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RESEARCH ARTICLE

EVALUATION OF KNOWLEDGE OF EMERGENCY PHYSICIANS REGARDING ASSESSMENT AND INITIAL MANAGEMENT OF HAND INJURIES

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Abstract

Introduction: We encounter acute traumatic injuries of the hand and wrist very often in the emergency department, ranging from simple soft tissue laceration to life threatening injuries.So for the optimum treatment of any serious hand injury depends upon early recognition and appropriate referral. This can only be achieved with a thorough understanding about the evaluation and management of hand injuries by the Emergency physicians.

Aims and Objectives: To assess the knowledge on initial management of common hand injuries presenting to emergency department. To understand the importance of evaluation and management of hand injuries and for prompt referral and further expert management (surgical).

Limitations of the Study: The study populations are being tested upon a confined set of questionnaire and it may not cover the entire range of questions. Physicians will be selected randomly, which may not represent ideal demographic scenario of physicians in our country. As some of the questionnaires are being distributed by e-mails, there is a high possibility of low response.

Methodology: Over a 12-month period of all doctors working in the department of emergency and trauma care, working in the private and govt. sectors of the state of West Bengal, were asked to solve the questionnaire based on clinical scenarios of hand injuries which included evaluation of the same and the primary management .The clinical experience of these doctors varied from post graduate trainees to senior consultants in the field of emergency and trauma care. All replies were assessed by one individual.

Results and Discussion: In our study we found that 25(16.7%) emergency physicians were ≤30 years old, 61(40.7%) emergency physicians were 31-40 years old and 64(42.7%) emergency physicians were 41-50 years old.43 (28.7%) emergency physicians were Female

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and 107(71.3%) emergency physicians were Male. Questions on the Haemorrhage Control, Fight Bites, Burns, Nerve Examination, Fractures, Tendon Injury, Radiology and local anaesthesia were answered correctly by most of the emergency physicians, but there was significant knowledge deficit in the questions based on Amputation , Nail bed injury and High pressure injection injury. Overall ,our study shows that there is significant knowledge deficit amongst the emergency physicians ,out of the twenty questions on various hand injuries presenting to ED,10(6.7%) emergency physicians had 100% correct answers, 35(23.3%) emergency physicians had 50% correct answers and 105(70.0%) emergency physicians had below 50% correct answers.Hence this study showed significant knowledge deficit in assessment and management of hand injuries amongst Emergency Physicians.

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Introduction:-

Human alone through the course of evolution has a hand,he used as a tool, symbol, and as a weapon. Any grievous injury to such a vital organ can be a huge occupational and socio-economic burden. Acute traumatic injuries of the hand and wrist especially from road traffic accidents are often encountered in the emergency department. About 10 to 20% of the patients attending the emergency and trauma care present with various forms of hand injuries. Several studies have enumerated the injuries to hand as per the severity where the most common being the soft tissue injuries followed by open wound injuries. The injuries to deeper structures like vessels, nerve and underlying bones were less common.[1, 2, 3]. So for the optimum treatment of any serious hand injury depends upon early recognition and appropriate referral. This can only be achieved with a thorough understanding about the evaluation and management of hand injuries by the ED physicians.

Function of hand has to be optimal for good quality of life. Unfortunately, hand injuries are very common as finger and hand injuries are the most common type of work related injury [4]. Severe and life threatening hand injuries are generally managed in the hospital emergency department setting. Whereas if the injuries are not that severe,they can be successfully managed in primary care. Many of the studies have enumerated the injuries to hand as per the severity where the most common being the soft tissue injuries followed by open wound injuries. The causes of such hand injuries are numerous and can include traumatic injuries, sporting accidents, occupational injuries, burns (thermal and chemical) and bites of various types. This study emphasises on the knowledge of emergency physicians regarding initial management and assessment of hand injuries presenting to emergency department followed by more specific detail about common injuries and their management. The aim is not to cover each injury in detail, but to assess the knowledge of emergency physicians regarding hand injuries and how confidently they can initially manage the hand injuries presenting in emergency department.

Studies in the emergency room showed that hand injuries comprise up to 10% of the visits and range from simple lacerations or finger sprains to mutilating injuries or amputations.[5]The human hand is extremely complex and often difficult to understand.

But so far, none of such studies related to assessment of hand injuries and initial management by emergency physicians have been conducted in India. As most of the hospitals running an emergency department have physicians who are having basic knowledge of hand anatomy and hand injuries, this questionnaire based study would help throw some light on the basic practices in emergency department and knowledge regarding assessment and initial management of hand injuries.

An entire subspecialty of training is dedicated therefore to the hand. However, emergency physicians and primary care providers manage most of the acute, traumatic hand injuries either for a brief period before the patient is taken over by the hand surgeon or the definitive treatment and discharge.

Managing emergent hand conditions encompasses correctly identifying and treating such injuries, which can be difficult at times due to subtle presentations. The most critical step is understanding which ones can be appropriately

managed in the emergency department (ED), and which need an urgent referral, and then providing proper splinting and wound management.[6]

Many patients seeking wound care have not received adequate tetanus immunizations in the emergency. In this circumstance, tetanus can be potentially prevented by episodic administration of tetanus toxoid either alone or with tetanus immunoglobulin, as dictated by recommendations of the Advisory Committee on Immunization Practices (ACIP). However, very minimal information exists about the extent to which these recommendations are followed in ED practice.[7]Further, the management of pain is often neglected and overlooked. Even if analgesia is administered, it is unlikely to have been sufficient. It is, thus, the responsibility of the attending doctor to relieve patients of the pain, even before considering definitive management.[8]

Emergency medicine-based trials related to ED management of hand injuries are very sparse. Hence, our over-reliance on the expert opinion. The specialty consultation may sometimes be delayed for days or weeks, more so in a resource-limited setting. The Emergency physician must then take appropriate first aid measures and definitive plans awaiting consults.

