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Baseline Heart Rate as a Predictor of Post-Spinal Hypotension in Patients Undergoing a Caesarean Section

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Abstract

Background: Although spinal anesthesia is generally well tolerated, hypotension is a common adverse effect of subarachnoid block in some patients. In pregnant women, it was demonstrated that sympathetic activity is increased as compared with that of not pregnant women.

Aim of study: To determine whether preoperative heart rate is a predictor for post spinal hypotension or not in obstetric patients.

Methods: A prospective trial study that was conducted in the Obstetrics operating room at Al-Imamain Al-Kadhmain and Baghdad Teaching Hospitals, Baghdad, Iraq for a period of 12 months from Nov. 2019 to Nov. 2020. It involved 100 healthy full term pregnant women scheduled for elective C/S under spinal anesthesia. Baseline systolic, diastolic, mean arterial pressure, and heart rate were recorded. Blood pressure was monitored with an automated cuff blood pressure monitor at three-minute intervals until 30 minutes then every five minutes.

Results: In this study, 55% of study patients complained from hypotension after spinal anesthesia. mean of baseline HR was significantly higher in patients who developed post spinal hypotension than that in those who didn't. The cut point of baseline HR was 92 beats/mint., so baseline HR > 92 beats/mint. is predictive for post spinal hypotension. Requirement of ephedrine was significantly higher in hypotensive patients who had baseline HR > 92 than that in those who had baseline HR ≤ 92.

Conclusion: Preoperative heart is a good predictor for post spinal hypotension in pregnant women underwent cesarean section under spinal c anesthesia.

Keywords: Spinal anesthesia, heart rate, hypotension, cesarean section, Iraq.

Introduction

The first case of spinal anesthesia in humans was performed by August Bier in 1898 using the local anesthetic cocaine [(1)] Spinal anesthesia provides excellent operating conditions for surgery below the umbilicus. More recently, spinal anesthesia has been used in surgery above the umbilicus [(2)].

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Spinal anesthesia is the standard anesthetic technique for performing Cesarean sections to prevent complications related to airway management during general anesthesia, such as intubation failure or aspiration [3]. Morbidity and mortality directly related to anesthesia for cesarean delivery has decreased in past decades to 1.7 per million [4].

Although spinal anesthesia is generally well tolerated, hypotension is a common adverse effect of subarachnoid block in some patients [5,6]. Systemic hemodynamics are modulated by autonomic nervous system (ANS) [7]. In pregnant women, it was demonstrated that sympathetic activity is increased as compared with that of no pregnant women[8-10]. Hypotension during spinal anesthesia is mainly a result of decreased systemic vascular resistance after blockade of preganglionic sympathetic fibers [11]

When severe hypotension persists, it may lead to serious complications, such as loss of consciousness, cardiovascular collapse, and ischemia in organs. Furthermore, prolonged maternal hypotension may cause reduced uterine placental blood flow and fetal distress, which may result in bradycardia, hypoxia, and acidosis in the fetus[12,13]. Hypotension as a result of anesthesia can be prevented to some extent with prophylactic ephedrine[14]. pelvic tilt and intravascular volume expansion. However, none of the currently available strategies effectively prevent hypotension caused by spinal anesthesia[15].

Aim of study: To determine whether preoperative heart rate as predictor for post spinal hypotension in obstetric patients.

Patients and Methods

This was a cross-sectional study that was conducted in the Obstetrics operating room at Al-Imamain Al-Kadhmain and Baghdad Teaching Hospitals, Baghdad, Iraq for a period of 12 months from Nov. 2019 to Nov. 2020.

This study involved 100 full term pregnant women scheduled for elective C/S under spinal anesthesia of a physical status of American Society of Anesthesiology (ASA) II.

Exclusion criteria: Patients refusal; Multiple pregnancy; complicated pregnancy (pre eclampsia, placenta accrete…);Patients with contraindication to spinal anesthesia; Patient with Cardiovascular disease; Patient with Thyroid disease; Morbidly obese patient.

A. Detailed thorough history (socio-demographic variables, previous medical, surgical, and drug history).

B. Complete physical examination.

C. Duration of surgery was recorded.

D. Baseline systolic, diastolic, mean arterial pressure (MAP), and heart rate were recorded by calculating the average of three independent readings taken every minute in the lateral position.

E. Patient's peripheral oxygen saturation and temperature were monitored. Basal values were recorded.

Prior to the induction of spinal anesthesia, normal saline (500 ml) preload solution was administered IV for all patients.

patient where put in the sitting position, exposure was done, full aseptic technique with povidone iodine sterilization.

Spinal anesthesia achieved by intrathecal injection of 12.5 mg (2.5 ml of 0.5%) hyperbaric bupivacaine through spinal needle (25-gauge) was inserted between L3-L4, or L4-L5 intervertebral space to achieve the level of insensibility at T4-T5 dermatomes.

Patients were placed in supine position with left pelvic tilt to avoid aortocaval compression and Oxygen Five L/min was administered via face mask.

Blood pressure was monitored with an automated cuff blood pressure monitor at three-minute intervals until 30 minutes then every five minutes.

Hypotension was considered when there is more than 20% decline from baseline MAP or the systolic blood pressure below 100 mmHg and this was managed with ephedrine (5 mg at incremental doses).

The data analyzed using Statistical Package for Social Sciences (SPSS) version 25. The data presented as mean, standard deviation and ranges. Categorical data presented by frequencies and percentages.

Independent t-test (two tailed) was used to compare the continuous variables accordingly. Receiver operating characteristic (ROC) curve analysis was used for prediction of baseline HR as a predictor for post spinal hypotension. A level of P – value less than 0.05 was considered significant.

All patients were verbally informed about the study and they were asked the permission to be part of the study. All personal information was kept anonymous. Data were exclusively used for the sake of this study.

Administrative approval was granted from the Scientific Council of Iraqi Board of Anesthesia and Intensive Care.

Results

The total number of study patients was 100 pregnant women. All of them were undergone C/S under spinal anesthesia and were evaluated for the role of baseline HR in prediction of post-spinal hypotension.

Results in table (1): shows the means of baseline of vital signs. Mean of HR was 101.16 beats/mints.; MAP was 93.19 mmHg; temp was 36.94 °C; and SPO2 was 97.58%.

Table 1: Means of baseline of vital signs.

Baseline vital signs	Mean ± SD	Range
HR (beats/mint)	101.16 ± 14.1	71.0 – 128.0
MAP (mmHg)	93.19 ± 6.5	80.6 – 103.8
Temp (°C)	36.72 ± 0.61	36.5 – 37.8
SPO2 (%)	97.58 ± 1.3	95.0 – 99.0

Table 2: Distribution of study patients by the occurrence of post spinal hypotension at different times

Post spinal hypotension	No. (n= 100)	Percentage (%)
Immediate after anesthesia	5	5.0
After 3 mints.	41	41.0
After 6 mints.	45	45.0
After 9 mints.	28	28.0
After 12 mints.	15	15.0
After 15 mints.	6	6.0
After 18 mints.	6	6.0
After 21 mints.	0	0
After 24 mints.	3	3.0
After 27 mints.	0	0
After 30 mints.	2	2.0
After 35 mints.	0	0
After 40 mints.	2	2.0
	n= 47	
After 45 mints.	2	3.5
	n= 17	
After 50 mints.	2	11.8
After 55 mints.	0	0

We noticed that hypotension was occurred in 41% of patients after three mints and 45% after six mints, then the prevalence was decreased with time.

Table 3: Comparison in baseline HR between patients who developed post spinal hypotension and those who didn't

	Post spinal hypotension		
Baseline HR (beats/mint.)	Yes Mean ± SD	No Mean ± SD	P – Value
	100.2 ± 14.4	91.02 ± 12.1	0.001

We noticed that mean of baseline HR was significantly higher in patients who developed post spinal hypotension than that in those who didn't (100.2 versus 91.02 beats/mint., P = 0.001).

Table 4: Comparison in age, height, weight and duration of surgery between patients who developed post spinal hypotension and those who didn't

	Post spinal hypotension		
Variable	Yes	No	P – Value
	Mean ± SD	Mean ± SD	
Age (Year)	26.14 ± 3.6	26.84 ± 3.5	0.327
Height (cm)	160.47± 5.38	161.26 ± 4.88	0.324
Weight (kg)	68.35 ± 6.21	67.43 ± 4.96	0.446
Duration of surgery (mint.)	44.72 ± 4.1	46.86 ± 14.8	0.353

No statistical significant differences (P ≥ 0.05) in these parameters between patients who developed post spinal hypotension and those who didn't.

Table 5: Comparison in ephedrine requirement between patients who had baseline HR ≤ 92 and those who had baseline HR > 92

	Baseline HR		
Ephedrine (mg)	**≤ 92**	**> 92**	**P – Value**
	Mean ± SD	**Mean ± SD**	
	1.75 ± 2.8	4.78 ± 4.5	0.001

We noticed that the requirement of ephedrine was significantly higher in hypotensive patients who had baseline HR > 92 than that in those who had baseline HR ≤ 92 (4.78 versus 1.75 mg, P= 0.001).

Discussion

In the present work, 45% of patients after six mints and 41% after three mints had hypotension. then the prevalence was decreased with time. In the same manner, Shehata et al study in 2019, reported that MAP measured a significant change in MAP over time during the study. MAP shows a significant decrease after fluid loading, after 15 minutes, after 30 minutes in comparison to MAP at baseline [16]. Furthermore, this study revealed that 55% of patients complained from hypotension after spinal anesthesia. A higher results observed in Shitemaw et al study in 2020, as observed from the total pregnant mothers who underwent CS under spinal anesthesia, that incidence of hypotension was 64% [17]. A lower results observed in Joshi et al study in 2018, in which thirty-nine patients out of 100 underwent CS under spinal anesthesia, developed hypotension (39%), of whom 27 were in those with HR>90 bpm (group 2) (50.9%) and 12 patients with HR <90 bpm (group 1) (25.5%) [18]. Also, Bishop et al study in 2017, reported a lower results, when the overall incidence of hypotension in patients underwent CS under SA was 30.4%[19]. The differences in the rate of incidences among above studies may have related to the sample size and to the fact that incidence of hypotension is difficult to quantify owing to inconsistencies in the definitions used across studies. In the current study, mean of baseline HR was significantly higher in patients who developed post spinal hypotension than that in those who didn't (100.2 versus 91.02 beats/mint, P= 0.001).

In comparison to Joshi et al study in 2018, a similar results observed, they reported that the higher the baseline HR, higher the risk of developing hypotension during spinal anesthesia. The incidence of hypotension was significant between patients with HR > 91 and others with rate < 91 BPM (P = 0.0260) [18].

The current results are comparable to khan et al study in 2010, by correlating higher pre-operative HR and development of post-spinal hypotension. They found out that incidence of hypotension was more in group with HR >91 bpm (31.82%) than patients with HR <90 bpm (11.86%) with P value of <0.001 [20]. Furthermore, Bishop et al study in 2017, reported a similar finding. They observed that preoperative HR was a predictive of hypotension in elective or emergency CS, in which high pre-operative HR was significantly increased incidence of hypotension after spinal anesthesia [19].

On the other hand, Frölich and colleagues observed in their study in 2002 that subjects with a baseline HR rate greater than 90 bpm had an 83% chance (positive predictive value) of developing marked hypotension after SA and patients with a HR less than 90 bpm had a 75% chance (negative predictive value) of not developing marked hypotension. Choosing a HR of 80 bpm as cut-off, the positive predictive value was 18% (chance of developing hypotension) with a 52% negative predictive value [21].

The current study revealed no statistical significant differences in age and duration of surgery between patients who developed post spinal hypotension and those who didn't (P ≥ 0.05). Similarly, Joshi and colleagues in their study in 2018, found no significant relation between age and duration of operation between group 1 (patients having a HR <90 bpm) and group 2 (patients having a HR >90 bpm) [18].

Another study observed a different results, as Bishop and colleagues in the study done in 2017, found that advanced maternal age was significantly increase the risk of hypotension following spinal anesthesia for CS (P=0.002) [19].It seems from other studies, that reduction in cardiac reserve and changes in baroreceptor and sympathetic nervous system responses may play certain roles in increasing the risk of hypotension as the age of participants increase [22].

The current study noticed that requirement of ephedrine was significantly higher in hypotensive patients who had baseline HR > 92 than that in those who had baseline HR ≤ 92 (4.78 versus 1.75 mg, P= 0.001). An agreement observed in Joshi et al study in 2018, as observed that use of ephedrine was significantly greater in hypotensive patients with HR > 91 BPM than those with HR < 91 BPM (mean 3.9 ± 0.45 vs 4.34 ± 0.45, P = 0.0148) [18]. An agreement observed in a study conducted by Frölich and colleagues in 2002, as found that a significant positive correlation in baseline HR and ephedrine requirements (P=0.005). With increasing HR, the ephedrine requirement and the incidence of hypotension increased [21]. Prophylactic fluid preloading and presence of mechanical compressor can have determined different dosage used in each study.

Conclusion

Preoperative heart rate is a good indicator for post spinal hypotension in pregnant women underwent cesarean section under spinal anesthesia, as well as Ephedrine requirements can be predicted by assessment of baseline heart rate.

Source of funding: Self

Conflict of Interest: non

Ethical clearance: non

References

1. Mandabach M. The early history of spinal anesthesia. International Congress Series. 2002:163–168.
2. Hadzic's Textbook of Regional Anesthesia and Acute Pain Management, Second Edition 2017, Chapter 23, Spinal Anesthesia, P 334
3. Algert CS, Bowen JR, Giles WB, Knoblanche GE, Lain SJ, Roberts CL. Regional block versus general anaesthesia for caesarean section and neonatal outcomes: a population-based study. BMC Med 2009; 7: 20
4. Hawkins JL, Koonin LM, Palmer SK, Gibbs CP. Anesthesia-related deaths during obstetric delivery in the United States, 1979-1990. Anesthesiology 1997; 86: 277-84.
5. Chestnut D. Obstetric Anesthesia: Principles and Practice. 2nd edition. St. Louis: Mosby; 2004. p 465-92
6. Aitkenhead AR, Rowbotham DJ, Smith G. Textbook of anesthesiology, 4th ed. Edinburgh: Churchil Livingstone; 2001. p 563.
7. Bootsma M, Swenne CA, Van Bolhuis HH, Chang PC, Cats VM, Bruschke AV. Heart rate and heart rate variability as indexes of sympathovagal balance. Am J Physiol 1994;266: 1565-713
8. Eneroth E, Storck N. Preeclampsia and maternal heart rate variability. Gynecol Obstet Invest 1998; 45: 170-3.
9. Eneroth E, Westgren M, Ericsson M, Lindblad LE, Storck N. 24-hour ECG frequency-domain measures in preeclamptic and healthy pregnant women during and after pregnancy. Hypertens Pregnancy 1999; 18: 1-9.
10. Lewinsky RM, Riskin-Mashiah S. Autonomic imbalance in preeclampsia: Evidence for increased sympathetic tone in response to the supine-pressor test. Obstet Gynecol 1998; 91: 935-9.
11. Hanss R, Bein B, Ledoski T, Lehmkuhl M, Ohnesorge H, Scherkl W, et al. Heart Rate Variability predicts Sever Hypotension after Spinal Anesthesia for Elective Cesarean Delivery. Anesthesiology 2005; 102: 1086-93
12. Ebner H, Barcohana J, Bartoshuk AK. Influence of postspinal hypotension on the fetal electrocardiogram. Am J Obstet Gynecol 1960; 80: 569-72.
13. Zilianti M, Salazar JR, Aller J, Agüero O. Fetal heart rate and pH of fetal capillary blood during epidural analgesia in labor. Obstet Gynecol 1970; 36: 881-6.
14. McCrae AF, Wildsmith JA. Prevention and treatment of hypotension during central neural block. Br J Anaesth 1993; 70:672-80.
15. Jackson R, Reid JA, Thorburn J. Volume preloading is not essential to prevent spinal-induced hypotension at caesarean section. Br J Anaesth 1995; 75:262-5.
16. Shehata JH, El Sakka AI, Omran A, Gbre MAMA, Mohamed AA, Fetouh AM, et al. Heart Rate Variability as A Predictor of Hypotension Following Spinal Anesthesia for Elective Caesarian Section in Preeclamptic Parturients: A Descriptive Observational Study. Open Access Maced J Med Sci. 2019;7(23):4043-7.
17. Shitemaw T, Jemal B, Mamo T, Akalu L. Incidence and associated factors for hypotension after spinal anesthesia during cesarean section at Gandhi Memorial Hospital Addis Ababa, Ethiopia. PloS one. 2020;15(8):e0236755.
18. Joshi M, Raghu K, Rajaram G, Nikhil N, Kumar S, Singh A. Baseline heart rate as a predictor of post-spinal hypotension in patients undergoing a caesarean section: An observational study. Journal of Obstetric Anaesthesia and Critical Care. 2018;8(1):20.

19. Bishop D, Cairns C, Grobbelaar M, Rodseth R. Obstetric spinal hypotension: Preoperative risk factors and the development of a preliminary risk score–the PRAM score. South African Medical Journal. 2017;107(12):1127-31.
20. Khan S, Zahoor MU, Zaid AY, Buland K. Effect of pre-operative heart rate on post spinal hypotension in obstetric patients. Pakistan Armed Forces Medical Journal. 2010;60(2):237-40.
21. Frölich MA, Caton D. Baseline heart rate may predict hypotension after spinal anesthesia in prehydrated obstetrical patients. Canadian Journal of Anesthesia. 2002;49(2):185.
22. Chinachoti T, Saetia S, Chaisiri P, Tritrakarn T. Incidence and risk factors of hypotension and bradycardia during spinal anesthesia. Siriraj Medical Journal. 2006;58(3):696-701.

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Comparison Between Volume Controlled Ventilation and Pressure Controlled Ventilation in Laparoscopic Cholecystectomy and their Effects on Hemodynamic and Respiratory Parameters

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Abstract

Background: Laparoscopic cholecystectomy is a minimally invasive surgical technique for amputation of an unhealthy gallbladder. This procedure has several advantages including shorter stay in hospital, minimal post-operative pain and fast recovery after procedure. The disadvantages of this procedure due to increase intra-abdominal pressure, patient position and general anesthesia. Many of anesthetist apply VCV in this procedure. VCV can deliver adequate minute volume but this is corresponded by an increase in airway pressure, so other alternative mode can be used to solve this problem like PCV.

Aim of the Study: To compare effect of volume controlled ventilation versus pressure controlled ventilation on respiratory and haemodynamic parameters during laproscopic cholycystectomy.

Patients and method: A prospective comparative observational study, conducted at the Department of general surgery in Baghdad Teaching Hospital/Medical city complex, from October 2019 - October 2020. Fifty participants underwent laparoscopic cholecystectomy within the inclusion criteria were included in the present study. Each group consist of 25 patients .one group received VCV and others receive PCV. peak airway pressure, mean airway pressure, MAP, and heart rate was recorded intraoperatively at 5,10 and 30 minute intervals. The collected data were analyzed by SSPS version 22 program.

Results: In pressure control group of patients, the peak airway pressure was significantly deceased after 10 and 30minutes after start of laparoscopy (20.2and 20.8) versus (24.3 and 24.1) respectively and mean airway pressure was significantly increased after same time (10.6 and10.6) versus (9.7 and 9.7) respectively relative to volume control group. No significant change in hemodynamic parameters. **Conclusion:** PCV mode is a safe alternative & offers protection to the lungs but there was no beneficial effect of PCV regarding mean airway pressures which reflect oxygenation, minute ventilation &ETCO2.

