates in long bones. They also play a part in the secretion of growth hormones.

The findings of the present studies were in agreement with numerous previous studies. Study by Gardasevic J et al concluded by saying that relation between arm span and stature is high and significant in their study sample, and the arm span is apparently a reliable indirect anthropometric measurement used for estimating stature in males from the Federation of Bosnia and Herzegovina.¹³ Study by Arifi et al reached conclusion that arm span reliably predicts stature and has a high value of correlation with validity of 95% in male as well as female, which have given very high value (0.776 and 0.688) of correlations between them.¹⁴ Study by Supare MS et al among medical students of Maharashtra found correlation coefficient (R) of 0.89 in male and 0.90 in female and concluded that there was a strong correlation between stature and arm span.¹⁵

Conclusions

There was statistically significant correlation between arm span and human stature. The regression equation formulated from arm span is a best indicator of stature. There were no statistically significant difference between estimated and actual stature in female and male subjects in the study.

In conclusion, stature can be estimated when the measurement of arm span is possible. The regression equation derived can be used in cadavers with fairly accurate results. This can be helpful in medicolegal cases as well as in anthropology studies. This study demonstrate that the stature and arm span is significantly higher in males when compared to females.

A direct relationship was observed between these measurements in both males and females. The regression equations for estimation of stature from arm span is $Y = 36.788 + 0.771 X$ for males and $Y = 39.393 + 0.738 X$ for females, where X is the arm span. The regression equation and slope obtained correlate with previous studies. There was difference in slope and intercept of the equation which is suggestive of ethnic and racial variations of the individuals. Similar studies should be conducted in different geographical locations and among different population groups in view of previously described variations. The possible limitation of study was that only one geographical location was used that is Govt. Medical college, Thrissur. This may affect the generalizability of the test results when applied to other geographic locations. However in future this regression equation derived could be tested on different populations to validate their accuracy across ethnic groups.

Ethical clearance:

Institutional Ethics committee, Order No: B6-155/2019/MCTCR(28), Date: 20/12/2019, Govt. Medical college, Thrissur

Source of funding: self

Conflict of interest: Nil

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Moot Court for Teaching – Learning of Court Procedures in MBBS Students in Central Region of India - An Educational Interventional Study

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ABSTRACT

Background: As a doctor we all need to attend the court of law either as a first treating doctor or treating doctor of a speciality or as subject expert as an expert witness. There are many incidents reported and also we experience as a part of society and medical institutes, where a doctor tries to avoid attending a case having legal implication either poisoning or some injury by any means so that he/she can avoid attending the court. Usually it's not because the doctor feels incompetent in treatment but most of the time it is the apprehension to attend the court. It was also observed that when a doctor goes to court for a few times they will become more confident and comfortable, but first experience remains more or less same. It gave us an idea that if Indian medical graduates, can get some practical experience during MBBS (even in simulation situation) e.g. "moot court" with the theory class on legal procedure, this apprehension can be removed or minimised and in future they will not be hesitant to attend cases with legal implication.

Primary Objective:

Students will get more practical knowledge about court procedures.

Secondary Objectives:

1. Future IMG will become more confident in court, 2. Future IMG will not hesitate to attend medico-legal cases in future during their professional life, 3. Introducing moot court to the students as simulation technique for the court procedure, 4. To assess the effectiveness of moot court in comparison of didactic lecture on court procedure by comparing pre and post-test about the topic.

Methodology:

It is an Educational interventional study. Convenient sample technique was used for sampling method, in which 130 students of Phase III part 1 MBBS, of MIMS & R, Bhopal (MP), participated. Informed consent was obtained. Data collected by pre and post-test and paired t-test was used to analyse them.

Results: On observing in pre and post-test of the sample size 99 and using paired samples t-test (with 95% Confidence Interval of the Difference) mean value in post-test increased from 13.63 to 17.34, showed the improvement in the knowledge of the students about topic. In the study Std. Deviation decreased from 3.14 to 2.47. Std. Error Mean decreased from 0.32 to 0.25. In the study t-value is 12.1770 and P value is <0.0001.