Emergency medicine is a new field in our country, and every physician should be trained in the assessment and management of emergencies including trauma. The evaluation of hand injuries needs specialized training and practice. However, a study done to describe the diagnostic errors occurring in district general hospital accident and EDs in England over 4 years showed 953 diagnostic errors in 934 patients.[9] Very few Indian studies have described hand injuries, specifically in detail; one such is that by Mathur and Sharma.[10] Hence, this study would go hand in hand with the aforementioned study in building national data regarding hand injuries. Moreover, this would help create data regarding the ED presentation and management of hand injuries that is presently lacking in our country, which would further help improve ED first aid management including the oftenneglected analgesia for hand injuries. The stronger randomized, controlled studies that exist on hand injuries focus on their operative or rehabilitative aspects and are found in the hand surgery or occupational therapy literature. Very few studies have described the emergency presentation and management of these injuries, which includes early wound care, tetanus prophylaxis, and adequate analgesia.[7]

Aims and Objectives:-

Aims:

In this questionnaire basedstudy, the knowledge regarding assessment and initial management of hand injuries of physicians working in emergency department is assessed.

Specific objectives:

1. To assess the knowledge on initial management of common hand injuries presenting to emergency department
2. To understand the importance of evaluation and management of hand injuries and for prompt referral and further expert management(surgical).

Review of Literature:

Hand Anatomy:

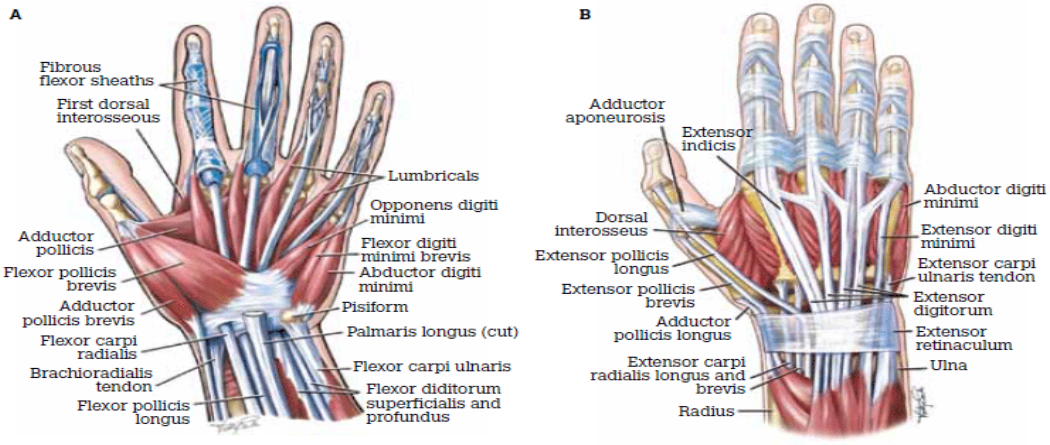


Figure 1:- Hand Anatomy1) Volar aspect; 2) Dorsal aspect.

Initial steps in assessing a hand injury:

Step 1 History:

A complete history should be taken:

1. The event which caused the injury.
2. Whether the patient is left-handed or right-handed.
3. Any previous history of damage/disease/surgery in the injured hand.
4. Occupational history – example: musician.
5. Drug history – example: warfarin.
6. Tetanus vaccination status.
7. Any other illnesses – example: diabetes.

Step 2 Observation of the hand:

Observe the affected hand prior to examining and Look for:

1. Jewellery: identify promptly any jewellery liable to cause constriction if swelling develops and remove if needed– example: rings.
2. Symmetry and position of the hand is checked : with the patient's hand in the resting position, look for fingers that are flexed, suggesting damage to an extensor tendon, or extended, suggesting damage to a flexor tendon.
3. Colour: look for cyanosis, pallor, bruising, blistering. If part or all of a finger is a different colour, pale or erythema, this may suggest a digital nerve injury.
4. Swelling of the hand.

Step 3 Vascular examination of the hand[11]:

Check the vascular status of the hand by feeling for the radial pulse and ulnar pulse and assess capillary refill.

Step 4 Sensory assessment of the hand[12]:

Damage to nerves is very common and therefore potential damage to the three major nerves that supply the hand should be looked for, examplethe radial nerve, the median nerve and the ulnar nerve. Testing of sensation using two-point discrimination (example with a bent paper clip) in three locations will allow for rapid testing of these nerves:

1. The ulnar nerve - the fifth finger.
2. The median nerve –supplies the palmar aspect of the web space between the thumb and first finger.
3. The radial nerve –supplies the dorsal surface of the proximal part of the first and second digits.

Step 5 Motor assessment of the hand[13]:

Screening nerve damage producing impairment of motor function:

1. Make the patient hold the end of a pen using the tips of the fingers and the thumb together in a circle.
2. Make the patient spread his/her fingers widely.
3. Ask the patient to make a 'thumbs up' sign

If the patient is able to perform all these tests, the ulnar, median and radial nerves are all intact. Any evidence of nerve damage will require specialist assessment and repair by a hand surgeon.

Assessing potential tendon injuries:

Potential tendon injuries are tested by examining the flexion and extension of every finger at every joint of the hand. Flexion should be tested(ensure that both deep and superficial flexor tendons are tested) by holding the proximal interphalangeal joint still whilst asking the patient to flex the distal interphalangeal joint. Extension should be tested by placing the patient’s palmon the table and lifting each finger up one at a time. Tendon injuries should be referred to an appropriate specialist, orthopaedics or plastic surgeon for repair.

Step 6 Assessment of bones and joints:

Due to the relatively small muscle bulk in the hand, injuries to the bones and joints of the hand are relatively common example accidental amputation, fractures and dislocation injuries.

Amputation injuries:

1. Approximately 5% of all hand injuries come under amputation injuries .

2. Any amputated digit should be cooled as soon as possible as this will prolong its viability. Ideally, the amputated digit should be wrapped in a saline-soaked swab, sealed in a plastic bag and placed in another bag containing ice.

Amputated digits should never be frozen, or placed directly in any solution, example in water, or any chemical solution like formaline.