Keyword: laparoscopic surgery, Pneumoperitoneum, PCV, VCV, Peak airway pressure, mean airway pressure.

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Introduction

Laparoscopic surgery is a minimally invasive surgical technique where specialized tubes are inserted for surgical access. Small skin incisions are made, approximately 1 cm in length, to facilitate insertion of rigid tubes, called trocars. Trocars are sharp, multiport, one-way conduits used to insufflate gas and to guide various specialized surgical instruments. Intra-peritoneal viewing is conducted using a video-capable telescopic camera[1]. It is one of the most common surgical techniques and has several advantages over traditional surgery, including decreased postoperative pain, a shorter length of stay in the hospital, and cosmetic appeal, less postoperative pulmonary impairment, a reduction in postoperative ileus, laparoscopic surgery can provide substantial medical and economic advantages. Carbon dioxide is the most commonly used gas for insufflation because it is extremely soluble and diffuses easily through biological membranes. Intra-abdominal pressure (IAP) is raised from less than 5 mm Hg to approximately 15 mm Hg[2].

Although the procedure involves minimal invasion and tissue damage, it has potentially serious complications, including cardiopulmonary effects that result mainly from hypercarbia and raised intraabdominal pressure caused by pneumoperitoneum. Absorbed carbon dioxide from the peritoneal cavity tends to cause acidosis. Leakage of the gas into tissue spaces may induce subcutaneous emphysema, pneumothorax, pneumomediastinum and pneumopericardium. Cardiac effects include arrhythmias, hypotension, cardiac arrest, gas embolism, pulmonary edema,and myocardial ischemia or infarction. Some of these effects, though rare, are serious and potentially fatal. Physicians should anticipate these problems in their patients undergoing laparoscopic procedures[3]. A moderate-to-low intra-abdominal pressure (<12 mm Hg) can help limit the extent of the pathophysiological changes[4]. Patients who undergo laparoscopic cholecystectomy is operated on under general anesthesia, in a reverse Trendelenburg position, with 12–15-mmHg pneumoperitoneum. All of these factors can induce venous stasis of the legs, which may lead to postoperative deep-vein thrombosis (DVT) [5].

The gallbladder lives on the inferior aspect of the liver bed, more specifically under liver segments 4b and 5. The gallbladder can be up to 10 cm in length and physiologically can hold up to 50 cc of fluid (bile). A line from the gallbladder to the inferior vena cava separates the liver into right and left lobes. There are four anatomical sections to the gallbladder: fundus, body, infundibulum, and neck. There is great variation in the biliary ductal anatomy[6].The cystic duct most commonly arises from the common bile duct and inserts at the neck of the gallbladder. The branch point of the cystic duct from the common bile duct marks the beginning of the common hepatic duct superiorly. The blood supply to the gallbladder is from the cystic artery which originates approximately 90% of the time from the right hepatic artery. Again, there is great variation in the course and origin of the cystic artery. The hepatocytes triangle (triangle of Calot) is a surgical anatomical landmark created by the cystic duct laterally, the common hepatic duct medially, and the liver edge superiorly. This triangle is of surgical importance because this is the location for the most common path of the cystic artery to the gallbladder. There sentinel lymph node of the gallbladder resides within the hepatocytes triangle, also known as Lund's node (and erroneously referred to as the node of Calot) [7].

Aim of the study: To compare effect of volume controlled ventilation versus pressure controlled ventilation on respiratory and haemodynamic parameters during laproscopic cholycystectomy.

Patient and Method:A prospective observational study, conducted at the Department of general surgery in Baghdad Teaching Hospital/Medical city complex, from first of October 2019 to the first of october2020.

Inclusion criteria: Patients within the age between 18-65 years' old ;ASA physical status between I-II; BMI < 30; Those who indicated for laparoscopic cholecystectomy under general anesthesia and Those who agreed to participate in the study.

Exclusion criteria: Patient with any suspected abnormality in the airway or respiratory system ; Patient with cardio-pulmonary diseases and Patients who are heavy smoker.

50 participants underwent laparoscopic cholecystectomy within the inclusion criteria were included in the present study. History and physical examination for each participant, height and weight were measured and the BMI were calculated.

Laboratory investigations include complete blood count, viral screen, CXR, and ECG.Then patients were divided into 2 groups each group were included 25 patients:Group A: (VC group) and Group B: (PC group).

Methods

Patients were divided into two groups; each group receive different type of ventilator mode either PCV or VCV. Each group was including twenty-five patients, were admitted in Baghdad teaching hospital.

At the operative room, standard monitoring of non-invasive blood pressure measurement, ECG, pulse oximetry & capnograph. The patients were cannulated & received 500 ml ringer lactate or normal saline then the baseline mean arterial pressure, heart rate& SPO2 were recorded.

Induction of anesthesia was done after premedication which consist of midazolam 2mg, metoclopramide 10 mg, dexamethasone 8 mg and preoxygenation with 1mcg/kg of fentanyl, 0.5 mg/kg of ketamine,and sleeping dose of propofol (1.25-2.5mg/kg).endotracheal intubation was done after administration of 0.6mg per kg rocuronium.maintenance of anesthesia was done with isoflurane1.2% and rocuronium 0.1mg/kg.paracetomol 1gm and nefopam 20mg infusion was given.The anesthetist administered further drugs and fluids as clinically indicated.

In VC group, the ventilator parameters were: tidal volume 6-8 ml per kg, respiratory rate 12 beat per minute, inspiratory to expiratory ratio (I: E) was 1:2 and maximum alarm setting of airway pressure is 35 cmH2O, PEEP was 5 cmH2O. so, In PC group, inspiratory pressure was adjusted to obtain tidal volume of 6-8 ml per kg. other parameters similar to VCV mode.

During surgery; pneumoperitoneum was done with CO2 insufflation with patients in the supine position, to a maximum intra-abdominal pressure of 12 mmHg. Patients were then tilted head-up by 15–20 degree. The same position was maintained throughout the procedure.

At the end of operation, after skin closure, isoflurane was turned off and neuromuscular blockage was reversed with 0.2mg/kg neostigmine and 0.02mg/kg atropine.pateints were stimulated verbally or with gentle tactile stimulation and extubated safely when they meet standardized extubation criteria.

Data were recorded intra-operatively at three-time intervals: approximately 5 min after tracheal intubation and at 10 and 30 min after the beginning of laparoscopy.Data include peak airway pressure, mean airway pressure,MAP and heart rate.

Statistical analysis: The data were analyzed using statistical package for social sciences (spss) version (24). Chi-square test was used to assess the association between categorical variables, P. value less than 0.05 considered statistically significant.

Results

Fifty patients were involved in this study. Comparison between two groups each of them received either VCV or PCV then the results were analyzed by using SPSS program statistic student's independent sample T test for difference of mean these tests were further referenced for P value less than 0.05 were considered statisticallysignificant

Shows **Table (1)** that mean age of the VC group was 32±3.9 years old and 33±0.2 years for PC group. female was more prominent in both groups (21 and 22) in VC and PC respectively.So mean of BMI was 27±3 in VC and 26±4 in PC.

Figure(1) showed25 patients were found in each of the studied groups.

Table 1: Mean age and BMI for laparoscopic cholecystectomy patients.

Variables	VC (n=25)	PC (n=25)	P - Value
Age (mean)/years	32.3±3.9	33±0.2	0.3 Ns
BMI (mean)	27±3	26±4	0.3 Ns

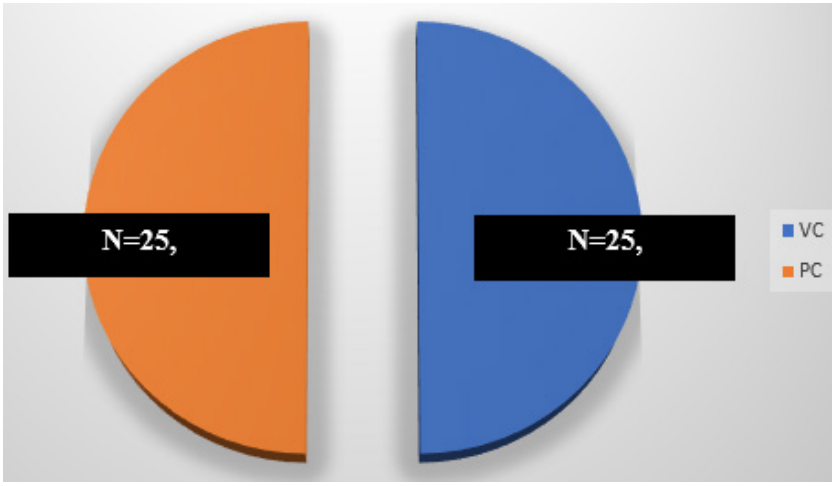


Figure 1: Distribution of the patients at the studied groups

The Baseline data for patients undergoing laparoscopic cholecystectomy was; heart rate of the studied groups was 92 with SD= 9 beats/min, mean arterial pressure was 100 and SD=12 mmHg, SPO2 was 98 with SD=4.

Table 2: Baseline data for laparoscopic cholecystectomy patients and patients undergoing laparoscopic cholecystectomy. Values are mean± SD.

Variables	laparoscopic cholecystectomy patients			patients undergoing laparoscopic cholecystectomy		
	Mean±SD	95% CI		VC (n=25)	PC (n=25)	P – Value
HR (beats/min) (mean)	92±9	88	91±11	91±11	93±16	0.6 Ns
MAP (mmHg) (mean)	100±12	95	102±10	102±10	98±18	0.3 Ns
SPO2(mean)	98±4	93	98±2	98±2	98±6	0.9 Ns

VC, volume-controlled ventilation; PC, pressure-controlled ventilation, MAP, mean arterial pressure; HR, heart rate; Ns, not significant.

The mean of heart rate was 91±11 beats/min in VC and 93±16 beats/min in PC, mean arterial pressure was 102±10 mmHg in VC and 98±18 mmHg in PC, SPO2 was 98±2 in VC and 98±6 in PC.

Table (3) showedin the two classes (VC and PC), both peak and mean airway pressures were the same at five minute after tracheal intubation. Nevertheless, the peak airway pressure decreased significantly after the start of laparoscopy at 10 and 30minutes and the mean airway pressure significantly increased in the PC group compared to VC group.

Table (3): Respiratory data results in the studied groups at different time interval. Values are mean± SD.

Variables		VC	PC	P. value
P_{peak}; cmH2O	5 min	18.2±1.42	17.8±1.1	0.2 Ns
	10 min	24.3±2.3	20.2±2.1	<0.001
	30 min	24.1±2.1	20.8±1.9	<0.001
P_{mean}; cmH2O	5 min	8.8±0.8	9±0.7	0.3 Ns
	10 min	9.7±1.01	10.6±1.5	0.01
	30 min	9.7±1.03	10.6±1.3	0.009

VC, volume-controlled ventilation; PC, pressure-controlled ventilation; P_{peak}, peak airway pressure; P_{mean}, mean airway pressure, Ns; not significant.

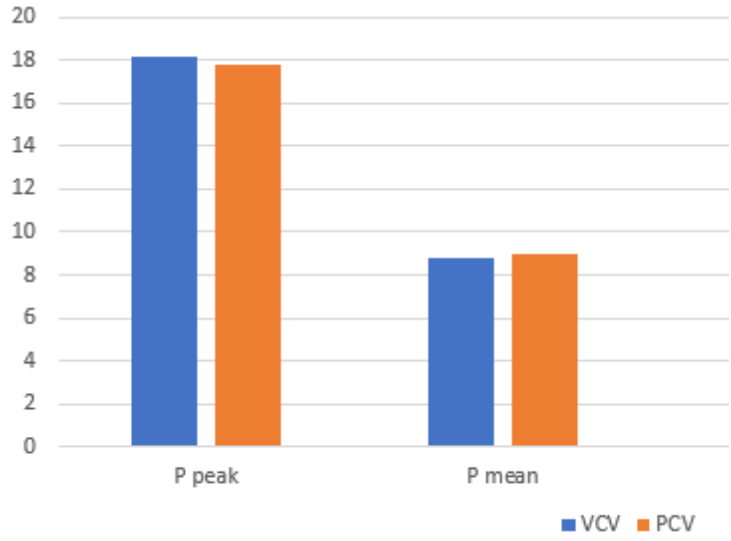


Figure (2): Comparison Between Respiratory Parameter After 5 minutes after tracheal intubation for both Modes

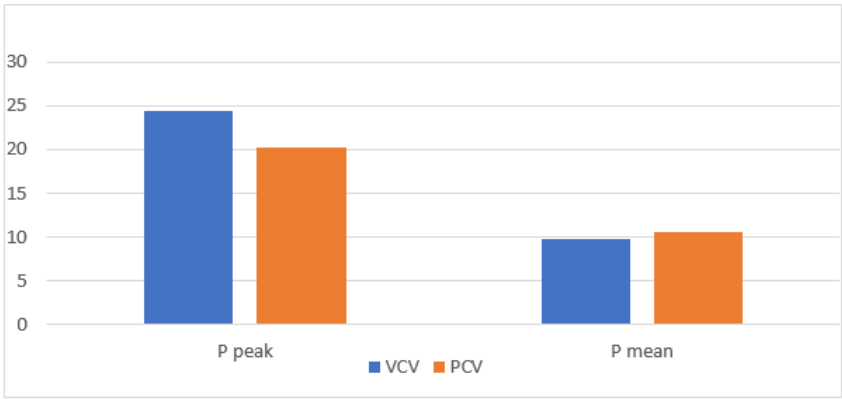


Figure (3): Comparison Between Respiratory Parameter After 10 Minutes after start of laparoscopy for both Modes

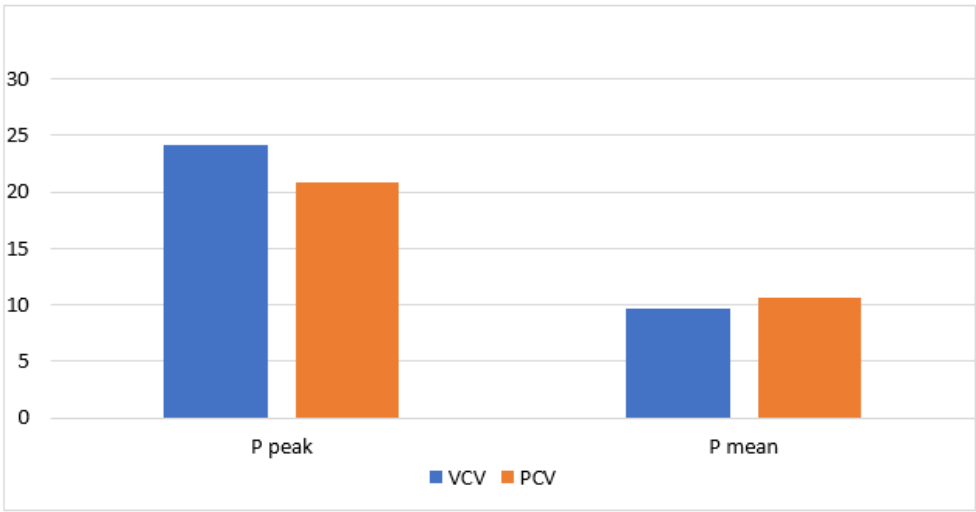


Figure (4): Comparison Between Respiratory Parameter after 30 minutes after start of laparoscopy for both Modes

No significant differences were found between VC and PC regarding heart rate, MAP.

Table (4): Hemodynamic data in the studied groups at various time interval; Values are mean ± SD. HR, heart rate;MAP,mean arterial pressure; Ns, not significant.

Variables		VC	PC	P – value
HR; beats/ min)	5 min	91±3	89±4	0.051 Ns
	10 min	84±2	85±3	0.17 Ns
	30 min	84±5	82±3	0.09 Ns
MAP; mmHg	5 min	88±8	85±3	0.08 Ns
	10 min	98±3	101±7	0.054 Ns
	30 min	94±1	97±9	0.1 Ns

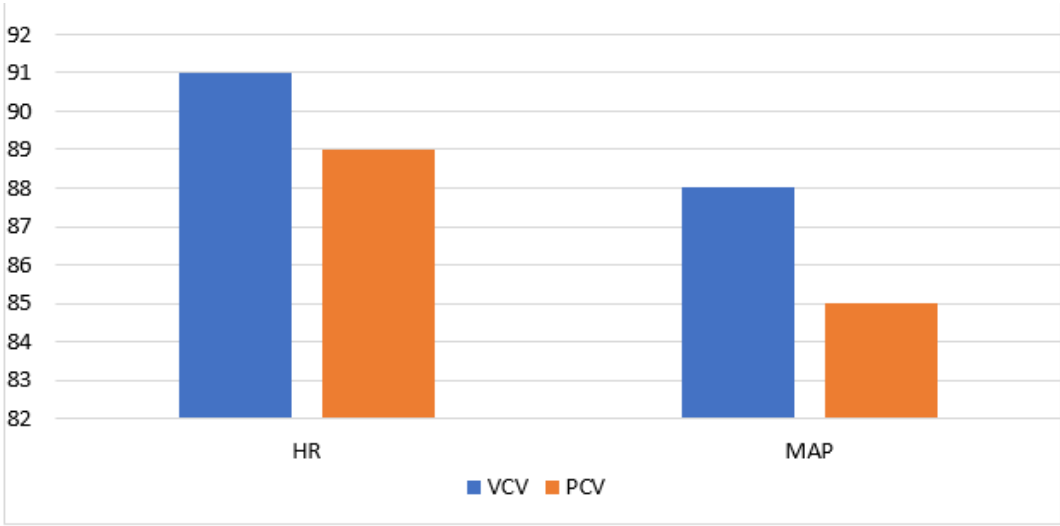
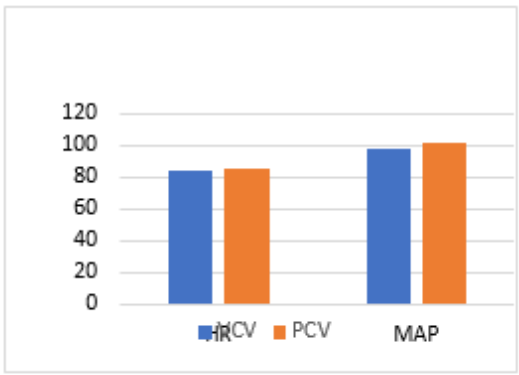
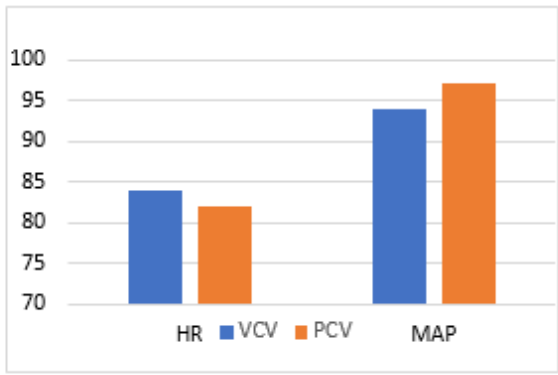


Figure (5): Comparison Between Hemodynamic Parameter After 5 minutes of tracheal intubation for both Modes





A- 10 Minutes after start of laparoscopy for both Modes

B-30 minutes after start of laparoscopy for both Modes.

Figure (6): Comparison Between Hemodynamic Parameter After10AND 30 Minutes after start of laparoscopy for both Modes.