Conclusion: Overall this study shows that "Implementation of the Moot court as a simulation technique for teaching – learning of court procedures" is beneficial for improving the knowledge of the students about the court procedures.

Keywords: Court Procedure, Medicolegal cases, Moot Court

Introduction

As a practicing physician it is also a moral responsibility of all the medical practitioners to respond to the summons/warrants etc. whenever required.

But it is very common to see that Doctors tries to avoid any case having legal implication. Even when forensic PG attend first court evidence they also feel a little bit anxious, even though as forensic PG students, they have guidance from the senior teachers and prepared for the case under their guidance.

So it is very much understood how all newly graduates must have felt, for attending the court as an expert witness, without any practical expert guidance for only “How to Act in Court”.

In “Court room exposure to medical students: a practical approach to legal procedures in Indian scenario” by Gupta Sanjay² et al also concluded that the average knowledge level improved significantly.

After discussing this type of scenario with forensic medicine and other subject experts, in formal as well as informal meetings, it became evident that practitioners have this dilemma because during MBBS, as a student they attend the theory classes on the legal procedures in the subject of forensic medicine but practical knowledge or exposure to real court procedures are not part of the curriculum till now. Hence, implementation of moot court as a simulation technique can be helpful for the students to get more practical knowledge about court procedures.

At first as a Pilot Project, we prepared a moot court¹ as simulation technique for better learning of the court procedure with student of the II MBBS (batch 2017 PCMS, Bhopal), then presented this “moot court” in a Dental college in a fellowship programme³ on forensic odontology to understand the impact of it on both, performers as well as audience and it really gave a better understanding to the both audience as well as performers. It was an experiment at that time but it gave an encouragement to go further on it. Both performers as well as audience gave positive response verbally, but no questionnaire or pre and post-test were used during that time. So it encouraged us to start this project as research work with following the proper guidelines.

Before going further here is a brief description of the moot court and discuss the literature about it. According to Catherine Elise Barrett⁴, simulation means an imitation or an act that is only mock. As a teaching method, simulation can be interpreted as an activity that describes the real situation. The point is that students (with teacher’s guidance) perform a role in mock simulations to try to describe the actual events. In the simulation activity, participants or role holders perform a mock environment of the actual event.

In the current project, addition to acting as lawyers or judges, students were also assigned to serve as “law clerks, reporters, or amicus brief writers and also expert witness.

To get a real evaluation of the “Moot court for teaching – learning of court procedures in medical education” this research project was started. Here, students argue a mock appellate case before judges to understand “their overall act in court”.

Material and Method

As court procedure taught in MBBS as theory lecture, in this project we tried to give practical experience to the students of court so they can be more comfortable in courts in future and also used this project to analyse and evaluate the impact of this practical experience, to improve student’s knowledge about court procedure.

Study Design: Educational interventional study – A Quantitative Study.

Data collection method:

For getting the data and preparing the project, a meeting was held with various faculties from different departments including Community medicine as experts in this work, to discuss the difficulties they faced in the court proceedings. They also shared their experiences and what can be added in this project and what they think the challenges can be faced during this project and how to overcome them.

A meeting was also held with the 13 coordinator students, who participated in “moot court” during previous basic course of medical education workshop in the institute.

Pre and Post-test prepared in the google form that covered both theory as well as practical aspect of the legal procedure for the medical professionals. Questions in pre and post-test were same. A theory class as interactive learning, was taken during second MBBS of the same students, as a part of curriculum and then this project was started with a pre-test than project of moot court and in the end post-test was taken, to get to know the improvement of the knowledge (if any) of the students about the legal procedures.

The students of the Phase III Part 1 MBBS were divided in 10 groups and among them 13 coordinators were appointed for these 10 groups. They helped in the sessions to train the participants for this project.

As these coordinators were already exposed to the moot-court (during previous basic course of medical education workshop) they were excluded from the pre and post-test.