Dislocation Injuries:
Dislocations are commonly seen with tendon injuries or fractures and therefore any suspected dislocation injury should be fully assessed and appropriate X-rays should be done before any attempt at reduction of the dislocation.

Fractures:
1. Most common fractures of hand are phalangeal fractures, metacarpal fractures and fractures of carpal bones.
2. Metacarpal fractures comprise 18-44% of all hand fractures; the fifth metacarpal is mostcommonlyaffected.[14]
3. If a tendon injury or dislocation is suspected, examine the motor functions of the fingers and X-ray examination of the hand should be performed to rule out associated fractures.
4. The mostcommonlyfracturedbone of the wrist is scaphoid bone which is frequently broken by falling on to an outstretched hand. Pain to palpation in the area of the 'anatomical snuff box' (ask the patient to abduct and extend the thumb; the scaphoid is situated in the 'gutter' created by the extensor pollicis longus tendon) suggests a scaphoid fracture.[15] See the separate Wrist Fractures article.

Step 7 Immediate management:
1. Remove rings as soon as possible, to avoid tourniquet traumafollowing the hand swelling.
2. Remove any foreign bodies, visible foreign body like metal impacted,wooden particle embedded and thoroughly irrigate if there is a presence of acid or alkali compounds.
3. Identify any soft tissue injury or bleeding.
4. Irrigate and explore the wound, identify the extent of damage to deeper structures – example: tendons, vessels and nerves. Identify any foreign bodies.
5. Superficial lacerationsshould be cleaned, debrided and sutured, taking care not to injure superficial extensor tendons. Clean the contaminated wound thoroughly with normal saline and pack with fine mesh gauze and delay suturing for 3-5 days to prevent infection from developing.[16]
6. Scaphoid fracture should not be pronated and supinatedat the wrist to prevent further trauma, splinting the wrist with a long arm cast or thumbspica splint must be done.[17]

Managing common injuries:
1. Fractures
2. Finger fractures

In general, closed and minimally displaced fractures with good alignment can be treated conservatively.[18]Phalangeal fractures are fully immobilised for a maximum of 3 weeks[18, 19, 20] followed by reduced immobilisation and active exercise. Unstable fractures require referral.

Volar plate avulsion fracture (Figure**)** occurs after hyperextension injury to the PIP joint, often from a ‘jamming’ injury during ball sports. This type of fracture is common but easily missed[9] and, unfortunately, permanent loss of PIP joint function results from mismanagement. Treatment includes finger exercises in several stages and an extension block splint, ideally under the supervision of a hand therapist.

Transverse fractures treated by reduction and immobilisation in a thumb spica cast.

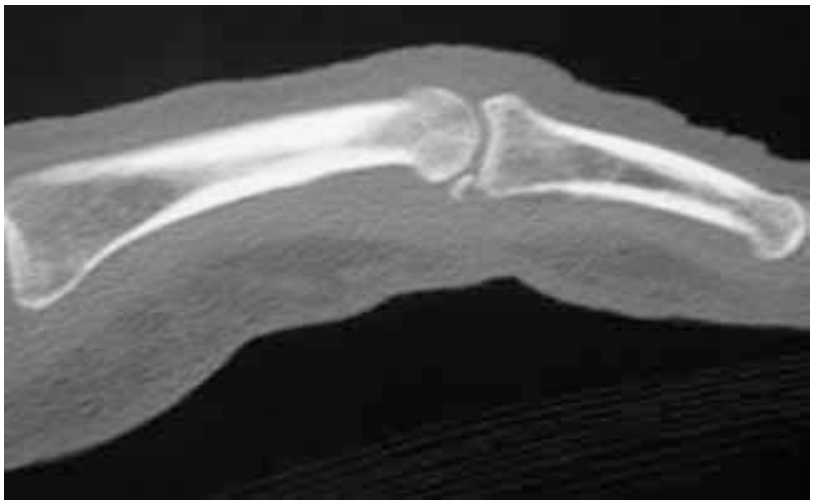


Figure:- X-ray demonstrating a volar plate avulsion fracture.

Joint injury:

Proximal interphalangeal joint:

Dislocation of the PIP joint most commonly results dorsally from hyperextension stress. An X-ray should be performed before and after the reduction to ensure proper reduction. However, most of these dislocations are already reduced before presentation. Treat fractures by splinting or as per the advice of the hand specialist. The volar plate and collateral ligaments will have been damaged if the joint is dislocated.

If after reduction:

1. joint dislocation with active movement, referral for repair is required.
2. joint hyperextension, treatment for volar plate avulsion fracture must be conducted.
3. there is no hyperextension, splint PIP joint in slight flexion for a few days followed by buddy taping.[19]

Volar dislocations usually require referral for reduction. Failure of reduction need to be treated to prevent a boutonnière deformity (Figure).

Sideways force causes PIP joint collateral ligament sprain. If partially teared then treated with buddy taping for several days followed by early active exercise.

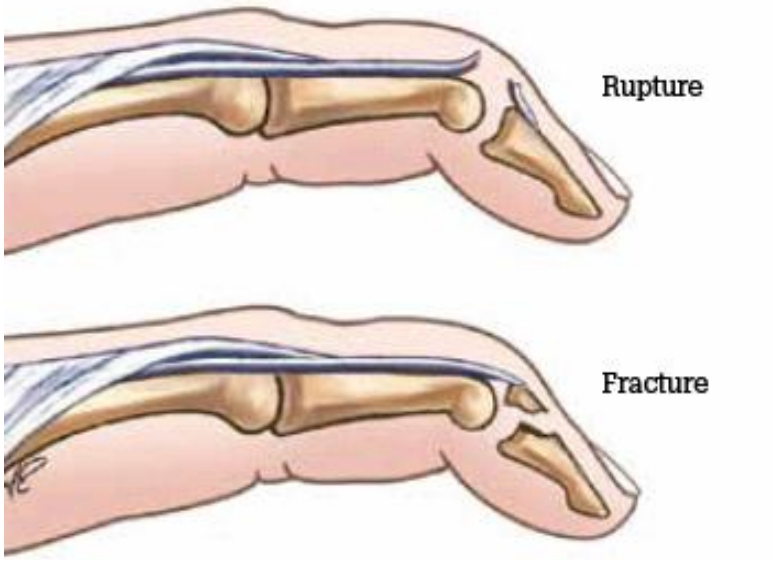


Figure:- Mallet finger deformity.