Discussion

In this study we found statistical difference between two modes of ventilation in term of peak airway pressure and mean airway pressure at 10 and 30 minutes start of laparoscopy. Peak airway pressure at 10 and 30 minutes is (24.3 in VCV vs 20.2 in PCV, P = < 0.001) and (24.1 in VCV vs 20.8 in PCV, P value = < 0.001) respectively. Mean airway pressure at 10 and 30 minutes is (9.7 in VCV vs 10.6 in PCV. P, value = 0.01) and (9.7 in VCV vs 10.6 in PCV, P value = 0.009) respectively.

Balick *et al* and Oğurlu *et al.,* were found a significant decrease in the peak airway pressures to those for non-bariatric laparoscopic surgery[8 &9].

Davis K *et al.,* Mang *et al.,* and Hans *et al.,* Were found in other cases including acute pulmonary trauma / acute respiratory distress syndrome[10&11] and obese patients[12], a decrease in peak airway pressure due to PC ventilation has been observed.

In comparison, Cadi *et al.,* Baerdemaeker *et al.,* and Sinha *et al.,* were found that there are no ventilator changes between two groups in obese patient[13&14]. This can be explained by the physiological differences associated with obesity in the respiratory system that may impair mechanical ventilation regardless of the compromise caused by laparoscopy[15].

A variety of changes in the ventilatory strategy during laparoscopy have been evaluated for their effect on surgical conditions. The effect of mechanical ventilation was compared with spontaneous ventilation during laparoscopic gynecological surgery by Williams *et al.,*[16]. The use of mechanical ventilation was associated with substantially improved pneumoperitoneum (facilitating surgical access) and lower Intra-abdominal pressure.

Due to its decelerating inspiratory flow pattern the decrease in peak airway pressure correlated with PC ventilation is likely to be the consequence[10 &17], with the optimum value reached early in inspiration. This is then accompanied by a flow rate deceleration, resulting in its characteristic shape. The initial fast flow contributes to early alveolar inflation and PC ventilation thus associated with an increase in mean airway pressure[18].

Hemodynamic changes, including a rise in cardiac workload, can be associated with the development of a pneumoperitoneum during laparoscopic surgery[19]. Because of the increased mean airway pressure[20], pressure-controlled ventilation can yield an enhanced effect of the increased mean airway pressure, which may adversely affect hemodynamic variables by its effects on pleural pressure[8], Balik *et al.,* explain the hemodynamic effects of laparoscopic urological procedures using trans esophageal echocardiography to measure systolic and diastolic function as a primary outcome of left ventricular wall stress. The authors found that PCV and VCV ventilation were associated with statistically comparable hemodynamic outcomes[8].

Conclusion

PCV mode is a safe alternative & offers protection to the lungs but there was no beneficial effect of PCV regarding mean airway pressures which reflect oxygenation, minute ventilation &ETCO2.

Source of funding: Self

Conflict of Interest: non

Ethical clearance: non

References

1. Barash PG,CullenPF, stoetling RK, Cahalan MK, Stock MC, Ortega R, Sharar SR, Holt NF, editors. Anesthesia for laparoscopic & Roboticsurgeries, clinical anesthesia. 8th ed. Philadelphia: Wolters Kluwer; 2017,3145.
2. Hines R, Marshall KE, editors. Restrictive lung diseases & lung transplantation, Anesthesia & Co-existing disease.7th ed. Philadelphia: Elsevier; 2018,49.
3. Sharma KC, Kabinoff G, Ducheine Y, Tierney J, Brandstetter RD. Laparoscopic surgery and its potential for medical complications. Heart & lung. 1997 Jan 1;26(1):52-64
4. Gutt CN, Oniu T, Mehrabi A, Schemmer P, Kashfi A, Kraus T, Büchler MW. Circulatory and respiratory complications of carbon dioxide insufflation. Digestive surgery. 2004;21(2):95-105
5. Caprini JA, Arcelus JI, Laubach M, Size G, Hoffman KN, Coats R2, Blattner S. Postoperative hypercoagulability and deep-vein thrombosis after laparoscopic cholecystectomy. Surgical endoscopy. 1995 Mar;9(3):304-9.

6. Sarawagi R, Sundar S, Raghuvanshi S, Gupta SK, Jayaraman G. Common and Uncommon Anatomical Variants of Intrahepatic Bile Ducts in Magnetic Resonance Cholangiopancreatography and its Clinical Implication. Pol J Radiol. 2016; 81:250-5.
7. Sherwinter DA. Identification of anomolous biliary anatomy using near-infrared cholangiography. J Gastrointest Surg. 2012 Sep;16(9):1814-5.
8. BalickWeber CC, Nicolas P, Hedreville-Montout M, Blanchet P, Stéphan F. Respiratory and haemodynamic effects of volumecontrolled vs pressurecontrolled ventilation during laparoscopy: a cross-over study with echocardiographic assessment. British Journal of Anaesthesia 2007; 99: 429-35.
9. Oğurlu M, Küçük M, Bilgin F, *et al.* Pressurecontrolled vs volumecontrolled ventilation during laparoscopic gynecologic surgery. Journal of Minimally Invasive Gynecology 2010; 17: 295–300.
10. Davis K Jr, Branson RD, Campbell RS, Porembka DT. Comparison of volume control and pressure control ventilation: is flow waveform the difference? Journal of Trauma 1996; 41: 808–14
11. Mang H, Kacmarek RM, Ritz R, Wilson RS, Kimball WP. Cardiorespiratory effects of volume□ and pressure□ controlled ventilation at various I/E ratios in an acute lung injury model. American Journal of Respiratory and Critical Care Medicine 1995; 151: 731–6
12. Hans GA, Prégaldien AA, Kaba A, *et al.* Pressurecontrolled ventilation does not improve gas exchange in morbidly obese patients undergoing abdominal surgery. Obesity Surgery 2008; 18: 71–6
13. Cadi P, Guenoun T, Journois D, et al. Pressure-controlled ventilation improves oxygenation during laparoscopic obesity surgery compared with volume-controlled ventilation. Braz J Anaesthesiol. 2008;100:709---16.
14. De Baerdemaeker LE, Van der Herten C, Gillardin JM, Pattyn P, Mortier EP, Szegedi LL. Comparison of volume-controlled and pressure-controlled ventilation during laparopscopic gastric banding in morbidly obese patients. Obesity Surgery 2008; 18: 680–5.
15. Sinha AC, Eckman DM. Anesthesia for bariatric surgery. In: Miller RD, ed. Miller's Anesthesia, 7th edn. Philadelphia: Churchill Livingstone, Elsevier, 1999: 2089–104
16. Williams MT, Rice I, Ewen SP, Elliott SM. A comparison of the effect of two anaesthetic techniques on surgical conditions during gynaecological laparoscopy. Anaesthesia 2003; 58: 574–8
17. Edibam C, Rutten AJ, Collins DV, Bersten AD. Effect of inspiratory flow pattern and inspiratory to expiratory ratio on nonlinear elastic behavior in patients with acute lung injury. American Journal of Respiratory and Critical Care Medicine 2003; 167: 702–7
18. Armstrong BW Jr, MacIntyre NR. Pressure-controlled, inverse ratio ventilation that avoids air trapping in the adult respiratory distress syndrome. Critical Care Medicine 1995; 23: 279–85.
19. Irwin MG, Ng JK. Transoesophageal acoustic quantification for evaluation of cardiac function during laparoscopic surgery. Anaesthesia 2001; 56: 623–20. Mercat A, Graini L, Teboul JL, et al. Cardiorespiratory effects of pressure controlled ventilation with and without inverse ratio in adult respiratory distress syndrome. Chest 1993; 104: 871–5.

Original Research Article

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Sociodemographic Profile of Burns Case for Autopsy: One Year Study

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Abstract

Background: Burns constitute a major cause of deaths, both suicidal & accidental in the world & our country. As per the National crime record bureau of India, burns one among the common method of suicide and the rate of fatal suicidal burns was 2.6% in 2021. In Tamil Nadu, the rate of suicide is 11.5%, and also, being the second highest among the other states.(1) This study is undertaken with the aim to study sociodemographic profile of burns case brought to autopsy at tertiary medical college, along with the pattern & outcome.

Methods: A cross sectional study was done in a total of 53 cases of burns brought for medicolegal autopsy during the study period. Data including age, gender, socioeconomic status, manner of burns , % of burns, duration of survival were all collected based on pre structured proforma & further was analysed using standard statistical method.

Results and Conclusion: Burns incidence is seen in mostly age group 31-40, with majority of them being females(62.27%).suicidal burns are more common (73.59%), with >75%(66.03%) burns being more. About 35.8% survived for 1-7 days prior to succumbing death.

Enhancing a better mental& physical environment should be the priority. Early & effective treatment can be useful in reducing the mortality due to burns.

Keywords: Burns, medicolegal autopsy, suicide.

Introduction

Burns are the fourth leading traumatic event in the world after traffic accidents, falls and violence among individuals. Globally, there are about 300,000 deaths due to burns every year. Of these, 95% take place in developing countries with Southeast Asia recording nearly 57% of deaths due to burns. According to WHO (2000) report, 238,000 individuals died of burns related deaths and 95% of these deaths occurred in low- and middle-income countries. There are an estimated 7 million burn injuries in India annually, of which 700,000 require hospital admission and 140,000 are fatal, 2.4 lakh people suffer with disability.(1)Burn injuries constitute a serious medical, social, and psychological problem along with severe economic loss to individual and their family. According to National program for prevention of burn injuries, high occurrence is ascribed to illiteracy, poverty, and low-level safety, and 90% of burn injuries are preventable.[2] Keeping

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this background, this study was undertaken with objectives to study the sociodemographic factors of burn patients in Thoothukudi region, to find out the cause and outcome of burn patients admitted in Government Thoothukudi Medical college and to draw conclusion about preventive aspects of burn injuries.

Methods and Materials

A total of 53 cases of death due to burns were brought for autopsy at the mortuary of Thoothukudi Government Medical Collage, during the period January 2021 to December 2021, were studied. The information was collected from accompanying relatives, hospital records, and police papers to ascertain the incidence, manner and circumstances of burns. Percentage of total body surface area burn was calculated according to Wallace's rule of nine A speciallyprepared proforma containing medico-legal aspects of deathdue to burns was filled. It was analysed by using standard statistical method and tabulated for better understanding.

Study was started after receiving approval from institutional ethical committee from government Thoothukudi medical college.

Observations

The present medico-legal study of burns in 53 cases was conducted on dead bodies brought in the Department of Forensic Medicine & Toxicology in Thoothukudi Government Medical College in Thoothukudi with effect from January 2021 to December 2021.

Present study demonstrated preponderance of female 33 (62.27%) victims over male 20 (37.73%) victims.

The maximum incidence of burn injuries were noted in the age group of 31-40 years i.e. 18.7% and minimum cases were reported in the age group of 0-10 years i.e. 1.88 %. Minimum cases were reported in age group of above 80-90 years i.e 5.66% (TABLE 1.1)

Table 1.1: Age distribution .

AGE GROUP	NUMBER OF CASES (n)	PERCENTAGE
0-10	1	1.8 %
11-20	7	13.2%
21-30	8	15.09%
31-40	10	18.8%
41-50	8	15.09%
51-60	4	7.54%
61-70	6	11.32%
71-80	6	11.32%
81-90	3	5.6%

In our study (TABLE 1.2) ,as per police inquest it is observed that 17(32.08%) cases out of 53 cases have sustained burn during morning. Occurrence of burn during afternoon hours was found in 11(20.75%) cases. 13(24.53 %) cases have sustained burns during evening hours.12 (22.64%) cases occurrence of burns during night hours.As it is the morning hour rush time, where women rush in the kitchen , possibility of accidental burns is more, also after leaving for work the person left alone in home have increased tendency to commit suicide at the earliest.

Table 1.2: Time of occurrence of burns

TIME OF OCCURRENCE OF BURNS	NO OF CASES	PERCENTAGE %
MORNING	17	32.08
AFTERNOON	11	20.75
EVENING	13	24.53
NIGHT	12	22.64

Its observed that most of the victims were married 46 (86.79%) and 7 cases (13.21%) were unmarried. Duration of marriage <5 years 5 9.43%), 5- 10 years 15 (2.30%), >15 years 26 (49.05%). The most common manner of death due to burns was found to be suicidal (73.59%) followed by accidental (26.41%) and homicidal cases contributed to(0%) of the total deaths.

Table 1.3: Causes Of Suicidal Burns

S No	Causes Of Suicidal Burn	Yes	No
1	Prior Psychiatric Illness	6	47
2	Substance Abuse	9	44
3	Disputed Family	12	41
4	Other Medical Illnesses	19	34
5	Others	11	42

Maximum cases of death due to burns were seen in low socio economic status of 35 cases (66.01%) followed by middle socio economic status of 18 (33.99%).

Table 1.4: Percentage Of Burns.

% OF BURNS	NO. OF MALES(n)	%	No. of female (n)	%	Total no. of cases	%
<50%	3	60%	2	40%	5	9.43%
50-75%	6	46%	7	53.84%	13	24.56%
>75%	11	31.42%	24	68.57%	35	66.03%

In present study most of the victims sustained >75% burns (n=35 (66.03%) cases died and followed by 50–75 % burns i.e., 13 (24.56%) followed by < 50% 4 (9.43%).(table 1.4)

Table 1.5: Duration of survival after burns

Survival Duration	No. of cases (n)	%
Brought dead	13	24.52 %
< 1 day	13	24.52 %
1-7 days	19	35.84 %
>7 days	8	15.09 %

As per our study, majority of deceased survived for a period in between 1-7 days on treatment(n= 19 ,35.84%) , while brought dead & those survived less than contributed (24.52 % each) & least no. of people survived for a period of more than 7 days (15.09%). (table 1.5)

Discussion

Burn injuries occur universally and they have plagued mankind since antiquity, till the present day. In all societies which include those in the developed or in the developing countries, burn pose not only medical and psychological problems, butthey also pro-duce severe economic and social consequences on the victim's families and also on the society in general.[3] An analysis has been made based onthe sociodemographic profile with the following results. Maximum cases of death due burns were seen in Females which contributed to 33 (62.27%) of the total deaths, which is similar to studies by Mazumdar A et al, Buchade D et al. [2,4]. Females were more prone to the burn incidences because of their domestic activities which required an association with fire sources. Moreover Indian women wore dresses like the sari and the salwar – kamiz with dupatta, which were often of synthetic material, which covered almost the whole body. Such clothes would have favored aggravation of the burn injuries.

Maximum deaths due to burns were seen in the age group of 31-40 years which constitutes (18.7%) of deathsfollowedby21-30Years(15.09%)and41-50Years (15.09%). It could be explained by the facts that the persons of this young age group are suffering from stress of the modern life style, family problems, financial problems. This is slightly different from other studies where majority is 21-30 years , as per Ambade VN et al, Kumar V et al[5,6]

Maximum cases of death due to burns were seen in low socio economic status 35 cases (66.01%) followed by middle socio economic status 18 cases (33.99%). Similar findings as in studies by Buchade et al, Manigandaraj&et al.[3,7]This may be due to poverty, financial crisis, stress related to work and competition in education.

The most common manner of death due to burns was found to be suicidal (73.59%) followed by accidental (26.41%) and homicidal cases contributed to (0%) of the total deaths similar to all major studies by Vijayanath .v. et al, dr. Soumyajyothi et al, Shinde et al.[8,9,10] Kitchen being the easiest access for the

women andbecause of the deep –rooted custom of dowry and marital disharmony which could have compelled the married females either to commit suicide or they may be killed by their in laws and husbands.

Conclusion

The epidemiological factors of the burn injuries vary for different regions. For planning and implementing prevention programs, the approach has to be multidisciplinary and co-ordinated and this can largely be accomplished by taking the following measures. Providing awareness through school eduction programmes & mass media programmes so as to change, the mindset of the general population, with the aim of not only instilling education but also discouraging dowry demands and ostentatious marriage rituals, thereby reducing marital disharmony. Also ensuring proper mental health care support to withstand the hard circumstances in life is also very important.

Recommendations

Implementation of strict preventive strategies at high risk work places, so as to prevent fatal burn accidents among the employees. The early detection and treatment of microbial infections can reduce the mortality among the burn victims. Proper up gradation of the ICUs, burn-units and the transport facilities with recent techniques. Advanced modes of facilities are required to handle all the fatal cases. So, as long as the problem of deaths by burns persist in India, the government needs to concentrate in this direction and the NGOs, social groups, and the workers need to put in more sincere efforts.

Source of Funding: Self

Conflict of Interest: Nil

Ethical clearance: Study was started after receiving approval from institutional ethical committee from government Thoothukudi medical college.

References

1. ADSI-2021/National Crime Records Bureau- https://ncrb.gov.in/en/ADSI-2021
2. Mazumdar A, Patowary A. A Study of Pattern of burn injury cases. J. Indian Acad Forensic Med. 2013;35(1):44–6.

   Kumar V, Tripathi CB. Fatal accidental burns in marriedwomen. Legal Medicine 2003;5:139-145.
3. UsamaB. Ghaffar, Husain M, Rizvi JS. Thermal burns: An epidemiological prospective study. J Indian Acad Forensic Med, 2007; 29 (3): 42-9.
4. Buchade D, Kukde H, Dere R, Savardekar R. Pattern of burns cases brought to morgue, Sion Hospital, Mumbai: A Two year study. JIAFM 2011 Oct-Dec;33(4):309-10.
5. Ambade VN, Godbole HV. Study of burn deaths in Nagpur, central India. Burns 2006;32:902-8.
6. Kumar V, Mohanty MK, Kanth S. Fatal burns in Manipal area: A 10 year study. Journal of Forensic and Legal Medicine 2007;14:3-6.
7. Pattern and trends of deaths related to burns - Manigandaraj G1*, Selvakumar R2,MedPulse International Journal of Forensic Medicine, Volume 17, Issue 1 January 2021; 10(5)
8. Prakash.IBabladi, Vijayanath.V, Vijayamahantesh.S. N, Burns and burning issues in Gulbarga, Karnataka; Indian Journal of Forensic Medicine Toxicology; July-Dec2010;Vol 4,No.2:85-87.
9. Dr. Soumyajyoti Bandyopadhyay1, Dr. Arup Kundu2, Dr. Atanu Bhattacharjee3,Dr. Arista Lahiri4, *Dr. Shouvanik Adhya5-Socio-Demographic Profile and Reported Circumstances of Deathamong Female Burn-Victims: Experience from a Tertiary CareHospital, Kolkata- IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 18, Issue 2 Ser. 8 (February. 2019), PP 56-59
10. Shinde AB, Keoliya AN. Socio-demographiccharacteristics of burn deaths in rural India. InternationalJ. of Health care and Biomedical Research 2013.

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Comparison Between Ultrasonography and Capnography in the Assessment of Endotracheal Tube Placement after General Anesthesia

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Abstract

Background: Verification of endotracheal tube placement is of vital importance and can prove rapidly fatal. Because the placement of unrecognized esophageal tubes is so obviously detrimental, several instruments and techniques have been investigated to get rid of such fatal complications. While there are numerous methods and devices utilized for verifying endotracheal tube placement, none have been shown to be completely reliable. In the present study, we compared the upper airway ultrasound with capnography so as to assess endotracheal tube placements rapidly and accurately following general anesthesia (GA).

Aim of the study: The aim is to examine how much fast and accurate the ultrasound in comparison with capnography for assessing the endotracheal tube placement after general anesthesia.

Patients and methods: This prospective cross-sectional study was conducted on (100) patients requiring tracheal intubation under general anesthesia by using ultrasonography for confirming the endotracheal tube position compared to capnography.

Results: Significant differences were found in the meantime for the group (A) between ultrasound (US) and capnography. But in the group (B), there was no significant difference between means of time for confirmation by U/S and capnography. A P-value less than (0.05) was considered significant.