Before starting the project, students of the phase III part 1 were sensitized about the project and written informed consent was obtained from the willing students.

The students who were willing to participate in the project were asked to take a pre-test with the help of google form on the topic “legal procedures” (students were asked to prepare for pre-test, as it was not a surprise test).

Different real life medicolegal circumstances were provided to the different groups and were asked to prepare for moot court competition. To get the guidance for procedure of moot court competition, reference from the Amity International Moot Court Competition⁵, 2021 amity law school, Noida Amity University, Uttar Pradesh rules, procedure and guidelines of the competition and Sixteenth Nelson Mandela World Human Rights Moot Court Competition⁶, University of Pretoria, South Africa, were used. For this project group dynamics and SDL were also used.

Process of validation:

For the validation of the project, a meeting was held with 2 senior subject expert from L N Medical College Bhopal and RKDF Medical College Bhopal, along with faculties of the department of the forensic medicine and toxicology of MIMS & R, Bhopal, discussed about various aspects of the Pre and Posttest, rectified what needed as per suggestions and then validated the Pre and Post-tests and complete method.

Project was put in front of the IEC and got the ethical clearance.

Status of Ethical permission: Got the ethical clearance from the IEC (REG. No. ECR / 1190 / INST / MP / 2019 / RR-22) of the LNMC & RC & JK HOSPITAL, BHOPAL with ref. no. LMNC&RC/Dean/2024/Ethics/046.

Sampling Method: Convenient sampling technique (As the study was an Educational interventional study and it will be directly visible if there are any impact in either way positive/ negative/ neutral on the students, as they are currently studying in the department of forensic medicine)

Participants: The students from the Phase III part 1 MBBS, MIMS & R, and medical Faculties of various subjects from MIMS & R and other Medical colleges of Bhopal, MP.

Sample size: Students - 130 (Phase 3 Part 1, MIMS& R)

Inclusion criteria:

Students - 130 (Phase III Part 1 MBBS, MIMS & R)

Exclusion criteria:

- Who were not willing to participate and didn't give written consent.
- Who were not present during the session both in the practice session and competition.
- 13 coordinator students (who participated in MOOT COURT during previous BCME workshop) did not participate in pre and post-test.
- Students whose responses of either pre or post-test were not collected due to some technical error were excluded.

Informed consent obtained (Annexure- 1 INFORMED CONSENT FORM STUDENT)

Moot Court Competition and data collection

The moot court competition was held in which 35 faculties attended the competition as Judges and guests. All 10 groups performed "moot court".

Three senior faculties, having vast court procedure experience as medical professionals were invited to become Judges in this competition and willing faculties from various departments of MIMS & R and other medical colleges of Bhopal, were invited as guests.

After the competition, students (other than coordinators) took Post-test in the google form.

Statistical analysis:

Responses of the Pre & Post test were recorded. Only 99 student's both Pre and Post-test data were collected, other's either Pre or Post-test were missing. So only 99 student's data was used for the study, in MS Excel and used Paired t-test for the comparison. Statistical analysis was done using SPSS-20 software. The data was expressed as means and percentages.

Results/Observations

On observing in pre and post-test of the sample size 99 and using paired sample t-test (with 95% Confidence Interval of the Difference), mean value in post-test increased from 13.63 to 17.34. Std. Deviation decreased from 3.14 to 2.47. Std. Error Mean decreased from 0.32 to 0.25. Here t-value is 12.1770 and P value is <0.0001.

So the current project shows by comparing pre and post-test and using paired samples t-test (Table no-1), the mean value of the post-test increased and concluded that the level of knowledge increased by using this moot court as simulation technique in medical education too.