Distal interphalangeal joint:
Extensor tendon damage is associated with DIP joint injury. (See mallet finger deformity). Dislocations are less common and usually occur dorsally.[21] After reduction, splint the DIP joint in slight flexion for 2–3 weeks.

Metacarpophalangeal joint:
The MCP joint of thumb is most commonly injured. Sprain of the ulnar collateral ligament known as skiers thumb is more often seen in ball sports, occurs from forced abduction and hyperextension of the MCP joint. An X-ray is done before assessment of a UCL as any associated fracture is a contraindication to stress testing.

Stress the ulnar collateral ligament with the joint at 30^0 flexion and full extension. Complete rupture causes loss of end-feel and >10–20 degrees of deviation in both positions when compared to the other side. Pinch grip i.e. between thumb and index finger, will be painful and weak. There may be a painful lump on the ulnar side of the joint due to the ruptured ligament sitting outside the adductor aponeurosis (Stener lesion).[22]

Complete rupture of the ligament which is unstable and requires surgical repair. Keeping the MCP joint in slight flexionpartial tears are immobilised with a splint for 6 weeks. Chronic forms of this injury are called gamekeeper's thumb.

Injury to the radial collateral ligament is treated similarly. Complete rupture does not surgery.
MCP joint dislocations usually require referral.

Tendon injuries:
In general, acute tendon injuries require surgical evaluation,exceptextensor tendon injuries.

Extensor tendon – mallet finger:
Extensor digitorum injury at its distal insertion occurs when the joint is forced into flexion while being actively extended for eg. a ball hitting the outstretched finger. The patient may not present withtypical mallet finger injury deformity. Hence isolation of the DIP joint during resistance testing is to be done so that injury is not missed.

X-ray is to be done , as mallet finger can occur with an avulsion fracture. An avulsion fracture involving>30% of the articular surface or if there is joint subluxation, surgery is required. Otherwise, mallet finger deformity is managed conservatively.

Splint with the DIP joint in slight hyperextensionfor a minimum of 6 weeks. Crucial to maintain extension at all times, even when removing the splint for hygiene purposes.[9] Patients must be aware that failure to do this will result in permanent joint deformity. Although research[23] indicates similar outcomes for various splints, ready to use splints are only available in a small range of sizes, and custom made splinting may be required. Check for active pain free extension after six weeks and then begin intermittent splinting and active rehabilitation.

Mallet finger deformity can be successfully treated up to 3 months after the initial injury.[24, 25]
Extensor tendon – Boutonnière deformity
Central slip of extensor digitorum is injured from a direct force to the PIP joint, or from the same mechanism of injury that causes mallet finger deformity. Initially presented as only pain with no deformity. Examine the injury with active finger extension showing the PIP joint will lag behind the DIP joint and full range can be lost.

Tenderness over the dorsal PIP joint may be present. Even suspicion of a subtle lag requires treatment. Failure to detect this injury results in the 'boutonnière' (**Figure**) or 'swan neck' deformity over time.

Surgery is required if there is associated intra-articular fracture of more than thirty percent. Splint the PIP joint in full extension while allowing DIP joint flexion for 6 weeks. Intermittent splinting and active rehabilitation is then required.

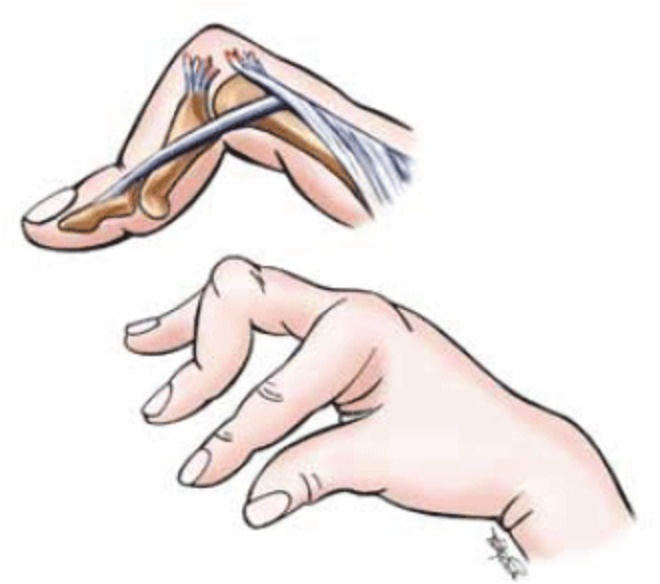


Figure:- Boutonnière deformity.

The rupture of the central slip of extensor digitorum from its insertion allows the lateral bands to migrate in a palmar direction. In turn, the middle phalanx is then pulled into flexion by FDS; the PIP joint herniates through the central slip tear

Flexor tendon injury:
Injury to the flexor digitorum profendus most commonly occurs at the fourth finger, as it is the weakest. Classically due to a grabbing incident, such as a missed tackle. After the injury fingerwould be in relative extension to the others, with inability to flex that finger. Order X-rays, as associated avulsion fracture is common. Immediate referral to a hand surgeon must be done as these injuries are irreparable after 10 days.

Lacerations:
Management of lacerated injury to the hand require exclusion of damage to underlying structures. Before the infiltration of local anaesthetic, examination of movement and sensation must be done. Careful wound exploration can then take place. If the mechanism of injury suggests a fracture, an X-ray should be performed.

Excruciating pain with active movements and against resistance is suspicious for tendon injury. If unsure about tendon integrity, re-evaluate in two to three days. Compound fracture, tendon or nerve injury warrants surgical repair.

Simple lacerations should be given copious lavage and irrigated then sutured loosely to allow ooze. Although normal saline is traditional, there is evidence to suggest[15] that drinking-quality tap water is a viable option. Delayed closure can be done in wounds that present after 6 hours of injury. Antibiotics should be prescribed as per antibiotic guidelines[26] and tetanus toxoid administered as necessary.