Conclusion: In confirming the position of the tracheal tube, the real-time US was shown to be similar to capnography in accuracy.

Key words: endotracheal tube, capnography, ultrasonography, general anesthesia

Introduction

In operation theatre settings, tracheal intubation is generally performed to maintain and protect the airway during general anesthesia. Confirmation of correct endotracheal tube (ETT) placement is essential immediately after intubation. Failure to diagnose esophageal intubation can be disastrous. The incidence of esophageal intubation was reported at 2-6% in emergency conditions and 1.75% in the elective setting [1]. Esophageal intubation is one of the main causes of accidents leading to death

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or neurologic damage. An investigation of anesthesia mortality revealed that 69% of the deaths were related to airway management, with esophageal intubation as one of the contributing factors [2]. Direct visualization of the ETT passing through the glottis is often applied in practice, but it is not always possible, especially if laryngoscopy is difficult. The alternative methods of confirmation include auscultation, observation of chest movements, observation of condensation in the ETT and increasing heart rate.

None of these indirect methods have been proven to be fully reliable, especially under emergency conditions. Given the efficacy of devices such as the electronic end-tidal carbon dioxide ($Etco_2$) detector in the operating suite, the American Society of Anesthesiology has included $Etco_2$ detection in their Standards for Basic Intra-operative Monitoring. This action, combined with the ready availability of inexpensive devices, has established Etco2 detection as the standard of care for endotracheal intubation in the hospital[3]. So, it is the gold standard for identifying esophageal intubation. Capnography has also been found to be the best method for rapid assessment of ETT position [4]. Capnography has 100% sensitivity and 100% specificity in verifying the correct ETT location which shows that waveform capnography can be considered as the standard method for the primary verification of ETT location [5]. Several studies of upper airway ultrasonography (USG) confirmation of ETT position provided promising results in a cadaver model or in patients under controlled operating room conditions [6-8].

In this prospective observational study, we have compared upper airway USG with reference to capnography (the gold standard method) for rapid confirmation of endotracheal tube placement after general anesthesia. The reason for this research is important; it is to show that ultrasound is in good agreement to waveform capnography which is the gold standard in the immediate confirmation of endotracheal intubation. Not all hospitals have the facilities of Etco2, but all district hospitals at least have U/S at their disposal. If this is successful, we could train all health care providers whose involved in life threatening situations to use U/S to confirm ETT placement and thus reduce incidences of unrecognized esophageal intubation which are sometimes difficult to detect clinically but may cause substantial morbidity and mortality.

Confirmation of tube placement is a dynamic process requiring ongoing patient assessment. In order to mechanically ventilate the patients, an endotracheal tube (ETT), the most commonly used artificial airway, has to be inserted into the patient's trachea [9]. Intubation has been classified as a highly technical and clinical skill that is accompanied by the danger of complications. These complications can occur during the intubation procedure, while the ETT is in place or after the ETT has been removed. Incorrect placement of the ETT may lead to inadequate ventilation, displacement, aspiration, ineffective oxygenation, hypoxia, hypotension and esophageal intubation. Verification of the ETT in mechanically ventilated patients is therefore important [10-13].

Capnography is a continuous measurement and graphic display of exhaled carbon dioxide. It is noninvasive method to assess the ventilation and cardiac output. Most commonly infrared light absorption by CO2 is the method used to determine the CO2 concentration. It is a plot of the partial pressure of carbon dioxide against time. It may be classified as main stream or side stream, depending on the part of the breathing system that the gas sampled from [14].

Patients and Methods

After obtaining the approval of the Iraqi council of anesthesia and intensive care, the current prospective, cross sectional study was carried out in general surgical operation theaters of Baghdad teaching hospital, during the period from January to august 2018.

In this study, 100 patients who need direct laryngoscopy were enrolled. Before their enrollment in this study, written informed consents were taken from the patients. All the patients were undergone surgical operation under general anesthesia and divided into two groups according to time of operation. Group (A) included patients studied in first four months and Group (B) included patients studied in the second four months of the study.

Patient scheduled for elective surgeries under

general anesthesia with direct laryngoscopic tracheal intubations, were included, whereas pediatric age groups and patient's refusals were excluded from our study.

After taking a history and examining the patient, intravenous line was established and the patient was connected to the monitor. Data were collected using pre-constructed form sheet & information about age, weight and height. General anesthesia was performed for all patients. By a help of another anesthesia and intensive care resident who was holding the mask during giving anesthesia and doing ETT insertion. Tracheal ultrasonography was performed in real-time as the endotracheal tube is passed by using Sonosite S-Nerve ultrasonography machine with a high frequency linear probe (6-12MHz) and depth sufficient to see posterior to trachea directly after intubation and the cuff inflated. The probe was ready to use with jell and by suprasternal notch approach transversely putting the probe during insertion of the endotracheal tube start counting the time needed to verify tube position and then go to esophagus in same time to be sure it is empty, then the patient was connected to a circuit with a side stream capnography & start counting a time needed by capnography by another resident.

Statistical analysis

The SPSS version (25) was used for the statistical analysis of data. Independent t-test (two tailed) was used to compare the continuous variables among study groups accordingly. Pearson's Chi–square test was used to assess statistical association between time for confirmation by U/S and general characteristics. Pearson correlation coefficient (r) measures the strength and direction of a linear relationship between time for confirmation by U/S with age and BMI. The P value (≤0.05) was regarded as significant significant.

Results

The study included (100) patients. All of them were undergone surgical operation under general anesthesia and divided into two groups according to time of operation. Group (A) included (56) patients studied in first four months and Group (B) included (44) patients studied in the second four months of the study as shown in table (1).

Table (1): Distribution of patients according to operation time

Groups	(n=100)	Percentage (%)
Group A (1st four months)	56	56
Group B (2nd four months)	44	44

The comparison between study groups according to age and BMI is shown in table (2). In this study, no significant differences observed between study groups according to age and BMI (P ≥ 0.05).

Table (2): Comparison between the study groups according to age and BMI

Variables	Study groups		P-value
	Group A Mean± SD	Group B Mean± SD	
Age (years)	42.27±11.4	39.82 ± 14.97	0.173
BMI	31.84 ± 5.05	29.56 ± 7.51	0.091

Sensitivity of U/S trans-tracheal was 99%, and accuracy was 99%, while specificity could not be evaluated as shown in table (3).

Table (3): Sensitivity, specificity and accuracy of U/S trans-tracheal for evaluation of ETT placement

Assessment by U/S	Assessment by Capnography		Total (n=100)
	Confirmed ETT placement	Doubt ETT placement	
Confirmed ETT Placement	99	0	99
Doubt ETT Placement	1	0	1
Total	100	0	100

The comparison in mean time for confirmation between U/S and Capnography is shown in table (4). It was observed that the mean time for confirmation was significantly higher in U/S than that in capnography in group (A) (13.95 versus 9.27 sec, P= 0.001).

In group (B), no significant difference was detected between means of time for confirmation in U/S from that in capnography (10.07 versus 9.56 sec, P= 0.079).

Table (4): Comparison in mean time for confirmation between U/S and Capnography

Variable	Time for confirmation (sec)		P-Value
	By U/S Mean ± SD	By Capnography Mean ± SD	
Group A	13.95 ± 1.18	9.27 ± 0.49	0.001
Group B	10.07 ± 1.44	9.56 ± 1.23	0.079

Table (5) shows the correlations between time for confirmation by U/S with age and BMI in group (A). There is a significant moderate positive correlation between BMI and time for confirmation by U/S (r = 0.619, P= 0.001).

Regarding age, no significant correlation noticed with time needed for confirmation by U/S (r= - 0.009, P= 0.952) , Also showed the correlations between time for confirmation by U/S with age and BMI in group (B). There is a significant strong positive correlation between BMI and time for confirmation by U/S (r = 0.751, P= 0.001). A significant weak positive correlation was found between age and time for confirmation by U/S (r = 0.456, P= 0.001).

Table (5): Correlation between time for confirmation by U/S with age and BMI in group A and B

Variable	Group A		
	Time for confirmation by U/S (sec)		P-Value
	By U/S Mean ± SD	By Capnography Mean ± SD	
	R		
Age (years)	-0.009		0.952
BMI (kg/m^2)	0.619		0.001
	Group B		
Age (years)	0.456		0.001
BMI (kg/m^2)	0.751		0.001

Discussion

From the data analyzed, two techniques were used to prove ETT placement in adult mechanically ventilated patients. The perfection of any method to recognize correct ETT placement is based on its sensitivity (ability to detect whenever tracheal intubation does occur) and specificity (ability to detect whenever tracheal intubation does not occur). Both techniques are time-saving, safe and faster than other techniques such as chest radiographs [15].

This study covers a variety of patients who vary significantly in age, weight and surgeries they underwent, most of them same type (laparoscopic surgeries 82%).

Capnography is also a straight method that detects the amount of carbon dioxide in the exhaled air (Etco 2), detection can result in a false negative finding, which can give rise to unwarranted reintubation attempts [16]. Thus, upper airway U/S might be the technique of choice in the primary verification of ETT position in upper airway in such conditions [17].

Upper airway U/S additionally has few disadvantages as seen in the study. In this study, upper airway USG misidentified one tracheal

intubation (one false negative) which was identified as positive by waveform capnography. This subject was found to be overweight or obese (230 kg) with more subcutaneous fat in the neck region which might have made identification of the hyperechoic comet tail shape, posterior shadowing in the transverse view difficult and therefore the ETT placement was not detected. However, one study showed that in overweight and obese patients, upper airway USG has been shown to be superior to auscultation in speed and accuracy in detection of placement of endotracheal [18].

Another restriction is that upper airway USG is operator dependent; hence, its repeatability and generalizability needs to be further studied. In this study the evolution of skills were apparent on time taken to verify the ETT, and our results showed that the time for identification was less in group (B) than in group (A).

The reliability of capnography is distrusted in some conditions which are mentioned previously, and they will not disturb upper airway USG view. Thus, the upper airway US can be used in such conditions to confirm the placement of ETT.

This study specified that the use of upper airway ultrasonography to verify endotracheal tube location in the primary verification process is feasible and can be performed rapidly and easily. This technique is rapid, safe, portable, repeatable, widely obtainable and provides real time dynamic image suitable for many airway management aspects. Also, we noticed that the ultrasonography method have a good accuracy, good correlation, good agreement and quick confirmation times.

In the management of upper airway, particularly in emergency conditions, the ultrasound has become very important, since it is easily carried out, relatively inexpensive, has a confirmed safety record and does not cause pain [19]. Capnography is not always obtainable in emergency settings and peripheral centers. In such situations, ultrasound can be used for the verification of ETT placement. U/S have some definite advantages over existing method of verification. U/S can detect endotracheal tube position simultaneously with intubation or just after it, which is faster than any other methods [20].

The detection of Etco2 with quantitative or semi-quantitative techniques were shown to be dependable methods to confirm tracheal positions by endotracheal tube, with the quantitative waveform capnography is regarded as a goal standard technique. Nevertheless, such instruments, particularly the waveform quantitative capnography are not always found in several intensive care units [21].

Conclusion

The real-time tracheal sonography is also accurate like capnography to confirm tracheal intubations. The real-time USG may be applied in immediate observation of whether the tubes enter the esophagus or trachea by putting the US probes transversely on the neck at the level of the suprasternal notch during intubation, thus confirming intubation without the need for ventilation or circulation.

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References

1. Mort TC. Unplanned tracheal extubation outside the operating room: A quality improvement audit of hemodynamic and tracheal airway complications associated with emergency tracheal reintubation. Anesth Analg 1998;86:1171-6.
2. Cook TM, Woodall N, Frerk C; Fourth National Audit Project. Major complications of airway management in the UK: Results of the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 1: Anaesthesia. Br J Anaesth 2011;106:617-31
3. Standards of Basic Intra-operative Monitoring, approved by American Society of Anesthesiology House of Delegates, Oct 1986, amended Oct 1990).
4. Bozeman WP, Hexter D, Liang HK, Kelen GD. Esophageal detector device versus detection of end-tidal carbon dioxide level in emergency intubation. Ann Emerg Med 1996;27:595-9.
5. Grmec S. Comparison of three different methods to confirm tracheal tube placement in emergency intubation. Intensive Care Med 2002;28:701-4.
6. Kundra P, Mishra SK, Ramesh A. Ultrasound of the airway. Indian J Anaesth 2011;55:456-62)

7. Chou EH, Dickman E, Tsou PY, Tessaro M, Tsai YM, Ma MH, et al. Ultrasonography for confirmation of endotracheal tube placement: A systematic review and meta-analysis. Resuscitation 2015;90:97-103)
8. Chou H-C, Chong K-M, Sim S-S, Ma MH-M, Liu S-H, Chen N- C, et al. Real-time tracheal ultrasonography for confirmation of endotracheal tube placement during cardiopulmonary resuscitation. Resuscitation 2013;84:1708-12).
9. Estaban A, Anzueto A, Alia I, et al. How is mechanical ventilation employed in the critical care unit? An international utilization review. Am J Respir Crit Care Med 2000;161(5):1450-1458.
10. Griesdale DE, Bosma TL, Kurth T, Isac G, Chittock DR. Complications of endotracheal intubation in the critically ill. Intensive Care Med 2008;34(1):1835-1842.
11. Jaber S, Amraoui J, Lefrant JYl. Clinical practice and risk factors for immediate complications of endotracheal intubation in the intensive care unit: A prospective, multiple-center study. Crit Care Med 2006;34(9):2355-2361.
12. Bowles TM, Freshwater-Turner DA, Janssen DJ, Peden CJ; the RTIC Severn Group. Out-of- theatre tracheal intubation: Prospective multicenter study of clinical practice and adverse events. Br J Anesth 2011;107(5):687-692.
13. Sitzwohl C, Langheinrich A, Schober A, et al. Endobronchial intubation detected by insertion depth of endotracheal tube, bilateral auscultation, or observation of chest movements: Randomized trial. BMJ 2010;41:c5943.
14. Daniel A, Angus R, Asela D. Equipment in anesthesia and critical care. A complete guide for the FRCA First published 2014 (P185-188).
15. Chenkin J, McCartney CJ, Jelic T, Romano M, Heslop C, Bandiera G, et al. Defining the learning curve of point-of-care ultrasound for confirming endotracheal tube placement by emergency physicians. Crit Ultrasound J 2015;7:14.
16. Neumar RW, Otto CW, Link MS, Kronick SL, Shuster M, et al. Part 8: Adult Advanced Cardiovascular Life Support: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 2010; 122: S729-S767.
17. Adi O, Chuan TW, Rishya M. A feasibility study on bedside upper airway ultrasonography compared to waveform capnography for verifying endotracheal tube location after intubation. Crit Ultrasound J 2013;5:7.
18. Sustic A. Role of ultrasound in the airway management of critically ill patients. Crit Care Med 2007;35 (5 Suppl):S173-7.
19. Rajan S, Surendran J, Paul J, Kumar L. Rapidity and efficacy of ultrasonographic sliding lung sign and auscultation in confirming endotracheal intubation in overweight and obese patients. Indian J Anaesth 2017;61:230-4.
20. Werner SL, Smith CE, Goldstein JR, Jones RA, Cydulka RK. Pilot study to evaluate the accuracy of ultrasonography in confirming endotracheal tube placement. Ann Emerg Med. 2007; 49: 75-80.
21. Drescher M, Conard F,U., Schamban N. Identification and Description of Esophageal Intubation Using Ultrasound. Academic Emergency Medicine. 2008; 7(6): 1-4.

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Study of Skull Fractures and its Associated Features Due to Injury in Central Gujarat Region: A Retrospective Study

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Abstract

Background: Among all the traffic accidents fractures of the skull has significant role because brain of the human being is in semi-liquid form and more prone to be affected. It has co-ordinating and controlling whole body movements. It may cause sudden death or person becomes disabled throughout life.

Method: 141 cases of different age group head injuries dead bodies broughtfor post-mortem examination, V.S General Hospital, Ahmedabad, Gujarat-380006were studied. Types of skull fractures and associated features were studied.

Results: Out of 141, 130 (92.1%) cases had contusion / haematoma, 68 (48.2%) had laceration, 59 (41.8%) had contusion and laceration, 3 (2.1%) had abrasion and 3 (2.1%) had abrasion and contusion. In addition to skull fractures 44 (31.2%) had limbs, 36 (25.3%) abdomen, 33 (23.4%) face and neck, 26 (18.4%) had chest injuries. Types of fractures included, 72 (51%) had linear / fissure, 37 (26.3%0 multiple / communicated, 33 (23.6%) were depressed, 16 (11.3%) had base of skull fracture, 12 (8.33%) had suture separation, 4 (2.83%) had linear and depression, 88 (62.5%) had single fracture.

Conclusion: Present pragmatic post-mortem study will be helpful toMedico-legal expert, Neuro-surgeon and Neuro physicianto predict the fatality of persons who had different types of skull fractures

Keywords: Scalp, haematoma, laceration, contusion, depression, linear.

Introduction

Head injury can be defined as a morbid state resulting from gross or subtle structural changes in the scalp, skull and / or contents of skull, produced by mechanical forces[(1)]. Unintentional injuries contribute 66% of all injury deaths and 70% of injuries leads to disabilities in under developed countries like

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India. Young people aged from 15-30 years are more victim to road traffic injuries (RTI). Due to rising vehicle density, high velocity technologies, along with congestion of roads and traffic rules violation are the major causes of head injuries.India has just 1% of total vehicles in the world but it contributes to 6% of the global road traffic cases [(2)]. It is estimated that major cities like Delhi, Calcutta,Chennai, Bengaluru, Hyderabad, Ahmedabad had highest number of accidents due to high velocity of driving and density of vehicles [(3)(4)].

Unintentional high velocity head injuries associated with different parts to the crania like meninges, scalp base of the skull, brain substance too, sometimes other parts of the body including limbs, chest, abdomen hence attempt was made to evaluate associated features of skull injuries because certain injury cause sudden death and majority of skull fractures leave the people disabled, dependent throughout the life which cause socio-economic burden to the middle class families because majority of India has lower middle socio-economic society.

Material and Method

141(one hundred forty-one) dead bodieshaving skull fractures were brought for post-mortem examinationto forensic and toxicology department, V. S. General Hospital Ahmedabad, Gujarat -380006wasstudied.

Inclusive Criteria: Skull fractures due to road trafficaccident injury cases aged between 18 to 65 years were selected for study.

Exclusion Criteria: Skull fractures other than 18 -65 years age, homicide or suicide cases were excluded from the study.

Method: Every casewas studied the mode of accident time of accident information was collected from investigating officer, inquest panchnama, relatives or attenders. Apart from this detailed history of patients regarding his habits like alcohol. Smoker, tobacco chewers, occupation was also noted.

Types of skull fractures and associated features like base of skull fractures involvement of meninges, and Brain substance was also studied.

Duration of study was from February-2014 to May-2017 (Retrospective study)

Statistical analysis: Different types of injuries of skull were classified with percentage. The statistical analysis was carried out in SPSS software. The ratio of male and female was 2:1.

Observation and Results

Table 1: Study of distribution of cases of scalp injury 130 (92.1%) had contusion / Hematoma, 68 (48.2%) laceration, 59 (41.8%) contusion and laceration, 3 (2.1%) had abrasion and abrasion with contusion.

Table 2: Study of distribution of injury cases associated with other body injuries 44 (31.2%) limb (upper and lower limb), 36 (25.3%) abdominal, 33 (23.4%) Face and Neck, 26 (18.4%) chest

Table 3: Study of distribution of skull fractures 72 (51%) linear / Fissure, 37 (26.3%) multiple / communicated, 33 (23.6%) depressed, 16 (11.3%) Base of the skull, 12 (8.33%) suture separation, 4 (2.83%) linear + depression, 88 (62.5%) single fracture.