Table No 1: Comparison Of Pre And Post-Test

	Mean	Number of observation	Std. Deviation	Std. Error Mean	t value	P value
Total score pre-test	13.63	99	3.14	0.32	12.1770	<0.0001 (significant)
Total score post-test	17.34	99	2.47	0.25		

Discussion

Sakhalkar Ujjwala⁷ in her book "Developing skills through moot court and mock trials from preparation to performance" write all about the fundamental premise that Mooting and mock trials can be used as an effective educative tool, that helped a lot to prepare this project as "Moot Court" as teaching learning method in M.B.B.S. students. As it is still at a very early phase in medical education. As mentioned above, Ringel⁸, Lewis. (2004) wrote, their same article, about how a moot court is an extremely fluid pedagogical tool which can be used for more than learning about the law or the judicial process. It has been used in a variety of disciplines including political science, media, history, journalism, sociology, art, economics, business, and the life sciences to educate students about a variety of subjects such as history, journalistic rights, antitrust laws, or professional ethics. In this study more emphasis was given on the behaviour of a "Doctor in the courtroom as an expert witness", so that

conclusion can be made for whether it can be helpful for the MBBS students in their professional life in the future or not too.

Hamzeh Abu Issa⁹ et al also in their study shows that the Moot Courts should be an integrated part of the study curricula by allocating a subject for it, to grant all students the opportunity to participate in it, in order to enhance and develop their skills.

They in their research paper “The Impact of Moot Courts on the Quality of Legal Education: Students of the Faculty of Law at the Applied Science Private University as a Model”, concluded that Moot Court is a norm for Law students and definitely have positive impact on their knowledge that is why this is a part of their studies for a very long time.

This current project also concluded by using paired samples t-test, mean value of the post-test increased that level of knowledge increased by using this moot court as simulation technique in medical education too.

In “Court room exposure to medical students: a practical approach to legal procedures in Indian scenario” by Gupta Sanjay² et al also concluded that the average knowledge level improved significantly by the courtroom exposure when compared to didactic lecture, which also shows the same results of this study.

Edward F. Kammerer¹⁰, Jr et al wrote that “students are motivated to participate in moot court for academic reasons, they believe their critical thinking and public speaking skills improve, and that, despite its heavy work load and difficulty, moot court is also fun”. Same response in present study shows in the comments of the students and faculties too.

On searching among peers of the subject Forensic Medicine and toxicology in India, it came to know that “Moot Court” is used as teaching learning method in some of the medical institutes e.g. GMC, Bhopal where acts done by PGs and Faculties, also in SIAMS, Indore and D Y Patil medical college, Pune by the under graduate students of the MBBS.

Studies of the effectiveness of Moot Courts in medical education, are not many found till time but it is very common as student centered simulation technique as mentioned by Carlson¹¹, J. & Skaggs, and Neil. (2000) in “Learning by Trial and Error” or Tindwani Manik¹² in “Legal research for a moot court problem” and Bose Sohini¹³ in “Tips on How to Be a Good moot court Researcher” and many more, in many other courses e.g. Law and Politics successfully.

Although we are discussing about moot court in real life situation, there is also concept of virtual moot court too that was discussed as pilot study by Ireland et al¹⁴ as a second life mooting project in 2010 at university of Western University (UWS) in Australia. We can also use this in India if needed.

This study on the effect of the “Implementation of the Moot court as a simulation technique for teaching – learning of court procedures” in medical students shows that it is a very effective way to teach the students about the legal procedure.

Conclusion

- To gain practical knowledge, practical ways of study in any way, either in “real or simulation” are more effective than only theory lectures.
- Active participation of the students is beneficial not only for that particular topic, but it also gives them and faculties encouragement to become better in every way.
- “Implementation of the Moot court as a simulation technique for teaching – learning of court procedures” in medical students shows that it is a very effective way to teach the students about the legal procedure.
- As this study involved mainly one institute, more studies in different areas of the country are recommended.

- It can also be performed as role play with the volunteers every year, if all the student's participation is not possible, as it will be less time consuming but yes results will not be at par.
- It is recommended, that at least 1 court attendance during internship with senior (PG or Faculties from Forensic medicine) should be mandatory.