Bites:
Bites with fracture requires surgery referral for surgical washout along with oral antibiotics or parenteral antibiotics depending upon the severity. A bite wound should not be primarily closed. It should undergo copious lavage, treated with antibiotics ,tetanus cover and review.[26, 27] For human bitesconsider the patient's hepatitis B status and if the wound is clean in 3 days, then it can be loosely suture but ongoing review should be continue.

Nail bed injuries:
Nail bed injuries are commonly sustained as a result of high-force crush from a car or home doorsor high-speed lacerationfrom band saws. Fingernails originate from the germinal matrix, and injury to germinal matrix can result in permanent nail deformity. When assessing fingertip injuries, it is important to note the size and level of the defect, analyse the nail bed for significant injury, as well as the presence or absence of exposed bone.

Incomplete avulsion of the nail plate through the eponychia surface is one of the commonest injuries dealt by the emergency physicians in emergency department amongst nail injuries as the proximal nail plate lies on top of the eponychia surface. This even signify laceration of the underlying nail matrix and, possibly, fracture of the distal phalanx. In this case, the nail plate is removed and the underlying nail bed is sutured with a fine absorbable suture (level III evidence).[28] The original nail plate is then washed and replaced as a "free nail plate splint." In 2 to 4 months, a newly grown nail will push this out.

Fingertip amputations:
Fingertip amputations are classified according to the level of amputation with respect to the distal phalanx.

Principles of managing fingertip amputations areto provide effective and durable coverage, to preserve the finger length and sensation,pain management and donor-site morbidity.[29] In the absence of exposed bone, healing occurs by secondary intention for defects less than 1 cm in size. All wounds should be thoroughly irrigated and debrided of non-vitalized tissue to avoid infection .Haemostasis should be obtained; local direct pressure is often sufficient.

The bone is trimmed proximally with a bone rongeuras the bone might protrude beyond the soft tissue wound margin followed by daily dressing until the soft tissues contract over the next3 weeks, covering the bone and re-epithelializing the wound. The techniques for obtaining soft tissue coverageinclude V-Y advancement flaps, cross-finger flaps, and pedicled flaps.[29, 30] These procedures need to be managed by hand surgeons.

Fingertip open wounds, undergoing daily dressing are extremely painful. After the initial debridement and exploration under a metacarpal or digital block, the open wound is dressed with a single layer of petrolatum gauze, followed by a saline compress and dry gauze under all aseptic precautions. After 48 to 72 hours, the external dressing is soaked first in normal saline and removed, leaving the underlying petrolatum gauze in place, allowing alleviation of pain during future dressings and alsofacilitates epithelialization of the wound. After the first dressing change, the patient is instructed to bathe the finger in warm salt or magnesium sulphate baths daily for 1 to 2 minutes and then to dress the wound with dry gauze to minimize the bacterial count on the wound and prevent infection. The small wound epithelializes under the petrolatum gauze dressing, lifting it off approximately after 2 weeks.

Infections:
1. X-ray if indicated (especially if gas gangrene is expected)
2. Referral to a hand specialist is needed for extensive cleaning of the wound under general anaesthesia if the wound is contaminated or deep.
3. Antibiotics for bacterial infection of the tissue; antifungals for fungal infections

A major consideration for an infection in the hand is the presence of a fluid collection or an abscess. All infections isolated to the skin, such as cellulitis,are treated by oral or parenteral antibiotics depending upon the severity and close follow-up. However, presence of an abscess requires drainage also known as lancing. If the abscess is large or near nerves, arteries, ligaments, or tendons surgical intervention may be required. All major infections of hand have the potential for rapid progression leading to severe loss of function.

Serious burn injuries to the hand may require an evaluation by a handsurgeon or a burn specialist.Hospital admission may be required for treatment. Skin grafting may be needed in order to ensure the best outcome.

First-degree burn:
1. Cool burned area with water, not ice
2. Pain relief
3. Re-evaluation of depth or degree of burn
4. Bandage the injured area with antibacterial ointment
5. Follow-up in 48-72 hours

Second-degree burn:
1. Cool burned area with water, not ice
2. Pain relief
3. Re-evaluation of depth or degree of burn

4. Sterile rupture of blisters is recommended by some, but not all health care professionals
5. Bandage injured area with antibacterial ointment
6. Close follow-up in 48-72 hours

Third-degree burn and deep second-degree burns:
1. Cool with saline or water, not ice
2. Pain relief
3. Re-evaluation of depth or degree of burn
4. Sterile dressings with antibacterial ointment over injured area
5. Referral to burn specialist skilled in burn treatment for evaluation and debridement within 48 hours of injury. Burns that completely surroundthe fingers, hand, or wrist, may be admitted to a hospital burn unit because of the potential to develop compartment syndrome.

Chemical burns:
1. Chemical burns, require lots of irrigation with water
2. Certain exposures require immediate debridement. In certain chemical injuries, water is not used because it further damages the skin, other exposures require systemic treatments so a specialist in burns is good to consult can help decide emergency treatments that help with certain patients.
3. Local wound care.