Table 4: Study of distribution of cases having cerebral haemorrhage 35 (24.8%) subdural haemorrhage, 8 (5.6%) subarachnoid haemorrhage, 3 (2.1%) extradural haemorrhage, 49 (34.7%) EDH + SDH+SAH, 46 (32.6%) had SDH+SAH

Table 5: Distribution of cases having Brain substance injury 89 (63.1%) had Laceration, 26 (18.4%) contusion, 26 (184%) intra-cranial haemorrhage.

Table 1: Study of distribution of cases having scalp injury

Sl. No	Types of Injury	Number of cases	Percentage (%)
1	Contusion / Hematoma	130	92.1
2	Laceration	68	48.2
3	Contusion and laceration	59	41.8
4	Abrasion	3	2.1

Sl. No	Types of Injury	Number of cases	Percentage (%)
5	Abrasion and contusion	3	2.1
	Total	141	100

Table 2: Study of distribution of head injury cases associated with other parts of the body injuries

Sl. No	Site of injury	No. of cases	Percentage (%)
1	Limb a – Upper limb b – Lower limb	44	31.2
2	Abdominal	36	25.3
3	Face and Neck	33	23.4
4	Chest	26	18.4

Table 3: Study shows distribution cases having skull fractures

Total No. of cases: 141

Sl. No	Types of Injury	No. of patients	Percentage (%)
1	linear / fissure	72	51.0
2	Multiple / communicated	37	26.3
3	Depressed	33	23.6
4	Base of skull	16	11.3
5	Suture	12	8.33
6	Linear + depression	4	2.83
7	Single + fracture	88	62.5
8	Total	141	100

Table 4: Study of distribution of cases having cerebral haemorrhages

Types of haemorrhage	No. of cases	Percentage (%)
Subdural haemorrhage	35	24.8
Subarachnoid haemorrhage (alone)	8	5.6
Extradural haemorrhage (alone)	3	2.1
EDH + SDH + SAH	49	34.7
SDH + SAH	46	32.6

Table 5: Distribution of cases having brain substance injury

Types of Injury	No. of cases	Percentage (%)
Laceration	89	63.1
Contusion	26	18.4
Intra-cranial haemorrhage	26	18.4
Brain stem haemorrhage	-	0

Discussion

The present study of skull fractures of cadavers and its associated features due to injury in population of Central Gujarat Region. 130 (92.1%) cases had contusion / haematoma, 68 (48.2%) laceration, 3 (2.1%) had abrasion, 3 (21.1%) had abrasion and contusion (Table-1). 11 (31.2%) limbs (upper limb and lower

limb), 36 (25.3%) had abdominal, 33 (23.4%) had face and neck, 26 (18.4%) chest injuries apart from skull fractures (Table-2). 72 (51%), 37 (26.3%) multiple / communication, 33 (23.6%) depressed, 16 (11.3%) Base of skull, 12 (8.33%) suture separated, 4 (2.83%0 linear + depression, 88 (62.5%) single fracture (Table-3). 35 (24.8%) had subdural haemorrhage, 8 (5.6%) had subarachnoid haemorrhage, 3 (2.1%0 had extra-dural haemorrhage, 49 (34.7%) had EDH+SDH+SAH, 64 (32.6%) had SDH+SAH (Table-4). 89(63.1%) had laceration, 26 (18.4%) had contusion, 26 (18.4%) had Intra-cranial haemorrhage (Table-5). These findings are more or less in agreement with previous studies [5][6][7].

It was observed that, the victim is more vulnerable in frontal collision, side collision and hit if hit by heavy motor vehicle. Head injury also caused by the assault as a common reason and pattern of injuries depends upon type of weapon [8]. Clinical features of skull fractures are loss of consciousness or headache, nausea and vomiting, ear bleed, vertigo, papillodema. Likelihood of skull feature is directly associated with severity of injury and vault is involved three times more often than the base. Subdural haematoma (SDH) was most common intracranial lesion resulting from head injury [9]. Contusion and lacerations of the brain often seen in vehicular accidents and fall from height cases. These may occur with or without external injuries to the scalp and fractures of the skull [10]. Linear fractures may lead to cerebra cortical contusion or intra-cranial haematoma 80% of death was observed due to skull fractures and frequency of haematoma is higher in the cases with skull fractures. Linear fractures were located to frontal temporal and parietal bones in decreasing order. The depressed fractures are located to frontal, parietal and temporal bones in decreasing order [11]. Contusions are most common traumatic intracranial lesions and are always caused by trauma. Laceration either develops due to open skull fractures or bone fragments in closed skull fractures.

Severity of injury and transportation mechanism to health facility is important for the patient management and survival. As maximum number of cases of head injury is due to vehicular accidents proved to be fatal for life.

Summary and Conclusion

The present study of skull fracture and it associated features are maximum number of casesare due to vehicular accidents and proved to be fatal for life, the safety measures for both the drivers and the passengers of the respective vehicles should be addressed. Awareness of safety rules, speed limit for different type of vehicles should be implemented. Moreover, speaking on mobile, during driving, well-planned, high-tech roads, surveillance of traffic police can minimize the road accidents and avoid skull fractures.

Limitation of study – Due to less number of cases we have limited findings and results

- This research paper was approved by institutional ethics.
- No conflict of Interest
- No Funding

References

1. Biswas G, Verma SK, Sharma J – Pattern of road traffic accidents in North east Delhi J. Forens. Med. and toxicology 2003, 20 (1); 27-32.
2. Jacab R, Prabhakaran K – Victims of road traffic accidents assessments and management at field J. Ind. Med. Assoc. 1999, 97 (5); 171-175.
3. Dhillon S, Kapilla P, Sekhan HS – Pattern of injuries present in road traffic accidents in simla hills J. of Punjab academy of forensic medicine and toxicology 2007, 7 (2); 7-10.
4. Yavuz MS, Asirdiazer M, Cetin G – The correlation between skull fractures and intracranial lesions due to traffic accidents Am. J. Forensic. Med. pathol. 2003, 24 (4); 339-45.
5. Stablis G, Quigly G – Compound fractures occurs commonly from the assaults with various sharp / blunt weapons. Emerg. Med. J. 2005, 22; 303-304.
6. DEvdiga KV, Jain SP – An analytical study of acute head injury Ind. J. Surg. 1969, 31; 197-99.
7. Lambert DA – Death from falls MMWR 1988, 37; 21-24.
8. Pande CD – Incidence of accidental crania – cerebral trauma Ind. J. of Forense Med. 1979, 1; 21-24.
9. Lahaye PA, Gade GF – Injury to cranium In Moore EE Mattox KL Feliciano DV 2nd edition Trauma Norwalk Appleton Lange 1996, 247-8.
10. Di Maio DJ, Maio VJM – Head injuries, forensic pathology New York Elsevier 1993, 139-69.
11. Tedeschi CG – The wound Assessment by organ systems Head and Spine Forensic Medicine Philadelphia WB Saunders company 1977, 29-35.

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Epidemio-Demographical Study of Anemia in School: Aged groups

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Abstract

Background: Anemia is a significant global health problem affecting children and reproductive-age women and it is defined as a reduction of the hemoglobin concentration or red blood cell (RBC) volume below the range of values occurring in healthy persons.

Material and method: The current study was cross-sectional study done in AL-Alam general hospital, we take 500 children and adolescences and the age restricted from 6year to 18 year, the cases taken in the pediatric outpatients department regardless whether sick or healthy children or adolescences we take the history from the cases depending on the signs and symptoms of anemia. Data were analyzed by using the Windows program The data was summarized firstly in single master table manually . The Chi square test was used to determine whether significant differences occurred among the groups and where they occurred.

Results: we find about 33.60% of cases were anemic including IDA ,and 25.96% was mild anemia this mean anemia highly prevalent , and mainly at adolescents age group about(50%),also we find anemia more prevalent in rural area(42.5%) than urban area(32.2%) may be to low socioeconomic status in rural area, also the prevalence of anemia was more in not student cases(40.47%) and high level of anemia in illiterate father and mother this indicate the educational status important to parent and children to awareness about anemia and healthy food consumption.

Conclusion: Anemia highly prevalent in our area and more in rural area than the urban area and more in adolescent age group.

Keywords: Epidemio ; demographical ;Anemia ; school -Aged groups

Introduction

Anemia is a significant global health problem affecting children and reproductive-age women and it is defined as a reduction of the hemoglobin concentration or red blood cell (RBC) volume below the range of values occurring in healthy persons. "Normal" hemoglobin and hematocrit (packed red cell volume) vary substantially with age and sex[(1)]. Quantitatively defined as any hemoglobin or hematocrit value that is two standard deviations (SDs) (95%confidence limits)below the mean for age and gender[(2)].

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Anemia is a major public health problem in the world wide with prevalence of 43% in developing countries and 9% in developed nations[3]. It is widespread in individuals at any stage of life, although pregnant-reproductive women and young children are most susceptible, which may increase the risk of impaired cognitive and physical development and increased mortality and morbidity rate[4]. The World Health Organization (WHO) has estimated that more than 2 billion people worldwide are suffering anemia with 50 % of all anemia was attributed to iron deficiency[5]. Despite its multifactorial etiology, anemia might be nutritional (iron, folic acid, and vitamin B12), inherited (thalassemia and sickle cell), environmental pollutants (lead), infectious (malaria), socioeconomic (low maternal level of education and low household income), demographic factors (age and gender), autoimmune (hemolytic anemia), malabsorption (achlorhydria), and chronic (cancer); iron deficiency anemia IDA is the most common cause of anemia[6].

Despite the high prevalence and serious consequences of anemia, there have been few reported studies assessing the effectiveness of anemia prevention and control programs in developing countries. Prevention and control of anemia is essential to reduce its consequences which further require effective treatment, and management of patients. Likewise, effective diagnosis of anemia is the main avenue for proper treatment and management of anemic patients[7,8].

Anemia in children is influenced by structural and environmental factors, community, household factors, and individual's health and nutritional level. Anemia in pre-school children has a negative effect on cognition, motor development and growth, academic performance, immunity, and susceptibility to infections[9]. These threats to health in earlier life are determinants of other health problems in later life[10].

Aims of the study:

1. Identify the prevalence of anemia.
2. Recognize the percentage of anemia category groups according to severity.
3. Identify the prevalence of iron deficiency anemia.
4. Recognize the percentage of iron deficiency anemia category groups according to the severity.and study the association between some demographical factors and the occurrence of anemia including iron deficiency anemia.

Subjects:

The current study was a cross-sectional study done in AL-Alam general hospital, we take 500 children and adolescences and the age restricted from 6year to 18 year, the cases taken in the pediatric outpatients department regardless whether sick or healthy children or adolescences we take the history from the cases depending on the signs and symptoms of anemia, if there is any tiredness, fatigue, tachycardia, shortness of breath, cold hands and feet, chest pain, poor appetite, behavioral problems, dizziness, history of pica in children(the desire to ingest nonnutritive substance), and pagophagia (desire to ingest the ice). and we ask about educational level for the both parents for searching if there is any relation with anemia also ask about place of living whether rural or urban area , after that we examine the case for any sign of anemia like pallor of skin, conjunctiva, lower aspect of the tongue, palm or sole. Also we examine the nails for refilling sign if more than 2 second mean anemia and looking for koilonychias(spoon nail) which indicated for iron deficiency anemia and we examine the abdomen for organomegaly which present in non iron- deficiency anemia and the heart for any presence of murmur which indicate severe anemia after that we send the child or adolescence for investigation.

Investigations: CBC;. S.Ferritin; blood film; retic count (for noniron deficiency anemia); Hb electrophoresis (for noniron deficiency anemia) and TSB(total serum bilirubin) (for noniron deficiency anemia)

Statistical analysis:

The data was summarized firstly in single master table manually ,then according to the aim of study the data categorized into small tables which is help us to calculate the association between anemia and demographical factors by using Chi- square test and odd ratio and using P value table to reveal the significance difference between the variables.

Results

Identify the prevalence of anemia in school-aged group.

In our study, we take 530 cases restricted by 6-18 years old taking randomly in the pediatric and medicine department and we find about 33.60 % of cases were anemic including IDAIn our study, we take 530 cases restricted by 6-18 years

Table (1): prevalence of anemia in school-aged group.

	Not anemic No.(%)	**Anemia(including IDA) No.(%)**	**Total**
No.	334(66.40%)	196(33.60%)	530

Recognize the percentage of anemia category groups according to the severity.

In this table we classified the anemic patients including IDA according to the severity and we depending on WHO classification [11] and we find mild anemia (55.85%) more than the moderate and severe anemia

Table (2): percentage of anemia category groups according to the severity.

Anemia(including IDA) severity groups	**Mild No.(%)**	**Moderate No.(%)**	**Severe No.(%)**	**Total**
No.(%)	119(59.86%)	65(25.96%)	12(14.18%)	196

Identify the prevalence of iron deficiency anemia:

In this table, we take only IDA to estimate the prevalence of it in the school age group and we find that there is about 23.96% of cases are IDA regardless the age and gender as mentioned in table 3. so in the same table we take IDA and classified according to severity depending on WHO classification of[11] and we find the mild anemia(45.**67%)** more than the other anemia.

Table (3): Identify the prevalence of iron deficiency anemia and percentage of iron deficiency anemia category groups according to the severity.

Hb	**Not anemic+anemia but not IDA No.(%)**	**IDA No.(%)**	**Total No.(100%)**	
No.(%)	403(76.04%)	127(23.96%)	530	
IDA severity groups	**Mild No.(%)**	**Moderate No.(%)**	**Sever No.(%)**	**Total No.(100%)**
No.	64(50.40%)	58(45.67%)	5(3.93%)	127

Study the association between some demographical factors and the occurrence of anemia and iron deficiency anemia.

Prevalence of anemia including IDA in relation to the age groups.

In this table we study the prevalence of anemia in different age groups and we find the anemia including IDA more in primary school and adolescent than the other age groups and this study give us a significant relation, As well as In this table we reveal the prevalence of anemia including IDA in relation to gender and the study gave us this results 36.2% of anemic cases were females while 35.9% of anemic cases were male and so the study not significant *P* value >0.05 and the chi square =0.0045.

Table (4): Association between anemia; iron deficiency anemia and age with gender.

Age	Not anemic No.(%)	Anemic (including IDA) No.(%)	Total No.(100%)
6-7	53(62.3%)	32(37.6%)	85
8-9	95(64.1%)	53(35.8%)	148
10-11	117(73.5%	42(26.4%)	159
12-13	32(55.1%)	26(44.8%)	58
14-15	37(50%)	37(50%)	74
16≤	5(83.3%)	1(16.6%)	6
Total	339	191	530
The value of chi square test X^2 is 15.66, *P* value < 0.05 Result: Significant			
Gender			
Male	143(64.1%)	80(35.9%)	223
Female	196(63.8%)	111(36.2%)	307
Total	339	191	530
The value of chi square test X^2 is 0.0045, *P* value >0.05 . Result: Not significant			

prevalence of anemia including IDA in relation to many risk factors:

In this study we take the anemic patients including the IDA in relation to study status and we find the anemia in non-students (50%) more than anemia in student patients (34.83%) the chi square test =3.8578 and the *P* value <0.05 so the study significantIn this table we find the number of anemic patients in urban area more than the number of anemic patients in rural area ,so that the chi square test =5.488 and the *P* value <0.05 so the study significant .

In this object we take the anemia including IDA in relation with father education and we find the anemia more in not educated father and those just read and write not admitted to the school so this study reveals a significant relation between the anemia and the level of education, as well as in this study, we take cases with anemia including IDA in relation to mother education and we find the number of cases with not educated mothers more than the other cases with educated mothers so that there is the relation between the anemia and mothers education .

Table (5): Prevalence of anemia including The IDA in relation to residence ,study status, father and mother education.

Location	Not anemic N0.(%)	Anemic N0.(%) (including IDA)	Total No.(100%)
Urban	223(67.8%)	106(32.2%)	329
Rural	116(57.8%)	85(42.2%)	201
Total	339	191	530
value of chi square test X^2 is 5.4887, P value <0.05, Result: Significant.			
Student ?	**Not anemic No.(%)**	**Anemic No.(%) (including IDA)**	**Total No.(100%)**
Yes	318(65.2%)	170(34.8%)	488
No	21(50%)	21(50%)	42
Total	339	191	530
value of chi square test X^2 is 3.8578, P value <0.05. Result: Significant			

Father education	Not anemic N0.(%)	Anemic N0.(%) (including IDA)	Total No.(100%)
Not read not write	11(40.8%)	16(59.2%)	27
Read and write	11(34.4%)	21(65.6%)	32
Primary	248(68.9%)	112(31.1%)	360
Intermediate	26(50.9%)	27(49.1%)	53
Secondary	11(100%)	0	11
More	32(68.1%)	15(31.9%)	47
Total	339	191	530
value of chi square test X^2 is 33.91,P value < 0.05. Result: Significant			
Mother education			
Not read not write	57(41.3%)	81(58.7%)	138
Read and write	32(60.4%)	21(39.6%)	53
Primary	169(72.6%)	64(27.4%)	233
Intermediate	58(78.4%)	16(21.6%)	74
Secondary	0	0	0
More	23(71.9%)	9(28.1%)	32
Total	339	191	530
value of chi square test X^2 is 45.99, P value <0.05, Result: Significant.			

Discussion

Anemia is one of the major public health problems affecting more than half of school-age children in developing countries. Anemia among children has been conclusively seen to delay psychomotor development, poor cognitive performance, impaired immunity and decrease working capacity[11].

In current study we find that the prevalence of anemia including IDA about (33.60%) of cases but in another study of Sunil Pal Sing C[12]. found that the prevalence of anemia was (52.7%). This high percent of anemia in our study suggesting that anemia is a public health problem among the school-aged children in the area. And we find mild anemia more than the moderate and severe anemia.

The prevalence of anemia in our study is higher than those similar studies reported from different areas like, Egyptian children 12%[13], among school-age children in Kenitra Morocco 12.2%[14] and among Sanliurfa, South-east Turkish children 5.4%[15]. This variation might be due to low socioeconomic status and lower nutritional status of school-aged children in this study area than those reported from elsewhere.

We reported high prevalence of anemia including IDA in adolescent age group (50%) like a study in India Chandrakumari, Abilash Sasidharannair[16] the overall prevalence of anemia was 48.63%, which reflects upon the burden of anemia in a rural setting among a group of adolescent girls and like a study of P. Goyal, V. Potdar, and R. Reddy[17] the prevalence of anemia in adolescent (45.3%) this mean This variation might be due to the adolescence is the period of rapid growth marked by physical and mental transition. During this period, an individual undergoes emotional, sexual, social, and educational problems; in addition, unhealthy dietary habits and low socioeconomic background make them vulnerable to diverse nutritional morbidities. Of these various nutritional problems, anemia surpassed other conditions among adolescent girls in the developing countries[18].

We reported in our study that the prevalence of anemia including IDA was (36.15%) in females and (35.87%) in males while in another study in India the results of the study showed that 52.88% were anemic, the prevalence of anemia in girls (67.77%) was higher than in the boys (35.55%)[19]. this mean our study not significant in relation to other study.

On the other hand we find that anemia including IDA was more in rural area(42.28%) than the urban area (32.21%) its similar to a study of Al-kassab-Córdova A, Mendez-Guerra C.[20] In rural areas, the prevalence was 38.25%, where as in urban areas it was 26.39% . this prevalence of anemia in rural area may be due to poverty and low socioeconomic status. Also similar to a study carried out in AL-Yemen[21] the prevalence of anemia in rural area was(51.3%) and in urban area was(32.2%).