Ethical Clearance: From IEC of the LNMC & RC & JK HOSPITAL, BHOPAL

Source of Funding: Administration of the MIMS & R, Bhopal (MP)

Conflict of Interest: Nil

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Study on Knowledge and Awareness on Medical Ethics and Infamous Conduct among Medical Students in a Medical College,

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ABSTRACT

This cross-sectional study aims to assess the knowledge and awareness of medical ethics, as well as infamous conduct, among medical students at a medical college in Hyderabad, Telangana, in light of advancements in medicine and research. The study group consisted of 150 participants, including 35 undergraduate medical students, 66 internees, and 49 postgraduate medical students. After obtaining informed consent, participants were evaluated using a pre-structured questionnaire, with their responses graded accordingly. The data were analyzed using MS Excel.

The results revealed a significant lack of knowledge and awareness regarding infamous conduct among medical students, including internees and postgraduates. However, internees demonstrated a better understanding of the basic principles of medical ethics compared to postgraduate students, who exhibited notably poor knowledge levels. The study highlights the urgent need for stricter curriculum implementation, continued medical education programs, and workshops to enhance the standards of medical ethics education.

Key words: Medical ethics, Infamous conduct, Medical students.

Introduction

The term “ethics” is derived from the Greek word “ethos,” meaning custom or character. In 1803, Thomas Percival, a physician and author, developed the first modern code of medical ethics, introducing the terms “medical ethics” and “medical jurisprudence.”

In 1847, the American Medical Association adopted its first code of ethics, which was primarily based on Percival’s work.

Unethical practices were commonly observed in the early 20th century, often involving exposing individuals to risks for the broader benefit of society. The Nuremberg Code (1947) became the first international set of ethical principles for clinical research. Later, in 1964, the World Medical Association¹ established the Declaration of Helsinki to provide ethical guidelines for medical research. Similarly, in 1982, the Indian Council of Medical Research (ICMR) released its policy statement outlining the ethical considerations in human research. Tom Beauchamp and James Childress later defined four principles of medical ethics: respect for autonomy, non-maleficence, beneficence, and justice².

The principle of “autonomy” refers to an individual’s ability to make rational, independent decisions, emphasizing self-determination and freedom. This principle emerged as a response to the paternalistic approach traditionally seen in healthcare. “Beneficence” involves actions that prioritize the well-being of others, ensuring that decisions serve the best interests of patients and their families. “Nonmaleficence,” which is encapsulated by the phrase “do no harm,” advises healthcare providers to avoid causing harm, even if they are unable to provide a benefit. This principle is closely associated with the Hippocratic Oath taken by physicians. The principle of “justice” involves the fair and unbiased distribution of healthcare resources to all individuals.

Despite these ethical guidelines, there have been notable instances of clinical trials conducted without participants’ knowledge or consent, such as the Tuskegee Syphilis Study and the Thalidomide tragedy. In response to evolving medical research, the ICMR updated its guidelines in 2006.

The National Medical Commission’s Code of Medical Ethics^{3,4,5} Regulations, 2002, requires all doctors to adhere to its rules and regulations. Any violations of the ethical code are considered infamous conduct and are subject to penal action. Additionally, the ICMR⁶ has established 12 general principles for biomedical researchers working with human subjects, with ethics committees ensuring that research upholds the safety, dignity, and well-being of participants.

Integrating medical ethics and humanities into the curriculum for medical undergraduates will help shape future doctors who are not only skilled in their profession but also grounded in ethical principles.

The aim and objective of this study is to assess the knowledge and awareness of medical ethics and infamous conduct among medical students. The study objective is to evaluate the level of awareness in different groups, illustrate how inadequate knowledge can lead to unethical behavior, and compare the findings with other similar studies conducted both in India and abroad. Ultimately, this research will help guide medical students to practice medicine ethically, minimizing the risk of legal issues arising from unethical conduct.

Material and Methods

A cross-sectional, prospective study was conducted to assess the knowledge and awareness of medical ethics and infamous conduct among medical students at a medical college in Hyderabad, Telangana. The study included 150 participants, consisting of 35 final-year MBBS students, 66 interneers, and 49 postgraduate students, regardless of gender. The study was conducted from September 1, 2022, to August 31, 2023. Informed consent was obtained from all participants prior to their inclusion in the study, with the anonymity of participants maintained throughout.