Electrical burns:
1. Local wound care
2. Evaluation of other organ systems
3. If severe: IV fluids, cardiac monitoring

Cold injuries:
1. Rapid rewarming of tissue with warm water (104-08 F or 40-42.2 C) for 15-30 minutes
2. Sterile incision of blisters is usually recommended
3. Ointment plus sterile dressings over injured area
4. Pain relief
5. Consideration for antibiotics
6. Local wound care with follow-up in 2-3 days

High pressure injuries:
1. X-rays
2. Tetanus booster
3. Broad-spectrum antibiotics
4. Splint
5. Immediate hand surgeon referral
6. Steroids may be considered

AetiologyAnd Pathophysiology:
Hand injuries are often grouped by anatomical location. For instance the mechanism of injury should be a cue for the emergency clinician to consider specific diagnoses like a fall on outstretched hand "FOOSH" should prompt consideration of scaphoid fracture, scapholunate instability, lunate dislocation, and peri lunate dislocation. A motor vehicle crash with rapid deceleration while holding the steering wheel or a FOOSH injury while holding an object like ski pole or a bottle should prompt consideration of gamekeeper's thumb. The most common injuries to the hand are lacerations (49.8%), fractures (15.3%), strains/sprains (8.4%), and contusions/abrasions (8%).[31]

Differential Diagnosis:
Time critical limb-threatening injuries, high morbidity injuries, and diagnoses detected solely by examination like gamekeeper's thumb, deserve emphasis in patients presenting with acute hand injuries. Diligence is required in the trauma patient presenting with multisystem trauma or distracting injury (e.g. open tibia-fibula fracture), as this scenario may lead to search-satisfying error (that is the tendency to call off the diagnostic search once something is found).[32]

Emergency Department Evaluation:

Triage and Stabilization:

Initial Emergency triage, bed utilization, and care should follow standard practices for the undifferentiated trauma patient (example: Advanced Trauma Life Support or emergency clinician discretion). Certain injuries warrants immediate placement of the patient in an intensive care area to address lifeor limb-threatening injuries. In instances of significant bleeding where there is anticipation of the need for disposition to the operating room, parenteral pain medications, or intravascular volume resuscitation, intravenous access should be obtained and the patient should remain NPO (nil per oral). Haemorrhage control, splinting, and parenteral analgesia should be undertaken as needed.

History:

Hand trauma needs a focused history which stratifies the differential diagnosis and possible complications likejoint violation, tendon injury, retained foreign body,high pressure injection injury, infection, tetanus, rabies, and compartment syndrome. Rapid identification of limb-threatening and high-morbidity injuries must be done. Any information that may change the patient's ultimate disposition or alter management should be gathered, such as in cases of a suicide attempt or suspicion of child abuse. If the patient is unable to offer a reliable history aswith a child, or if the patient has an altered mental status, an attempt should be made to obtain information from an alternative source, such as from parents or care giver.

A detailed description of the mechanism of injury and the symptoms should be sought, including asking whether the injury was from blunt force, penetrating force, FOOSH, closed fist, or high-pressure injection. The patient or witness should also be asked about the time of onset, pain, location, range of motion, functional impairment, exacerbating/relieving factors, weakness, numbness, tingling, and discoloration.[32] In certain situations such as amputation, additional data are critical, including the method of storage of the body part and ischemic time. Knowledge of dominant hand, occupation, and hobbies are significant in surgical decision making in specific patient populations (example: for a professional musician).

Medical history should include baseline functional status, disability, prior injury, immunosuppression like diabetes mellitus, asplenia, bleeding disorders, current medications, allergies, peripheral vascular disease, rheumatoid arthritis,smoking, and past surgical history.[32]

Physical Examination:

A standardized hand examination is very important in every patient presenting with hand injury in emergency department. Some clinical circumstancesdemand additional focused examination. Examination should always begin with inspection and comparison with the unaffected hand for swelling, discoloration, bleeding, misalignment, amputation, and asymmetry. Palpation of the wrist joint, anatomical snuffbox, scapholunate joint, wounds, deformity, metacarpal bones, and metacarpophalangeal (MCP) joint, proximal interphalangeal (PIP) joint, and distal interphalangeal (DIP) joint in all digits should be performed. Passive and active range of motion of all joints is performed at the wrist and at the metacarpophalangeal, proximal and distal interphalangeal joints, looking for evidence of limited range of motion, crepitus, and tenderness. Valgus and Varus stress should be applied to the metacarpophalangeal, proximal and distal interphalangeal joints, and thumb joints to assess for ligamentous instability.

Assessing Motor And Nerve Function:

The motor components of the radial, median, and ulnar nerves are assessed with resistance to active thumb extension, thumb opposition, and thumb adduction, respectively.Weakness in the adductor pollicis brevis muscle shows the presence of Froment's sign positive due to ulnar nerve palsyresults in flexion of the thumb interphalangeal joint due to compensatory action of the flexor pollicis brevis, which is innervated by the median nerve. The motor and sensory function of the radial, median, and ulnar nerves may be rapidly assessed with a set of simple manoeuvres. Sensation with light touch at the dorsal aspect of the thumb carpometacarpal joint, second digit pulp, and fifth digit pulp, is assessed to evaluate the sensory components of the radial, median, and ulnar nerves respectively.

Assessing Tendon Function:

Extensor tendon examination is performed with the hand immobilized on a flat surface, with resistance against extension at the MCP, PIP, and DIP joints. The flexor system of digits 2 through 5 consists of flexor digitorum profundus (FDP), flexor digitorum superficialis (FDS), and the flexor tendon sheaths. The flexor pollicis longus

(FPL) is the major flexor tendon of the thumb. The FDP inserts into the volar aspect of the distal phalanx. The FDS runs superficial to the FDP and inserts into the volar aspect of the middle phalanx. Hand flexor tendons are assessed individually. To assess the Flexor digitorum profundus, hold the PIP in extension and the patient flexes at the DIP joint. FDS is assessed by immobilizing the other digits in extension while the patient flexes the non-immobilized digit. In open wounds, where tendon is exposed direct visualization up to the base of the wound is required.

Assessing Vascular Function:
Vascular examination should identify gross injuries of the dual blood supply of the hand and examine for any evidence of impaired perfusion. Bright-red pulsatile bleeding; expanding hematoma; a cold, pulseless extremity; a palpable thrill; or an audible bruit are the hard signs of arterial injury.Impaired capillary refill and pallor are the soft signs of arterial injury. Capillary refill and pulse oximetry have limited diagnostic utility.[33, 34, 35] The Allen test was originally devised to identify patients with a single radial artery supply of the hand.The Allen test is performed in suspected ulnar artery injury proximal to the wrist,.The hand is elevated 30 degrees in a clenched position and pressure is applied over the radial and ulnar arteries for 5 to 6 seconds. When the hand is unclenched and ulnar artery pressure is released, colour should return to the hand. If the pallor is persistent, it raises the suspicion of abnormal ulnar artery patency.