The current study reveal that the prevalence of anemia including IDA was more in not student children and adolescents (50%) than anemia including IDA in students children and adolescents(34.83%) this indicate that the level of education important in a knowledge of a healthy eats and important ways to prevent become anemic also its indicate the educational level of mother and father very important in treatment and prevention of anemia.

In our study we find the prevalence of anemia including IDA was high in children and adolescents with not educated or low educated father(59.25%) similar to a study carried in Egypt[22] the prevalence was (58.9%) and also we find that the prevalence of anemia including IDA was high in reported cases with illiterate or low educated mother this indicate there is a significant relation between paternal education and prevalence of anemia also similar to a study done in Northwest Ethiopia that reveals the prevalence of anemia high in illiterate fathers (39.5%) and illiterate mothers (42.7%)[23]. Children who had illiterate mothers were more likely to be anemic compared to children whose mothers were literate. A similar study conducted in Kenitra Morroco[24] also showed that anemia was significantly associated with mother education. Low level of mothers' education may affect children's nutritional status negatively. This might be related to lack of knowledge and awareness on the use of diversified diets including iron and other micronutrients.

Conclusions

1. The prevalence of Anemia including IDA was noticeable increased in the area of study (33.60%).also anemia including IDA was more prevalence in all age group but more in adolescent 14-15 years old.
2. Anemia including the IDA was significant increase in rural area than urban area
3. Anemia more significant in not student cases., so fathers and mothers education was important in decreasing the prevalence of anemia in school age children and adolescents.

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References

1. ROBERT M. KLIEGMAN, MD,JOSEPH W. ST GEME III, MD, NATHAN J. BLUM, MD. Nelson text book of pediatrics ,21th edition.2020.
2. Karen J.Marcdante.,Robert M.Kliegman.Nelson essentials of pediatrics , seven edition .2015.
3. Habibzadeh F. Anemia in the Middle East. Lancet. 2012;379(1).
4. Khaskheli M.-N., Baloch S., Baloch A. S., Baloch S., Khaskheli F. K. Iron deficiency anaemia is still a major killer of pregnant women. Pakistan Journal of Medical Sciences. 2016;32(3):630–634. doi: 10.12669/pjms.323.9557.
5. WHO (2011). Hemoglobin concentrations for the diagnosis of anemia and assessment of severity. Vitamin and mineral nutrition information system. Geneva: World Health organization.
6. Al-Zabedi E. M. Prevalence and Risk Factors of Iron Deficiency Anemia among Children in Yemen. American Journal of Health Research. 2014;2(5):p. 319. doi: 10.11648/j.ajhr.20140205.26.
7. Iron deficiency anemia WHO/UNICEF/UNU. Assessment, prevention, and control. Geneva: World Health Organization; 2001.
8. WHO, UNICEF, UNU. Iron deficiency Anemia: assessment, Prevention and Control, A Guide for Program Managers, WHO, UNICEF, UNU, Geneva, Switzerland,2001.http://www.who.int/nutrition/publications/micronutrients/anaemia_iron_deficiency/WHO_NHD_01.3/en/index.html.
9. Sanou D, Ngnie-Teta I. Risk factors for anemia in preschool children in sub-Saharan Africa. In: Donald S, editor. Anemia. (2012).
10. 4. World Health Organization. Children's Health and the Environment Annual Report – 2010. Geneva, USA: World Health Organization (2010).

11. Bekele Gutema,corresponding author Wondimagegn Adissu, Yaregal Asress, and Lealem Gedefaw, Anemia and associated factors among school-age children in Filtu Town, Somali region, Southeast Ethiopia, BMC Hematol. 2014; 14: 13. Published online 2014 Aug 18. doi: 10.1186/2052-1839-14-13.
12. Sunil Pal Singh C., Prevalence of nutritional anemia in primary school children in urban slums area of Hyderabad,Andhra Pradesh ,India, British Biomedical Bulletin,2014.
13. Barduagni P, Ahmed AS, Curtale F, Raafat M, Mansour E. Anemia among school children in Qena Governorate, Upper Egypt. East Mediterr Health J. 2004;10(6):917–919.
14. El Hioui M, Ahami AO, Aboussaleh Y, Rusinek S, Dik K, Soualem A, Azzaoui FZ, Loutfi H, Elqaj M. Risk Factors of Anemia among rural school Children in Kenitra, Morocco. East Afr J of Public Health. 2008;5(2):62–66.
15. Koc A, Kosecik M, Vural H, Erel O, Atlas A, Tatli MM. The frequency and etiology of anemia among children 6–16 years of age in Sauth-east region of Turkey. Turk J Pediatr. 2000;42:91–95.
16. Chandrakumari, A. S., Sinha, P., Singaravelu, S. & Jaikumar, S. Prevalence of Anemia Among Adolescent Girls in a Rural Area of Tamil Nadu, India. Journal of family medicine and primary care 8, 1414–1417, https://doi.org/10.4103/jfmpc.jfmpc_140_19 (2019).
17. P. Goyal, V. Potdar, and R. Reddy, "Hematological profile of nutritional anemia among adolescent girls in rural area around karad, District- Satara, Maharashtra," Journal of Medical Science and Clinical Research, vol. 4, no. 12, 2016.
18. Shekhar A. The iron status of adolescents girls and its effect on their physical fitness. Indian J Nutr Diet 2005;42:451-6.
19. B Sudhagandhi1, Sivapatham Sundaresan2, W Ebenezer William1, A Prema3, Prevalence of anemia in the school children of Kattankulathur, Tamil Nadu, India, year : 2011 | Volume : 1 | Issue : 2 | Page : 184-188.
20. Al-kassab-Córdova A, Mendez-Guerra C, Quevedo-Ramirez A, Espinoza R, Enriquez-Vera D, Robles-Valcarcel P. Rural and urban disparities in anemia among Peruvian children aged 6-59 months: a multivariate decomposition and spatial analysis. Rural and Remote Health 2022; 22: 6936.
21. Al-Jermmy, A.S.M.; Idris, S.M.; Coulibaly-Zerbo, F.;Nasreddine, L.; Al-Jawaldeh, A. Prevalence and Correlates of Anemia among Adolescents Living in Hodeida, Yemen. Children 2022, 9,977.
22. R. A Salama, K. El Aini, Prevalence of anemia among informal primary school children: a community based study in rural Upper Egypt: Epidemiology Biostatistics and Public Health - 2016, Volume 13, Number 1.
23. Birhanu M, Gedefaw L, Asres Y. Anemia among School-Age Children: Magnitude, Severity and Associated Factors in Pawe Town, Benishangul-Gumuz Region, Northwest Ethiopia. Ethiop J Health Sci. 2018 May;28(3):259-266. doi: 10.4314/ejhs.v28i3.3. PMID: 29983525; PMCID: PMC6016356.
24. Hioui M, Ahami A, Aboussaleh Y, Rusinek S, et al. Risk factor of anemia among school age children in Kenitra Morocco. *East Afr J Public Health.* 2008;5(2):62–66.

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Detection of C-9 as a Marker of Early Myocardial Infarction in Sudden Death Cases by Immunohistochemistry

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Abstract

Background: Autopsy changes in sudden cardiac death due to Acute Myocardial Infarction (MI), is a real challenge for Forensic Pathologist. Immuno-histochemistry has proved significant role in identifying myocardial necrosis.

Aim: To find the incidence of deaths due to myocardial ischemia, its changes among the postmortem cases and the role of C9 in identifying deaths due to myocardial infarction by immuno-histochemical staining methods among autopsy cases.

Materials and Methods: Study was conducted on 44 autopsy cases. Multiple tissue samples were collected from the heart and other organs, tissue processing and paraffin blocks were made and Hemotoxylin and Eosin (H&E) staining and immuno-histochemical expression was performed for C 9 marker to find out the myocardial necrosis. Data were analyzed using Statistical Package for Social Sciences (SPSS-20) as descriptive statistics.

Result: Common age group was 51-60 years. 75% of them were found to have co morbid conditions. Histopathology for C9 showed 66% to be positive.

Conclusion: Complement C9 factor was used as a reliable marker for identification of early MI in cases which do not show significant histopathological changes with haemotoxylin and Eosin stains.

Key words: C9, Immunohistochemistry, autopsy, myocardial infarction

Introduction

Diagnosis of sudden death is always a challenge for the forensic expert. The most common cause for sudden death, according to World Health Organization is cardiovascular diseases. Among the adult population the single important cause

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of sudden cardiac death (SCD) is atherosclerotic coronary artery disease. Over times, the origin of sudden cardiac death evolves as a consequence of structural remodeling of the left ventricle [6] .In acute myocardial infarction, specifically when death occurs within minutes to a few hours of ischemic insult which make the diagnosis difficult without pathological or microbiological intervention.

Histologically atheromatous plaques obtained at autopsy have demonstrated the presence of inflammatory mononuclear cells with foci of monocytes, macrophages and T- lymphocytes in the arterial wall. Anatomically, the most common site of plaque rupture in ACS appears to occur in the shoulder region, where inflammatory cells are most prominent and might serve to compromise the integrity of the surrounding connective tissue.

Immuno- histochemical complement factor C9 has very high reactivity and specificity for necrotic myocytes which is a protein involved in the complement system as a part of the innate immunity. It provides protection for the host and reduces susceptibility to foreign micro-organisms. When Myocardial Infarction (MI) occurs, cardiac cell necrosis triggers the activation of the complement system, causing neutrophilic infiltration in the myocardium. Viable myocardium does not activate the complement system because of the lack of cell necrosis. C9 antibodies react strongly and diffusely with necrotic myocytes in all types of infarctions for up to 2 days, whereas normal myocytes are nonreactive, resulting in a clear delineation between damaged and viable. [5]

Myocardial cells from the infarcted heart start expressing foreign antigens for the immune system of the body. This results in strong activation of the complement system and accumulation of extensive deposits of components of the final pathway C5b -9, MAC. Studies demonstrated co -localization of the complement components and inhibitors in the myocardial tissue. [42]

C9 showed greater advantages in detecting MI than the haemotoxylin and eosin (H&E) stains. The MAC complex had been used to localize areas of MI, and these complexes can occur at the cytoplasmic membranous surface of ischemic cells [1].

The usefulness of immune-histochemical markers to the diagnosis of early myocardial damage has been recently suggested, Schafer et al found C5b -9 deposits in myocardial cells located within the zones of infarction in the autopsy material derived from patients with acute MI. However, there has been no convincing evidence that associates the degree of activation of the complement system with the myocardial necrosis or cardiac function in vivo in patients with AMI, nor is there compelling evidence that the complement system is activated in the patients with anginapectoris. [8]

Henceforth, this study aims to find the incidence of deaths due to myocardial ischemia its changes among the postmortem cases and the role of C9 in identifying deaths due to myocardial infarction by immuno-histochemical staining methods among autopsy cases in the Department of Forensic Medicine, Sri Ramachandra Medical College and Research Institute.

Materials and Methods

The study duration was from August 2014 - August 2017 in the Department of Forensic Medicine, Sri Ramachandra Medical College and Research Institute. This study was done as a retrospective study during the period of August 2014 to August 2016 and as a prospective study during the period of September 2016 to August 2017 in the Department of Forensic Medicine, Sri Ramachandra Medical College and Research Institute. All sudden death cases which were brought for medico legal autopsy to the Department of Forensic Medicine were included as study subjects. Cases with signs of decomposition and consent were not obtained from the relatives were excluded from the study.After applying exclusion criteria, a total sample of 44 autopsy cases were taken for the study. Institutional Ethics Committee approval was obtained and informed consent was gathered from the blood relatives of the Deceased.

Details regarding the identification, socio economic class, occupation, time and date of incident and other relevant history, co morbid conditions of the Deceased person were obtained from the relatives through a questionnaire by interview schedule. In autopsy weight of the heart, clots and patency

of valves were noted and multiple samples were collected from the heart and other organs during autopsy. Tissue processing and paraffin blocks were made from the collected samples. Hemotoxylin and Eosin staining and immuno-histochemical expression of cardiac tissue was performed for C 9 marker to find out the myocardial necrosis. Data entry was done in Microsoft Excel and the results were analyzed using Statistical Package for Social Sciences (SPSS-20) as descriptive statistics. Data are expressed in frequency and percentage.

Results

Among the forty four sudden death cases 19% of them were between the age group of 51-60 years with mean age of 49.3 years. The next common age group was between 41- 50 years. Lower incidence of sudden death was noted in extreme age groups. Sudden death was more common among males 81.82% the ratio was for every five males one female sudden death occurs. Among the cases 25% of them have completed middle schools and 23% of them have finished their high schools whereas only 5% of the deceased have done professional degree. 43.18% of the cases belonged to upper lower class in the socio economic scale, as shown in Table 1.

Of all the sudden death cases 75% were recorded with co-morbidities like alcoholism, diabetes and hypertension. During autopsy 68% of the cases had atheromatous plaque of the aorta, as shown in Table 2.

Histopathological examination of myocardial tissue showed acute MI findings in 34% of autopsy cases and 23% old MI findings, given in Figure 1.

Out of all 44 autopsies, 66% were positive for complement C9 stain and 20 tissue blocks subjected to 2,3,5 Triphenyl Tertrazolium Chloride (TTC) stain were 80% positive, shown in Table 3.

Table 1: Sociodemographic profile of autopsy cases

Characteristics	Frequency (n=44)	Percentage (%)
Age group (in years)		
21-30 years	5	8
31-40 years	8	13
41-50 years	10	16
51-60 years	12	19
61-70 years	7	11
71-80 years	2	3
Sex		
Female	8	18.2
Male	36	81.8
Educational status		
Illiterate	5	11
Primary school	3	7
Middle school	11	25
High school	10	23
Post high school / diploma	7	16
Graduate	6	14
Profession/ honour	2	5
Socio economic status		
Upper (Class I)	3	6.8
Upper Miiddle (Class II)	8	18.2
Middle/Lower Middle (Class III)	11	25
Lower / Upper lower (Class IV)	19	43.2
Lower (Class V)	3	6.8

Table 2: Co-morbities and Atheromatous changes in aorta

Characteristics	Frequency (n=44)	Percentage (%)
Co-morbid condition		
Present	33	75
Absent	11	25
Atheromatous plaque of aorta		
Present	30	68
Absent	14	32

Table 3: Details of C9 stain and TTC staining

Report	C9 (N=44) Frequency (%)	TTC (N=20) Frequency (%)
Positive	29 (66)	16 (80)
Negative	15 (34)	4 (20)

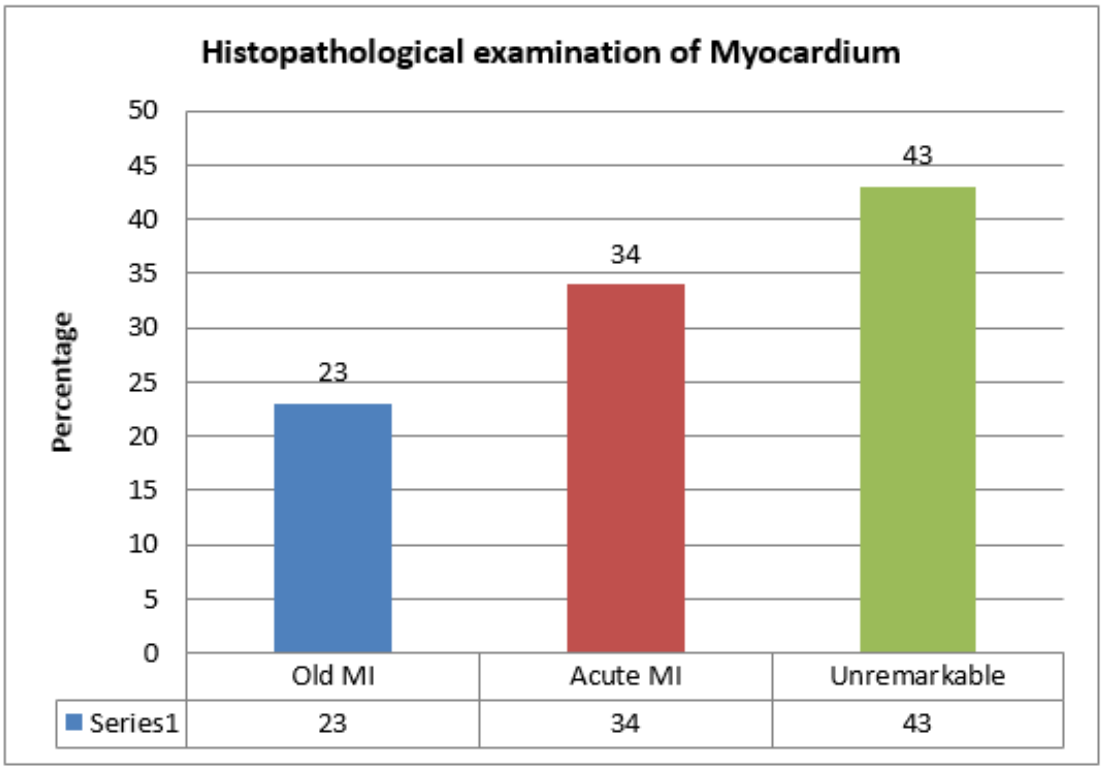

Figure 1: Histopathological Examination of Myocardial tissue

Discussion

In the present study maximum sudden death has occurred in the age group of 51- 60 years which is in accordance with 2011 census of India. Various studies have shown sudden death to be very common in male gender as 65.3%, 82% and 74.8% done by Jenkins et al, Murthy et al and Bhargav et al respectively [1,7].

Among 44 cases, 75% cases were with co-morbid conditions such as alcoholism, smoking, diabetes mellitus and hypertension, which was similar to studies done by Prasad VN et al[1,8]. Atherosclerosis of aorta was a reliable indicator, was noted in 68.18% of autopsy cases in the present study. M Maruet al [1,9] observed 47% of the autopsy cases with atherosclerotic changes.

In the present study histopathological examination by Haematoxylin and Eosin staining showed 34.09% of autopsy cases with acute myocardial infarction changes and in 43.18% cases myocardium changes was unremarkable. Out of the 44 cases, subjected to complement C9 marker immuno-histochemical analysis, 65.91% stained positive for complement C9 marker.

C9 as a marker of early acute myocardial infarction prove to be a reliable immuno-histochemical marker. Its utility is enhanced in cases which do not show obvious histopathological feature of myocardial infarction.

Cases which were unremarkable in Histopathological examination (H&E stain) when subjected to immuno-histochemical analysis for C9 marker were positive for C9 complement marker which indicates early acute MI.

Immuno-histochemical techniques have proven better suited to forensic pathology as they can be applied to tissue samples fixed in formalin and embedded in paraffin but mainly because they can detect ischemic areas when assessing acute myocardial damage.