A questionnaire was developed based on the principles of medical ethics and infamous conduct as outlined in the National Medical Commission’s Professional Conduct, Etiquette, and Ethics Regulations, 2002. The key components covered in the questionnaire were:

- Respect for autonomy, Non-maleficence, Beneficence and Justice.
- Professional secrecy, Informed consent
- Association with pharmaceutical and manufacturing companies
- Dichotomy, covering, and advertisement
- Addiction, alcohol use, and improper conduct with patients

Each component of the questionnaire was evaluated by grading participants’ knowledge and awareness as poor, fair, good, or excellent. Data was collected for all responses and analyzed statistically using MS Excel 2019.

Results

Cross sectional prospective study on knowledge and awareness on medical ethics and infamous conduct

among Medical students was conducted in a Medical college, Hyderabad, Telangana. 150 medical students were participated the study among 35 undergraduates, 66 interneers and 49 post graduates.

Table 1: Study Results of each variables in grading in total population.

S No	Variable	Poor	Fair	Good	Excellent
1	Respect for Autonomy	66.6%	19.3%	13.3%	0.66%
2	Non Maleficence	66.66%	23.33%	9.3%	0.66%
3	Beneficence	60.6%	23.33%	14%	1.33%
4	Justice	46%	32%	18%	4%
5	Professional Secrecy	24%	41.3%	22%	12.66%
6	Informed Consent	12.66%	50.66%	26.66%	10%
7	Association with manufacturing firms and pharmaceutical companies	35.33%	43.33%	9.33%	12%
8	Dichotomy	47.33%	34.66%	13.33%	4.66%
9	Covering	35.33%	41.33%	20%	3.33%
10	Advertisement	30%	46%	20%	4%
11	Addiction and Alcohol	16.665	54%	22.66%	6.66%
12	Awareness on improper conduct with patient	33.33%	49.33%	14%	3.33%

Autonomy

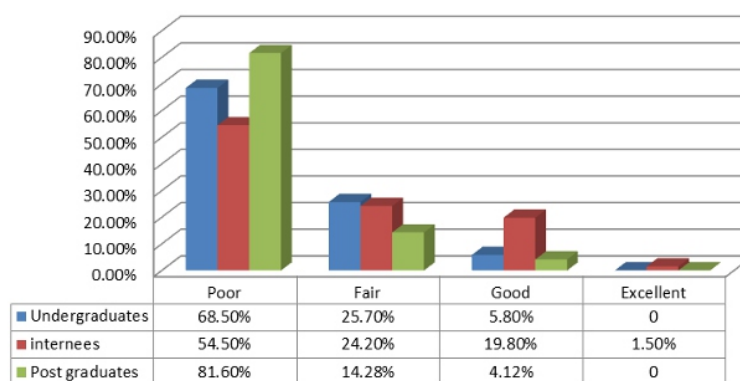


Fig 1: Showing the results of Autonomy among under graduates, Interneers and post graduates.

Non Maleficence

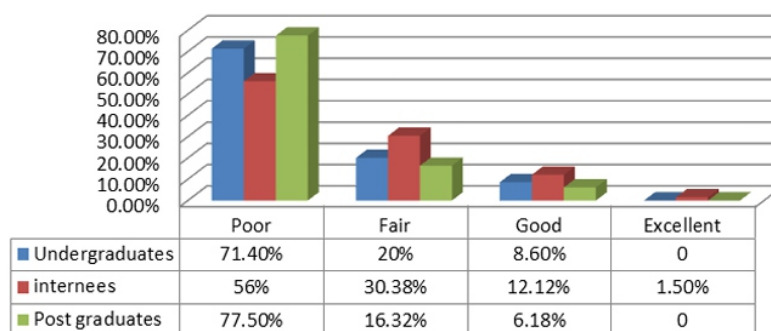


Fig 2: Showing the results of Non-maleficence among under graduates, Interneers and post graduates.