Diagnostic studies:
Laboratory Studies:
Complete Blood Count:
CBC has limited diagnostic utility in isolated hand trauma, particularly in the absence of significant bleeding or suspected coagulopathy. The platelet count may be useful in suspected coagulopathy or thrombocytopenia.[36]

Coagulation Studies:
Coagulation studies (prothrombin time, international normalized ratio, activated partial thromboplastin time) are generally not indicated in acute hand trauma except with significant bleeding or suspected coagulopathy (example: warfarin use, family history, or liver disease).

Imaging Studies:
Unlike in suspected ankle or cervical spine fractures, there are no prospectively validated clinical decision rules to omit imaging studies in low-risk patients with acute hand injury. In suspected fracture or joint injury, the initial imaging modality is plain radiography with anterior-posterior and lateral views, and consideration of an oblique view for overlapping bones.[37]Hand radiographs should be evaluated for adequacy of views, bony alignment, and individual bone morphology. In the posterior-anterior view of a normal hand, the middle metacarpal axis and radius axis should line up with one another, and the ulnar styloid should project laterally from the distal ulna. In the PA view of the wrist, the carpal bones form 2 arches and 3 distinct smooth arcs which is known as Gilula arcs. Irregularities in these smooth arcs suggestive of ligamentous instability or fracture. Spacing between carpal bones should be limited to 2 mm.The middle metacarpal axis forms a line through the capitate, lunate, and radius in the lateral view X-ray of the wrist. Scapholunate angle is formed by the longitudinal axis between the scaphoid and the lunate, normally measures 30° to 60°. Abnormal shapes of individual bones may signify pathology such as signet ring sign, pie-inthe-sky sign, spilled teacup sign, jumbled carpus.

Computed Tomograph:
Computed tomography (CT) is infrequently required in the ED. CT is more sensitive and specific than plain radiography to identify fractures.[38] The ACR supports CT imaging when clinical suspicion of occult fracture persists despite normal radiographs or when it is requested for surgical planning. Non-emergent CT imagingas in the case of suspected metacarpal fracture despite normal radiographs may be obtained in the outpatient setting.

Magnetic Resonance:
Imaging Magnetic resonance imaging (MRI) is very infrequently indicated in acute injuries of the hand in the ED. Although controversial, the ACR considers MRI as a diagnostic option for suspected scaphoid fracture with normal radiographs versus splinting, repeat examination, and radiographs at 10 to 14 days.[38,39,40]Nonemergent MRI in acute hand injury such as occult scaphoid fracture, gamekeeper's thumb may be obtained in the outpatient setting.

Ultrasonography:
Several studies have shown that ultrasound imaging is a useful diagnostic imaging tool for acute hand injuries.[41-43] Wu et al prospectively studied 34 patients with suspected tendon injury , 17 of whom had digit or hand injuries, comparing the diagnostic accuracy of emergency physician-performed bedside ultrasound versus physical examination. The authors reported equal sensitivities (100%); however, the specificity of ultrasound was superior to physical examination (95% vs 76%).[41]with appropriate training, emergency physician-performed bedside musculoskeletal ultrasound is a useful diagnostic tool.

Altman RS et al [44] (1987) found that failure to develop a proper routine for complete examination and documentation of the injured hand may result in the inability to make the proper diagnosis. Less than optimal treatment may result. The end result is unnecessary loss of function and, frequently, medical-legalliabilities.Initial ED management of acute hand is reviewed: Early recognition of surgical emergencies, proper initial treatment of tendon and nerve and arterial injuries, splinting, ,providing tetanus cover, parenteral or oral antibiotics and record keeping are emphasized.

Cheung K et al [45](2013) found that to review the initial management of common traumatic hand injuries seen by primary care physicians. Recent clinical evidence and literature identified through MEDLINE electronic database searches was reviewed. For areas with little evidence, expert opinion was used to supplement recommendations. Primary care physicians while routinely managing the patients with acute traumatic hand injuries shouldreview the assessment, diagnosis, and initial management of common traumatic hand injuries. The presentation and management of burn injuries of hand, high pressure injection injuries,nail bed injuries, fingertip amputations, mallet fingers, hand fractures, tendon lacerations, bite injuries, and infectious tenosynovitis will also be discussed. The management of traumatic hand injuries are reduction and immobilization of fractures, post-reduction x-ray scans, obtaining soft tissue coverage, preventing and treating infection by oral or parenteral antibiotics depending upon the extent of trauma and ensuring tetanus prophylaxis. Accurate initialassessment and management of traumatic hand injuries is very essential to prevent any kinds of substantial long-term morbidity in generally otherwise healthy population. All critical injuries requiring expert opinion by hand surgeon, should be promptly referred .

Ghiya MN et al [46] (2017) found that despite having a dedicated Plastic Surgery Unit, emergency physicians (EPs) manage many of the acute, traumatic hand injuries. The management of pain is often neglected in a busy ED. To provide a clinical description of hand injuries with aetiology and mechanism; and describe the trends of ED management, including analgesia and tetanus prophylaxis. Records of 80 patients with hand injuries were reviewed. SPSS version 18 was used for statistical analysis. Wilcoxon signed rank test, and Pearson Chi-square test were used to compare left with right-hand injuries and validate associations, respectively. The mean age of the patients was 27.41 years with a median delay in presentation was 2 h. The predominant mode of injury was occupational injury (74%).Most patients (59 of the 86) received intravenous analgesia; while 6 of the patients received local anaesthesia and 24 patients received no analgesia at all. A majority of patients (56) received tetanus toxoid prophylaxis, while only four patients (4.6%) also received tetanus immunoglobulin intramuscular. Most patients (71%) were admitted, while only a small number of patients (14%) were discharged from the ED. With proper training and sensitization towards the need and technique of anaesthesia, particularly local anaesthesia the quality of patient care would be improved. Several guidelines and periodic review of the charts would help to overcome poor adherence to tetanus prophylaxis. With proper training through rotations to the Plastic Surgery Unit, hand injuries could be managed in a better and systematic approach.