The usefulness of immuno-histochemical markers to the diagnosis of early myocardial injury has been recently promoted because most of them can be visible as early as few minutes after the beginning of the symptoms (chest pain and angina attacks). [10]

Myocardial cells from the infarcted heart start expressing foreign antigens for the immune system of the body. This results in strong activation of the complement system and accumulation of extensive deposits of components of the final pathway C5b - 9, MAC. Studies demonstrated co-localization of the complement components and inhibitors in the myocardial tissue. [11]

Immuno-histochemical reaction for the complement components and inhibitors examined under the light microscope, demonstrated widespread abundance of these proteins in the tissues. Positive immuno-histochemical reaction was found in the myocardial cells, intercellular matrix as well as in the vessel lumens. [12]

Among the various antigens, C5b - 9 is most commonly used one because it can reveal small areas of myocardial necrosis, even limited to a single cell (Myocytolysis). [13]

The property of C9 is due to its direct involvement in the complement cascade, which directly cause cell damage by opening pores of the cellular membrane surface (hence its name, membrane attack complex), through which the cell contents leak out (cytolysis). As plasma antigen, C5b – 9 typically accumulates in ischemic areas of the myocardium and can detect early myocardial injury 40 minutes after the beginning of hypoxia [14]

Immunostains for complement component C9 have been shown by a number of investigators to be a reliable and sensitive method for detecting early myocardial hypoxia. Normal (non -hypoxic) cardiac muscle lacks staining with C9, but hypoxic myocardium demonstrates positive immunostaining for this marker. [15]

Doran et al studied 25 autopsy cases of suspected MI, and 25 cases without appreciable morphological evidence of MI. 24 of the 25 cases of known MI showed positive C9 immunostaining.[16] Piercecchi -Marti et al studied 121 heart specimens, including 33 cases with histologically evident ischemic change, with 20 patients who died with EKG evidence of ischemia but no H&E changes of infarct, 35 cases with severe coronary disease but unknown cause of death. [17]

Cases where MI is suspected but typical histological changes are not apparent, immuno stains for complement component C9 can be very useful in documenting the presence of myocardial ischemia in specimens that are obtained too early after the hypoxic event to show appreciable morphological changes on H&E. [11]

Conclusion

Sudden death is defined as the death without any apparent clinical signs and symptoms. One of the major causes of sudden death is myocardial infarction that results due to decrease in blood supply to the heart. In this study it was found among 44 autopsy cases which was considered as sudden death cases, the number of cases who had atherosclerosis of aorta was 30, indicating there is an associated factor for myocardial infarction. Complement C9 factor was used as a reliable marker for identification of early MI in cases which do not show significant histopathological changes with haemotoxylin and Eosin stains. Also it was found male genders are more prone for sudden cardiac death and most MI are associated with co-morbid conditions which requires health education among the general population regarding the risk factors for myocardial infarction and life style modifications like healthy diet, avoiding alcohol, smoking and physical activities to avoid ischemia and silent MI.

On the part of the forensic pathologist it is necessary to subject every sudden death cases for TTC staining and C9 immuno-histopathology which identifies most of the acute MI in case of sudden death.

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Reference

1. Jenkins CP, Cardona DM, Bowers JN, Oliai BR, Allan RW, Normann SJ. The utility of C4d, C9, and troponin T immunohistochemistry in acute myocardial infarction. Archives of pathology & laboratory medicine. 2010 Feb;134(2):256-63.
2. Immunohistochemistry in the Recognition of Early Myocardial Infarction November 2004 by Rodney T. Miller, M .D., Director of Immunohistochemistry.
3. Casscells W, Kimura H, Sanchez JA, et al . Immunohistochemical stud y of fibronectin in experim ental myocardial infarction . Am J Pathol . 1990;137:801 – 810 .
4. Zaman S, Kovoor P. Sudden cardiac death early after myocardial infarction: pathogenesis, risk stratification, and primary prevention. Circulation. 2014 Jun 10;129(23):2426-35.
5. Schafer H, Mathey D, Hugo F, Bhakdi S . Deposition of the terminalC5b - 9 complement complex in infarcted areas of human myocardium . J Immunol 1986;137:1945 –9
6. Campobasso CP, Dell'Erba AS, Addante A, Zotti F, Marzullo A, Colonna MF. Sudden cardiac death and myocardial ischemia indicators: a comparative study of four immunohistochemical markers. The American journal of forensic medicine and pathology. 2008 Jun 1;29(2):154-61.
7. Bhargava MK, Bhargava SK. Coronary atherosclerosis in North Karnataka. Indian J Patho; Microbiol 1975;18:65 77
8. Vn Prasad, Jha A, Rc A, Sayami G, Pk S, HgS . Coronar y atherosclerosis in medico -legal autops y cases . Journal of Pathology of Nepal 2014 VOl . 4, 607 – 611
9. Maru M . Coronary atheroscelrosis and myocardial infarction in autopsied patients in Gondar Ethiopia . J R Soc Med 1989; 82(7): 399 – 401
10. Kilgore KS, Friedrichs GS, Homeister JW, Lucchesi BR. The complement system in myocardial ischaemia/ reperfusion injury. CardiovascRes 1994;28:437 –44
11. Casscells W, Kimura H, Sanchez JA, et al . Immunohistochemical study of fibronectin in experimental myocardial infarction . Am J Pathol . 1990;137:801 – 810
12. Doran JP, Howie AJ, Townend JN, Bonser RS . Detection of myocardial infarction by immuno histological staining for C9 on formalin fixed, paraffin wax embedded sections . J Clin Pathol 1996;49:34 –7
13. Block MI, Said JW, Siegel RJ, et al . Myocardial myoglobin following coronary artery occlusion . An immuno histochemical stud y. Am J Pathol . 1983;111:374 –379
14. Vakeva A, Morgan BP, Tikkanen I. Time course of complement activation and inhibitor expression after ischemic injury of rat myocardium. Am J Pathol 1994;144:1357 –68
15. Adams JE III, Bodor GS, Davila -Roman VG, et al . Cardiac troponin I. A marker with high specificit y for cardiac injury. Circulation . 1993;88:101
16. Walsh MC, Hart ML, Bourcier T, Bhole D, Takahashi M, Stahl GL. Role of complement in myocardial ischemia and infarction. InThe Complement System 2004 (pp. 421-435). Springer, Boston, MA.
17. Fujiwara H, Fujiwara T, Tanaka M, et al . Detection of earl y myocardial infarction in formalin -fixed, paraffin - embedded tissue. Am J Cardiovascular Pathol. 1988;2:57 – 61

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Morphometric Examination of Scapula to Determine Sexual Dimorphism

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Abstract

Background and Aim: Determining the sex of an individual is possible when we apply appropriate statistical methods using scapular measurements. Determination of sex using scapular measurements is very useful in medicolegal cases, natural disasters and in certain circumstances in which traditionally used bones of skeleton are either absent or fragmented. This study aims to assess sexual dimorphism for identification purposes.

Material and Methods: This study was conducted using 40 adult skeletons (25 males and 15 females) with closed epiphysis having intact and well-preserved scapulae. Scapulae were measured in millimetre for MSH, MSB, GCH and GCB with the help of the sliding calliper. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results: There was a highly significant difference ($P < 0.001$) between male and female for the mean value of all measurements. So it indicates the existence of strong sexual dimorphism in scapula.

Conclusion: Geometric morphometrics techniques feature promising results in the evaluation of skeletal sexual dimorphism, including in the size and shape of the scapula. The results of this study are very useful for sex determination in forensic anthropological and medicolegal cases where skull and pelvic bones are unavailable or damaged. The present study has confirmed that gender can be determined with high accuracy by use of scapular measurements.

Key Words: Glenoid cavity, Medicolegal cases, Sexual dimorphism, Scapular measurements

Introduction

Sex estimation of unidentified human skeletal remains is fundamental to establish a biological profile, being a critical step on the identification process.[1,2] Traditionally, the evaluation of a biological profile (sex, population affinity, age at death, and stature) begins with sex assessment, as age at death and stature are sex-dependent.[3,4] The evaluation of biological sex on skeletal remains assumes the existence of phenotypic differences between female and male individuals. These differences can be observed for both size and shape and are affected by chromosomic structure and the expression of sexual hormones. The degree of sexual dimorphism is influenced by the biomechanical functions of certain skeletal elements, environmental factors, nutrition, and sexual selection, among others.[5-10]

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Sex estimation methodologies usually fall into two categories: morphological (visual) and metric.[11,12] Morphological methods consist of a visual assessment on dry bones and they are observer-dependent, which produces subjective results. Metric methods evaluate size differences between males and females, assuming that males are larger than females.[13,14] They are less observer-dependent and easier to assess and interpret. Both approaches tend to be influenced by geographic-specific constraints. Molecular methods, particularly proteomic and genomic analyses, are highly accurate but generally not easily available.[15]

Skull and pelvis are most frequently utilized for the sex determination. However, there is a disadvantage of using skulls and pelvis for sex determination as they do not provide reliable results when they are damaged. The other bones mentioned above are often missing or found incomplete during forensic examinations. Scapula is mostly obtained in intact condition compared to the other bones. Determining the sex of an individual is possible when we apply appropriate statistical methods using scapular measurements. Determination of sex using scapular measurements is very useful in medicolegal cases, natural disasters and in certain circumstances in which traditionally used bones of skeleton are either absent or fragmented.

Materials and Methods

This study was conducted using 40 adult skeletons (25 males and 15 females) with closed epiphysis having intact and well-preserved scapulae. These skeletons of known sexes were taken from Dept. Of Anatomy, Tertiary care Institute, India. Following parameters of scapula were measured with the help of sliding calliper. All measurements were taken in millimeter.

Maximum scapular height

Maximum distance between the highest point of the superior angle and the lowest point of the inferior angle.

Maximum scapular breadth

Maximum distance between the point on the longitudinal axis of the glenoid cavity and the point on the prolongation of the inferior boundary of the dorsal margin of the spine.

Glenoid cavity height

Maximum distance from the inferior point of the glenoid margin to the most prominent point of the supraglenoid tubercle.

Glenoid cavity breadth

Maximum breadth of the articular margin, perpendicular to the glenoid cavity height.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

Table 1 shows mean of the MSH, MSB, GCH and GCB, their standard deviation, standard error mean, t-value and P value for both males and females. There was a highly significant difference ($P < 0.001$) between male and female for the mean value of all measurements. So it indicates the existence of strong sexual dimorphism in scapula.

Table 1: Descriptive statistics for the measurement of the MSH, MSB, GCH and GCB in Male and Female

Variable	Gender	N	Mean ±SD	P value
MSH	Male	50	135.25±10.54	0.001*
	Female	30	120.24±9.22	
MSB	Male	50	100.23±8.40	0.003*
	Female	30	94.36±5.14	

Variable	Gender	N	Mean ±SD	P value
GCH	Male	50	34.87±4.12	0.001*
	Female	30	31.47±5.10	
GCB	Male	50	23.54±4.65	0.05*
	Female	30	22.10±2.48	

* indicates statistically significance at p≤0.05
MSH=Maximum scapular height,
MSB=Maximum scapular breadth,
GCH=Glenoid cavity height,
GCB=Glenoid cavity breadth

Discussion

The human skeletal sexual dimorphism is expressed as differences in size and shape, with males presenting, in general, larger bones.[16,17] Sex differences observed on human bones, including the scapula, are influenced by genetic factors, hormonal stimuli during different stages of puberty, and socioeconomic and environmental factors, among others.[18,19] These factors vary significantly between geographic populations, leading to different degrees of sexual dimorphism in distinct populations. The scapular sexual differences can be expressed in both size and shape and these are significantly different between males and females in the studied sample. As observed in other bones, e.g[20,21] , the scapula from male individuals is usually larger. Traditional morphometric studies of the scapula also show that the human scapula displays sexual dimorphism in relation to size.[22,23]

After taking measurements of scapula described in materials and methods section, the resulting data of measurement was subjected to logistic regression analysis in order to develop population specific standards for sex determination as described in results section.[21] The derived regression equations yielded correct classification accuracy rates. Therefore, scapula is having a great importance in gender identification of unknown person in Indian population. As mentioned, among all the 4 parameters, scapular breadth was most significant. Dabbs G. reported 84 -88% accuracy using maximum length of scapula, maximum length of scapular spine, breadth of infraspinous body, height and breadth of the glenoid fossa.[24] P. James Macaluso Jr. Reported 88.3% success rate for area of the glenoid fossa and 85.8% success rate for glenoid fossa breadth.[25] Y Scoltz found >91% accuracy for female and >95% accuracy for male in his study.[26] Ozer reported 82.9% -95% accuracy with highest accuracy for maximum scapular breadth.[27]

Previous studies suggested that use of multiple variables give higher accuracy compared to the studies using single variable. The formula obtained using four variables (MSH, MSB, GCH, GCB) was highly reliable. It has to be kept in mind that sometimes it is possible that all the measurements are not available if the scapula is not intact. Because the mean scapular breadth measurements show highest accuracy rates amongst all the four parameters measured in the study, it may be having a great importance considering scapula an easily fragmented bone. It is to mention that MSB showed more reliable values over other parameters. The current study yielded that, accuracy of sex determination from scapula can be improved by deriving logistic regression score (Y) from 4 scapular measurements. Among the four measurements, MSB is the most significant parameter. Findings of this study are comparable to the findings of other studies utilizing the scapular measurements. This study confirmed that scapula has high value of accuracy to determine gender in Indians.

Conclusion

Geometric morphometrics techniques feature promising results in the evaluation of skeletal sexual dimorphism, including in the size and shape of the scapula. The results of this study are very useful for sex determination in forensic anthropological and medicolegal cases where skull and pelvic bones are unavailable or damaged. The present study has confirmed that gender can be determined with high accuracy by use of scapular measurements. Accuracy of sex determination can be improved by obtaining logistic regression score (Y) from four

scapular measurements (MSH, MSB, GCH and GCB). The present study confirmed that MSB alone as well as combination of all four parameters are good discriminators. In this study, population specific logistic regression formula is derived which is helpful for sex determination in Indians.

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References

1. Christensen, A.M.; Passalacqua, N.V.; Bartelink, E.J. (Eds.) Sex Estimation. In Forensic Anthropology, 2nd ed.; Academic Press: Warsaw, Poland, 2019; pp. 243–270. ISBN 978-0-12-815734-3.
2. Spradley, M.K.; Jantz, R.L. Sex Estimation in Forensic Anthropology: Skull Versus Postcranial Elements. J. Forensic Sci. 2011, 56, 289–296. [CrossRef] [PubMed]
3. Bethard, J.D.; VanSickle, C. Applications of Sex Estimation in Paleoanthropology, Bioarchaeology, and Forensic Anthropology. In Sex Estimation of the Human Skeleton: History, Methods, and Emerging Techniques; Klales, A.R., Ed.; Academic Press: London, UK, 2020; pp. 25–34. ISBN 978-0-12-815767-1.
4. Curate, F. The Estimation of Sex of Human Skeletal Remains in the Portuguese Identified Collections: History and Prospects. Forensic Sci. 2022, 2, 272–286. [CrossRef]
5. Berg, G.E. Sex Estimation of Unknown Human Skeletal Remains. In Forensic Anthropology a Comprehensive Introduction; Langley, N.R., Tersigni-Tarrant, M.A., Eds.; CRC Press: Boca Raton, FL, USA, 2017; pp. 143–162. ISBN 978-1-315-30003-0.
6. Best, K.C.; Garvin, H.M.; Cabo, L.L. An Investigation into the Relationship between Human Cranial and Pelvic Sexual Dimorphism. J. Forensic Sci. 2018, 63, 990–1000. [CrossRef] [PubMed]
7. Rowbotham, S.K. Anthropological Estimation of Sex. In Handbook of Forensic Anthropology and Archaeology; Blau, S., Ubelaker, D.K., Eds.; Routledge: New York, NY, USA, 2016; p. 738.
8. Bigoni, L.; Velemínská, J.; Br ˚uzek, J. Three-Dimensional Geometric Morphometric Analysis of Cranio-Facial Sexual Dimorphism in a Central European Sample of Known Sex. Homo 2010, 61, 16–32. [CrossRef]
9. Dunsworth, H.M. Expanding the Evolutionary Explanations for Sex Differences in the Human Skeleton. Evol. Anthropol. Issues News Rev. 2020, 29, 108–116. [CrossRef]
10. Steyn, M.; I¸scan, M.Y. Sexual Dimorphism in the Crania and Mandibles of South African Whites. Forensic Sci. Int. 1998, 98, 9–16. [CrossRef]
11. Krishan, K.; Chatterjee, P.M.; Kanchan, T.; Kaur, S.; Baryah, N.; Singh, R.K. A Review of Sex Estimation Techniques during Examination of Skeletal Remains in Forensic Anthropology Casework. Forensic Sci. Int. 2016, 261, 165.e1–165.e8. [CrossRef]
12. Omar, N.; Ali, S.H.M.; Shafie, M.S.; Ismail, N.A.N.; Hadi, H.; Nor, F.M. A preliminary study of sexual dimorphism of scapula by computed tomography in the Malaysian population. Asian J. Pharm. Clin. Res. 2019, 12, 391–395.
13. Petaros, A.; Garvin, H.M.; Sholts, S.B.; Schlager, S.; Wärmländer, S.K.T.S. Sexual Dimorphism and Regional Variation in Human Frontal Bone Inclination Measured via Digital 3D Models. Leg. Med. 2017, 29, 53–61. [CrossRef] [PubMed]
14. Galeta, P.; Br ˚užek, J. Sex Estimation Using Continuous Variables: Problems and Principles of Sex Classification in the Zone of Uncertainty. In Statistics and Probability in Forensic Anthropology; Obertova, Z., Stewart, A., Cattaneo, C., Eds.; Academic Press: London, UK, 2020; pp. 155–182. ISBN 978-0-12-815765-7.
15. Ubelaker, D.H.; DeGaglia, C.M. Population Variation in Skeletal Sexual Dimorphism. Forensic Sci. Int. 2017, 278, 407.e1–407.e7.
16. Akhlaghi M, Sheikhazadi A, Naghsh A, Dorvashi G. Identifi cation of sex in Iranian population using patella Dimensions. J Forensic Leg Med 2010;17:150-5.
17. Arora AK, Gupta P, Mahajan S,Kapoor SS. Signifi cance of Sacral index in estimation of sex in sacra of cadavers in Punjab. J Indian Acad Forensic Med 32 (2),2010;104-7.
18. Laurent, M.; Antonio, L.; Sinnesael, M.; Dubois, V.; Gielen, E.; Classens, F.; Vanderschueren, D. Androgens and Estrogens in Skeletal Sexual Dimorphism. Asian J. 2014, 16, 213–222.
19. Torimitsu, S.; Makino, Y.; Saitoh, H.; Sakuma, A.; Ishii, N.; Yajima, D.; Inokuchi, G.; Motomura, A.; Chiba, F.; Yamaguchi, R.; et al. Sex Estimation Based on Scapula Analysis in a Japanese Population Using Multidetector Computed Tomography. Forensic Sci. Int. 2016, 262, 285.e1–285.e5

20. Mukhopadhyay PP. Determination of Sex from Adult Sternum by Discriminant Function Analysis on Autopsy Sample of Indian Bengali Population: A New Approach. J Indian Acad Forensic Med 32 (4), 2010; 321-4.
21. Macaluso PJ Jr. Sex discrimination from the acetabulum in a twentieth-century skeletalsample from France using digital photogrammetry. Homo 2011;62:44-55.
22. Vassallo, S.; Davies, C.; Biehler-Gomez, L. Sex Estimation Using Scapular Measurements: Discriminant Function Analysis in a Modern Italian Population. Aust. J. Forensic Sci. 2022, 54, 785–798.
23. Prescher, A.; Klumpen, T.H. Does the Area of the Glenoid Cavity of the Scapula Show Sexual Dimorphism? J. Anat. 1995, 186, 223.
24. Dabbs G. Sex determination using the scapula in New Kingdom skeletons from Tell El-Amarna. Homo 2010;61:413-20.
25. Macaluso PJ Jr. Sex determination from the glenoid cavity in black South Africans: Morphometric analysis of digital photographs. Int J Legal Med 2011;125:773-8.
26. Scholtz Y, Steyn M, Pretorius M. A geometric morphometric study into the sexual dimorphism of the human scapula. Homo 2010;61:253-70.
27. Ozer I, Katayama K, Sagir M, Gulec E. Sex determination using scapula in medieval skeletons from East Anatolia. Coll Antroprol 2006;2:415-9.