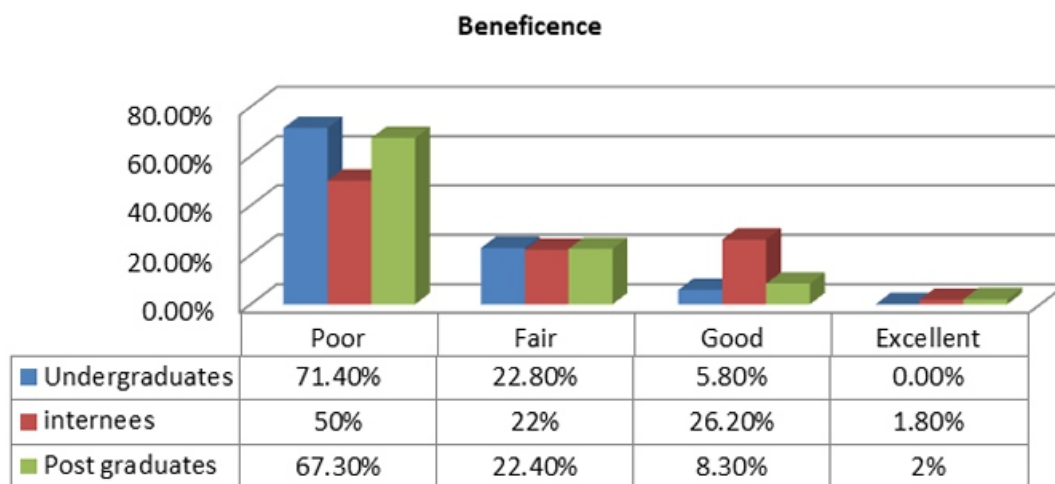


Fig 3: Showing the results of Beneficence among under graduates, Interneers and post graduates.

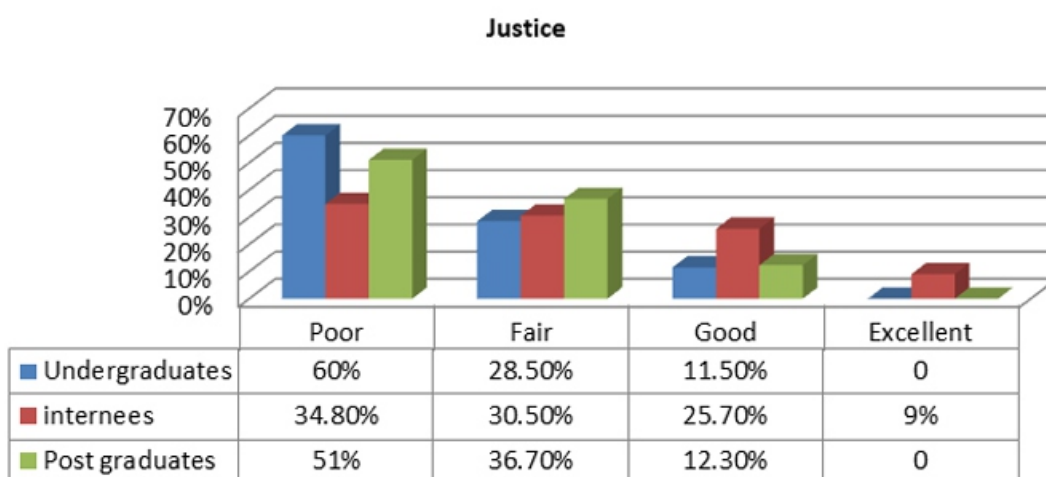


Fig 4: Showing the results of Justice among under graduates, Interneers and post graduates.

Discussion

A cross-sectional study on medical ethics and infamous conduct was conducted among medical students (undergraduates, interneers, and postgraduates) at a medical college in Hyderabad, Telangana. A total of 150 students, including both male and female participants, took part in the study. The study focused on four widely accepted principles of medical ethics: autonomy, non-maleficence, beneficence, and justice, as well as key components of infamous conduct.