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Victimization of transgender people in India

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Abstract

Concerns over lesbian, homosexual, bisexual, and transgender (LGBT) rights in recent years have established a global standard for the defense of gender-nonconforming groups. India, one of the countries that is home to the "Hijra" community, is gaining up in terms of the rights of the transgender minority. Having once served as the queen's aide, they now beg on the streets despite once being held in high regard by the general public and honored at ceremonial religious and spiritual gatherings. We have abused them after having used and rejected them. Who will reveal their real identity to them? Who will put an end to this prejudice? Who will assist in giving them a new life? Who will speak up and defend the rights of transgender people in India?

The transgender person protection of rights Act 2019 is the result of recent bills that the Indian legal system introduced that resulted in the repeal of Section 377 of the Indian Penal Code, a problematic colonial provision of the law. As we see new Bills, Acts, and other legislation focused on preserving and providing a livelihood for the community, we are witnessing a repetition of Indian history, which once served as a haven for the transgender population. However, compared to other countries, India has a larger transgender community and requires much more than just written legislation. For the transgender community to fully enjoy their rights and freedoms, legal gaps must be filled and processes are streamlined.

Transgender people are becoming more prevalent in India. With the exception of the transgender Act of 2019, they do not have adequate laws. This Act does not address many of the problems that the transgender population is dealing with in real life. Personal laws are required in this community concerning issues like marriage, adoption, job security, safety, etc.

Keywords: Transgender, Discrimination, India, Gender, Indian Penal Code

Introduction and background

Lesbian, homosexual, bisexual, and transgender (LGBT) rights problems have emerged recently, providing a global standard for the defense of gender-nonconforming groups. India, one of the countries that is home to the "Hijra" community, is catching up in terms of the rights of the transgender minority. Except for the transgender Act 2019, which

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was recently passed, India has the largest number of trans people. These glaring gaps in the legislation have caused some people to feel uneasy. Many of the challenges that the transgender population faces in real life and their everyday lives are not addressed by this Act. Personal laws are required in this community in relation to issues like marriage, adoption, job security, safety, etc.

In recent years, the Indian legal system has introduced bills that resulted in the repeal of Section 377 of the Indian Penal Code, a contentious colonial provision that eventually gave rise to "The transgender person protection of rights Act 2019." As we see new Bills, Acts, and other legislation focused toward preserving and providing a livelihood for the community, we are witnessing a repetition of Indian history, which once served as a haven for the transgender population. However, compared to other countries, India has a larger transgender community that requires much more than just written legislation. For the transgender community to fully enjoy their rights and freedoms, it is imperative that legal gaps be filled and processes are streamlined.

Among many other minority groups, the transgender community includes sub-groups of the Hijras, Eunuchs, Kothis, Aravanis, Jogappas, and Shiv-Shakthi. Given that it is mentioned in Hindu mythology and is mentioned in numerous holy texts, this society has a long history in India. The literature of the Vedas and the Puranas includes the idea of Tritiyaprakrti or Napunsaka. The literary works by Jain provide a thorough overview of the transgender community and refer to the idea of "psychological sex." In particular, in the Ottoman empires and Mughal rule in medieval India, the Hijra community was viewed as being vital in legal and leadership roles in the royal courts of the Islamic world. Transgender people have lived in India for more than 4,000 years. The population is estimated to be around a million, which is a sizeable fraction of the overall population. Compared to cisgender people, transgender people have an even greater likelihood of becoming the victim of violent crimes such rape, sexual assault, and simple or aggravated assault. According to a survey done by Foreign 2005, when asked if gender was a factor in the abuse or assault, 29 percent indicated "no," 42 percent said "yes," 21 percent were unsure or couldn't remember, and 8 percent provided alternate options. In this regard, it's crucial to emphasize that certain respondents have a propensity to think that sexual violence only happens to women or people who are believed to be women: Due to gender expression that deviates from standard male and female roles, both sexual minority and transgender youth may be outliers in their communities, leaving them more susceptible to bullying, a behavior frequently used against peers who are viewed as unusual.[1]

Historical Aspect

Early Indian literature reveal a lot about the group by identifying people who don't fit male or female gender standards. We can infer that the transgender group has long existed in Indian civilization based on the idea of Tritiya-Prakriti or Napumsaka, which is a crucial aspect of Hindu mythology, folklore, epics, and early Vedic and Puranic literature.."(1) a person with both male and female qualities by nature; (2) an intersex, transgender, or homosexual person; (3) sexually neutral people such as children, the elderly, the impotent, the celibate, and the third sex"[2]

Indian transgender is the most well-known and well-liked third category of sex nowadays. The third gender is shunned, mocked, and discriminated against in society up until the modern day. This has only been observed because of their intersex or transgender character. Joining the outcast and reviled Hijra community is the only way out. This signifies that you are residing in the guru-chela system and are once more required to submit to your new master, the Guru.[3]

Indian society still views transgender people as a godsend to bestow a blessing on any big event because they believe and trust them to be bearers of luck, prosperity, and fertility. However, discrimination from the same clients they are supposed to be serving has prevented this from being saved. They continue to belong to the very lowest social strata and are frequently derided and avoided. Transgender individuals were granted the right to vote in Supreme Court of India decisions between 1994 and 2014 that recognized them as members of society's third gender. As a result, individuals now have reservation rights under governmental restrictions, which has

produced several benefits.

Key Findings

- Targeting of transgender people occurs four times more frequently than that of cisgender people. in comparison to cisgender people, who experienced 21.7 victimizations per 1,000 people, transgender people experienced 86.2 victimizations per 1,000 people in 2017–2018.
- There were 86.1 and 107.5 violent crimes against transgender women and males per 1,000 people, respectively, compared to cisgender women and men (23.7 and 19.8 per 1,000 people, respectively).
- Compared to one in ten cisgender women, one out of every four transgender victims thought the incident was a hate crime.
- Between 2017 and 2018, transgender households had higher rates of property victimization (214.1 per 1,000 residences) than cisgender households. (108 for every 1,000 homes).
- Only around 50% of violent victimizations were reported. Calling the police was a common occurrence for both cisgender and transgender people.

Common Transgender Problems

The transgender community faces issues that are not unique to India. The global trend of victimization is mapped, but India appears to stand out because of the country's sizable transgender minority. Due to legislation passed under society's culture and norms, the LGBT population as a whole experiences prejudice. People have been stripped of their liberty, freedom, and safety, among other things, which are guaranteed under the constitution. Human Rights Campaign (HRC) statistics show that at least 44 transgender or gender nonconforming people were killed in the first few months of 2020, with trans women of color making up the majority of these deaths. On January 1st, Dustin Parker, 25, was gunned down in McAlester, Oklahoma; on February 24th, Neulisa Luciano Ruiz was assassinated in Toa Baja, Puerto Rico; and on March 18th, 34-year-old Black trans woman Monika Diamond was murdered in Charlotte, North Carolina. The HRC asserts that since it started tracking these incidents in 2013, it has not witnessed such a high number of transgender victimizations. Since 2013, more than 130 transgender people have been killed in the US. (HRC, 2019). When it comes to uncovering the actual figures related to the criminal victimization of transgender people, identification and greater knowledge of the variety of challenges posed by those encounters are just as important as a better appreciation of the scope of the issue.

Any aspect of effective policy-making, including the implementation of policies (or programs) to lessen transgender victimization, relieve the impact of victimization on victims, and ensure a more victim-centered methodology in the investigation and conviction of these crimes, requires a thorough analysis of these fundamental issues.

- **Harassment, abuse, and discrimination:**The transgender community experiences bullying and abuse at every turn. Due to legislation passed in accordance with society culture and norms, the LGBT population as a whole experiences prejudice. Though there is a vague notion of gender in the first place, this has pinned individuals down on issues like same-sex marriage. A same-sex marriage measure will go a long way toward fixing these problems and presenting the LGBT community with new prospects. Since transgender persons deal with the core question of identity, which even the law has taken a long time to solve and is currently dragging its feet on the bill, this will benefit them more than any other LGBT group. It is significant to remember that certain other nations, including the US, Canada, and the UK, went through a similar fight before deciding to legalize same-sex unions. The only obstacles to achieving this goal are our religion, social norms, and culture, which have brought a lot to the discussion table. One would think that transgender youngsters would be able to adapt and mature in the face of sexuality and gender challenges. This still needs to advance, just like same-sex marriage. Even when several factors are taken into account, such as internal stress and

involvement in bullying in the opposing role, transgender identification, particularly non-binary identity, is linked to both experiencing harassment and engaging in harassment. Thus, bullying in childhood might be a way to maintain hegemonic masculinity.

- **Forced begging:**The TG population frequently engages in forced begging due to the high rate of illiteracy and a lack of employment.
- **Forced prostitution:**Their community, friends, or family drove them into prostitution. Drug abuse: Abuse of drugs and other substances is a serious problem. Regardless of whether they are straight or LGBT, it is incorrect to characterize two consenting adults having a sexual relationship as prostitution. Sexual minorities do not include men or women who work in the sex industry or prostitution.
- **Rejection and Exclusion:**Exclusion from social, cultural, and economic activities as well as limited access to most public spaces.
- **Child Nabbing:**Newborns and children who identify as transgender are either willingly given up by their parents or picked up by the transgender community. This is due to the possibility that the parents would rather sell the kids for money than keep them. They may eventually be used as young beggars, in rituals, or for organ harvesting.
- **STI and STD:**Rape, unprotected sex, drug abuse, making people susceptible, sexually transmitted illnesses, and other similar issues.
- **Policies and procedures:** There aren't enough policies addressing gender recognition, sex reassignment surgery, child adoption, same-sex marriage, and family formation.
- **Human Trafficking**: The transgender population is more vulnerable to human trafficking, as well as sex, the sale of organs, and begging. The transgender community is the target of the most trafficking in India among women and children. Because society believes that transgender individuals can never be raped, these community members are frequently unable to advocate for their rights. Regardless of a person's biological sex, rape and sexual assault are forms of coercion into non-consensual intercourse. Sexual assault and violence against transgender people are prevalent.
- **Drug abuse**:Because society and families do not accept transgender people, there are problems with drug and alcohol abuse.
- **Homelessness:** Parental rejection, domestic violence, and family abuse are a few causes of homelessness. Particularly while transitioning or coming out. This leaves out the cause of poverty.

The Law amidst Discrimination and victimization

The lengthy and controversial international discussion over transgender rights concluded on April 15, 2014, when the Indian Supreme Court made a ruling. The law is supreme in India, and everyone is treated equally by the law. But whether it comes from their own family and friends or the broader community, the transgender population continuously battles marginalization, abuse, and prejudice. People who identify as transgender struggle every day since they are not accepted anywhere, are shunned by society and are frequently made fun of. However, a division bench of Justices K.S. Radhakrishnan and A.K. Sikri accepted the third gender alongside the male and female in the case National Legal Services Authority v. Union of India &Ors'

"Recognition of Transgenders as a third gender is not a social or medical issue but a human rights issue," *Justice K.S. Radhakrishnan*

The rights to equality before the law and equal protection under the law are guaranteed by Articles 14 and 21 of the Constitution. Living a decent existence, which is covered by Article 21, requires the freedom to choose one's gender identity. When determining a person's right to personal freedom and self-determination, the Court stated that "the gender to which a person belongs is to be determined by the individual concerned." The Indian people now have the right to express their gender identity, thanks to the court. Furthermore, Articles 14, 15,

16, and 21 specifically forbid discrimination based on gender.The Court also protects one's gender expression invoked by Article 19 (1) (a) and held that "*no restriction can be placed on one's appearance or choice of dressing subject to the restrictions contained in article 19(2) of the Constitution*".

For a person's personality to be able to express itself fully, the Court recognized the right to select one's private behavior, personhood, and freedom of thinking. The Court continued by stating that requiring someone to mature in a gender to which they do not belong or cannot relate will once more obstruct their development and keep them from achieving their dignity. The Supreme Court has specified guidelines for the protection of transgender people's rights by adding a third category to documents such as the voter registration card, passport, driver's license, and ration card, as well as for admission to hospitals and educational institutions, among other things. Every individual is entitled to some fundamental freedoms and rights just by virtue of being a human. These rights cannot be bestowed or revoked by governments. It includes the rights to life, freedom, equality, and honor in addition to the freedoms of expression and opinion.

The transgender community prayed that non-recognition of their gender identity is a breach of Articles 14 and 21 of the Indian Constitution. They requested a formal declaration of their gender identity rather than the identity of male or female that was assigned to them at birth. The Supreme Court became worried about their complaints and suffering as a result of this. Union of India v. National Legal Service Authority The honorable court determined that Article 14's protections apply to "any person," which includes transgender individuals, after interpreting the provision's intended use. As a result, just like any other citizen, all transgender people have a right to legal protection under the law in all spheres of state action.The court additionally found that Articles 15 and 16 are intended to apply to people who are neither biologically male nor female, as well as to people who identify as neither. Before reaching to the decision that transgender people's behavior and presentation can represent their transgender personalities and that this expression cannot be prohibited or restricted, the court additionally cited Articles 19(1)(a) and 19(2).The court determined in reference to Article 21 "Hijras/ Eunuchs have to be considered as the third gender, over and above binary gender under our constitution and the laws".

Transgender people should be recognized as belonging to a "third gender," the Supreme Court ruled in its final decision, in order to safeguard their rights under Part III of the Indian Constitution and the laws passed by the Parliament and State legislatures. The state government was further ordered by the court to formally recognize their third gender identification. The government was also required by the honorable top court to eradicate societal stigma, support particular health initiatives, and ensure equal protection for transgender persons. Every citizen has a right to justice, including social, economical, and political equality of standing, as stated in the constitution's preamble. The third gender has been denied a number of rights as an Indian citizen, including the right to marry, the right to vote, the right to own property, the right to declare a formal identity through a passport, etc. However, the right to healthcare, work, education, etc. is more significant. Due to state policy, which previously only recognized males and females as the two genders, the third gender has been denied these rights. The fundamental rights protected by Articles 14, 15, 16, and 21 were denied to them. In the 2014 NALSA Judgment, the Indian Supreme Court placed a high focus on safeguarding and preserving the rights of a transgender person in accordance with the provisions of the Indian Constitution expressed in Articles 14, 15, 16, and 21.

The 1986 amendment to the Immoral Traffic Prevention Act is a gender-neutral law. Now, the Act applies to both male and female sex workers as well as individuals whose gender identification was uncertain. Since both male and hijra sex workers are now regarded as criminals as a result of the legislation, the police are now authorized to detain and intimidate transgender sex workers. According to Section 377 of the IPC, consenting people who engage in same-sex relationships are unlawful. The transgender community is vulnerable to abuse, extortion, and harassment from the police because of this law, which dates back to the colonial era.Pandian, a transgender person, was apprehended by the police

on suspicion of stealing in Jayalakshmi v. State of Tamil Nadu. He was sexually molested in the police station, which ultimately led him to set himself on fire. In the matter of Nangaiv. the Superintendent of Police, the petitioner in the present case had applied for the employment of a female police constable. The Tamil Nadu Uniformed Services Recruitment Board in Chennai conducted the application exams. After the petitioner's application was accepted, the Superintendent of Police in the Karur district issued an order of appointment. As part of her instruction at the Vellore Police Recruit School, she received a medical examination.

The Hindu Marriage Act of 1955, the Muslim Marriage Dissolution Act of 1939, and the Indian Christian Marriage Act of 1872 are the marriage and adoption Acts in India, and they continue to this day to forbid the union of transgender people. The Hindu Adoption and Maintenance Act, of 1956 also prohibits transgender persons from adopting children because this institution is only open to heterosexuals.

The examination determined that she was "transgender" based on her genitalia and chromosomal make-up. The results of the medical examiner were in disagreement with her birth certificate, medical records, and academic credentials. Later, the Superintendent had her fired from her job as a female constable. To be able to uphold the petitioner's legal rights as a transgender person, the Hon'ble High Court upheld her freedom to choose a different gender identity as a third gender in the future based on the medical declaration and reversed the Superintendent of Police's contested order terminating the petitioner's employment. Transgender persons have long experienced prejudice in the housing, health, education, and work sectors.

Due to their societal stigma and lack of access to support that was provided to transgender persons, they encounter discrimination. To defend and safeguard the rights of transgender persons, it is essential that legislation like the Transgender Person (Protection of Rights) Act, 2019, which forbids discrimination in significant spheres like work, education, and health care.

Conclusion

Formerly the queen's helper, they now beg on the streets rather than being adored by society and honored during religious and spiritual rites. We have abused them after having used and rejected them. Who could provide them with their true identity? Who can stop this discrimination? Who might be able to help them start over? In India, who will step up and fight for transgender rights? In recent years, there have been many discussions on the transgender community that has taken place behind closed doors. India has not been excluded, just like the United States, Canada, and the United Kingdom, to name a few. Transgender issues are in the news and are receiving attention. Many cases have shown up in the recent past, and bills and Acts have also been implemented. It is important to remember that this community has hope at the end of the tunnel. The mechanism imposes for legal gender recognition the process by which trans individuals can update their documents to reflect their identity is likely the new law's most fundamental problem and is not yet worthy of complete praise.[4]

It is obvious that raising awareness of transgender issues will help find a cooperative solution. arranging for regional and worldwide workshops to address difficulties that the transgender community is facing Both the general public and the community may be subjected to this. As the subject gains attention, some workshops and seminars are being held all over the world. As a supporter of trans rights, the author plans to go to facilitate and arrange as much as she can. These lectures and workshops will go a long way toward keeping transgender people informed about their rights to a higher quality of life. Despite the fact that the law has protections for fundamental rights, as demonstrated by the empirical investigation, the majority are unaware of their rights.They will be inspired to speak out and defend their rights, especially in situations where they are being harassed or discriminated against. The researcher plans to collaborate on projects in the same field with other research groups and NGOs that are interested parties. With the outcomes of this study in hand, it will be fantastic to collaborate with research organizations

to improve the research as there are still unturned stones. Laws that are based on societal norms and culture discriminate against the LGBT population as a whole.Since there is no clear definition of what gender is in the first place, this has pinned them down on matters like same-sex marriage. A bill on same-sex marriage will go a long way toward resolving such situations and providing the LGBT community with a new path. The transgender community will benefit more from this than any other LGBT group since they experience the fundamental identity issue that the law of the nation has been slow to address and is currently doing so with the proposed measure. It is important to remember that other nations, including the USA, Canada, and the UK, have gone through the same struggle and decided to legalize same-sex unions. Our religion, social customs, and culture, all of which have much to contribute to the conversation, would be the only obstacle to this purpose.

Ethical clearance- The study does not require the approval of Institutional Ethics Committee. As the study is the combination of socio-medico-legal issue. No field study is done for this research.

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References

1. Jones et al., 2018; Price-Feeney et al., 2018
2. Wilhelm, Amara Das, Tritiya-Prakriti: People of the Third Sex: Understanding Homosexuality, Transgender Identity, and Intersex Conditions Through Hinduism, Page No. 430, (1st Edition 2003)
3. Gayatri Reddy, With Respect to Sex: Negotiating Hijra Identity in South India (Chicago: University of Chicago Press, 2010). Page no.76
4. Children Behind Bars The Global Overuse of Detention of Children available at https://www.hrw.org/world-report/2016/country-chapters/africa-americas-asia-europe/central-asia-middle-east/north

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