Autonomy: The overall awareness of autonomy in the study population revealed that 66.6% had poor knowledge, 19.3% had fair knowledge, 20% demonstrated good knowledge, and only 1% exhibited excellent knowledge. Among undergraduates, 68.5% had poor knowledge, 25.7% had fair knowledge, 5.8% had good knowledge, and none were classified as excellent. In interneers, 54.5% had poor knowledge, 24.2% had fair knowledge, 19.8% had good knowledge, and 1.5% had excellent knowledge. Among postgraduates, 81.6% were poor, 14.28% were fair, 4.12% were good, and none demonstrated excellent knowledge. Autonomy is a key principle in healthcare, underpinning informed consent, yet awareness was notably low, especially among postgraduates.

Non-maleficence: In terms of non-maleficence, 66.6% of the total study population demonstrated poor knowledge, 23.33% had fair knowledge, 9.3% had good knowledge, and only 0.66% had excellent knowledge. Among undergraduates, 71.4% had poor knowledge, 13.62% had good knowledge, and no

students had excellent knowledge. In interneers, 56% had poor knowledge, with 13.62% demonstrating good knowledge. Among postgraduates, 77.5% showed poor knowledge, 6.18% exhibited good knowledge, and no one had excellent knowledge. Postgraduates showed particularly poor awareness of non-maleficence.

Beneficence: Regarding beneficence, 60.6% of the study population had poor knowledge, 23.33% had fair knowledge, and 15.33% had good knowledge. Among undergraduates, 71.4% had poor knowledge, 5.8% demonstrated good knowledge, and none showed excellent knowledge. In interneers, 50% had poor knowledge, while 28% demonstrated good knowledge. Postgraduates again exhibited poor knowledge, with 67.3% having poor awareness, 10.3% demonstrating good knowledge, and no one showing excellent knowledge. Postgraduates appeared weakest in their understanding of beneficence.

Justice: Results related to justice revealed that 60% of undergraduates, 34.8% of interneers, and 51% of postgraduates exhibited poor knowledge. In contrast, 34.7% of interneers, 11.5% of undergraduates, and 12.3% of postgraduates demonstrated good knowledge. Interneers showed relatively better knowledge in this area.

Overall, awareness of the basic principles of medical ethics was found to be poor among undergraduate and postgraduate medical students, with interneers showing comparatively better knowledge.

Infamous Conduct: Knowledge and awareness of infamous conduct were also found to be lacking in the study population. Professional secrecy was well understood by 34.66%, association with pharmaceutical companies by 21.33%, dichotomy by 17.99%, covering by 23.33%, advertising by 24%, treating under the influence of alcohol by 29.32%, and improper conduct with patients by 17.33%. Across all components of infamous conduct, over 60% of participants had poor or fair knowledge.

The findings of this study align with similar research conducted in a medical college⁷ in Coimbatore, Tamil Nadu, which also reported low knowledge and awareness regarding medical ethics among medical students.

Conclusion

The study results indicate that the majority of medical students possess poor to fair knowledge of the basic principles of bioethics and infamous conduct. Postgraduate students, in particular, demonstrated a concerning lack of awareness and understanding of the core ethical principles, while interneers showed relatively better knowledge. These findings highlight a significant gap in the education of medical ethics at various stages of medical training.

The results emphasize the urgent need for stricter implementation of medical ethics curricula at the undergraduate level. Furthermore, there is a critical need for enhanced training programs, including workshops, conferences, and continued education initiatives, to underscore the importance of ethical practice, particularly at the postgraduate level. Addressing these deficiencies will be essential in fostering a generation of healthcare professionals who are not only technically proficient but also grounded in ethical principles, ensuring the provision of ethical and compassionate care to patients.

Source of funds: Self.

Conflict of interest: Nil,

Ethical clearance: Yes, obtained from institutional ethics committee Reference No: MRIMS-DHRIEC-12/2022.

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