Bowen WT et al [47] (2014) found that although injuries of the hand are infrequently life-threatening,they are common in the emergency department and are associatedwith significant patient morbidity and medicolegal risk for physicians. Examination of patients with acute hand injury begins with a focused history and physical examination. In most of the cases,a diagnosis is achieved clinically or with plain radiographs and some patients would require straightforward management The emergencyclinician should be capable of rapidly identifying the limb-threatening injuries, obtainingcritical clinical information, navigate diagnostic uncertainty, andfacilitate specialist consultation, when required. This review emphasises on the clinical evaluation and management of high-morbidityhand injuries in the context of the current evidence.

Alphonsus CK et al [48] (2011) found that mangling hand injuries are high energy complex conditions that are challenging to manage. Most of them requires careful planning and meticulous execution of treatment. A clear set of anatomical and functional goals are necessary as it guides the planning. The first surgery is crucialand it ensures

good vascularity to the salvaged tissue, prevent infection and achieve bony stabilization. Re-look surgery and definitive reconstruction can then follow. Post-operative therapy is an important component of treatment. Inspite of best efforts, outcomes are variable in these devastating injuries. Secondary procedures and provision of prostheses undoubtedly improves the patient's body image and limb function.

Chung KC et al [49] (2011) found that although reconstruction is often the primary choice of surgeons following an open tibial fracture, there is no evidence to support the long-term effectiveness of flap reconstruction over below-knee amputation. This studyaims to perform a decision analysis to evaluate treatment preferences for type IIIB and IIIC tibial fractures. Hand surgeons, physical medicine physicians and patients with lower extremity trauma completed a web-based standard gamble utility survey to generate quality-adjusted life years. Out of whichphysicians assigned quite high utility values, and there was a slight preference for reconstruction over amputation, with a gain of only 0.55 QALY. Patients assigned significantly lower utility values and alsofavoured reconstruction over amputation, but with a larger gain of 5.54 QALYs. This study highlights the necessity of realistic discussion of outcomes, regardless of management methods.

Wieschhoff GG et al [50] (2016) found that traumatic finger injuries account for a substantial number of emergency visits every year. Imaging helps in diagnosis and in management of these injuries. Many injuries can be managed conservatively, invasive interventions are sometimes required to prevent complications and loss of function. The soft-tissue anatomy of the hand is very complicated and due to this very often accurate diagnosis of finger injuries can often be difficult.The Radiologists must have a thorough knowledge of finger anatomy, the wide array of injury patterns that can occur, the characteristic imaging findings of different finger injuries, and the most appropriate treatment options for each type of injury. This would be very helpful for the treating physician .In this article the intricate anatomy of the hand is explained in detail as it relates to common finger injuries. This studyalsothrows some light on the various imaging findings of a range of injuries, optimal imaging modalities and imaging parameters for the diagnosis of different injury types, and addresses management implications for the patient and the orthopaedic surgeon. With this knowledge, radiologists will be able to recommend the most appropriate imaging studies, make accurate diagnoses, convey clinically relevant imaging findings to the referring physician, and suggest appropriate follow-up examinations there by improving patient care and outcomes. Online supplemental material is available for this article.

Jha S et al [51] (2014) found that bite wounds are a common form of hand injury with the potential to lead to severe local and systemic sequelae and permanent functional impairment. Bite wounds can be injuries resulting from the bites of various animals like dogs, cats and even humans and these are the most widely discussed and reported in the literature. The bite wounds are severely contaminated with aggressive pathogens and because of the anatomical vulnerability of structures within the hand,such injuries become fatal if early recognition and treatment is not provided. The bite injuries are managed with irrigation and antibiotics, and woundsinvolving deep structures require formal surgical exploration and washout. The consequences of such injuries can be disastrous.

Pilling T et al [52] (2016) found that numerous studies internationally highlight the devastating effects of firework-related injuries and the costs involved in treating these injuries. This study was done to profile the firework-injured hand and to review the management from a surgical and rehabilitation perspective. A retrospective audit was conducted on patients with firework injuries between 2009 and 2014 (n = 65) in two hospitals in KwaZulu-Natal (KZN), South Africa. The thumb, index and middle fingers were predominantly affected at the level of the distal phalanges and distal interphalangeal joints resulting in amputation due to severe soft tissue injury and resultant fractures. Both medical and surgical interventions were performed within the first three to six hours post-injury involved washout, cleaning, debridement and suturing. was The predominant course of action was formalisation of amputation.The authors concluded that the firework-injured hand should be managed according to the resultant diagnosis, be it an amputation, fracture, or soft tissue injury.

Goldwyn RM et al [53] (1974) found that it was important to provide the surgeon with a basic approach to the management of acute hand injuries founded on the biology of tissue repair and regeneration. The result of a hand injury and the operation done depends on the technique and the biological processes.

Griffin M et al [55] (2012) found that flexor tendon injuries still remain a challenging condition to manage to ensure optimal outcome for the patient. Kirchmayr in 1917, described the first flexor tendon repair. Primary surgical repair often results in better functional outcome compared to secondary repair or tendon graft surgery. This literature

demonstrates that successful repair of flexor tendon injury requires minimal gapping at the repair site or interference with tendon vascularity, secured suture knots, smooth junction of tendon end and having sufficient strength for healing.This review aims to discuss the results of studies demonstrating the current knowledge regarding the optimal approach for flexor tendon repair. There has been an extensive debate in field of hand surgery regarding post-operative rehabilitation for flexor tendon repair surgery. It was supporting active mobilisation protocols but further study in this area is needed to find the protocol, which achieves function and gliding but avoids rupture of the tendons. Complications that commonly occur post surgery are adhesion formation, tendon rupture and stiffness of the joints. This study has also discussed the appropriate management of these difficulties post surgery.

Vitale E et al [56] (2019) found that hand injuries after high-pressure injection are a medical emergency. This types of injuries frequently seen in industrial workers while cleaning, painting, and lubrication, and may have devastating consequences, leading to eventual amputation and poor functional outcomes. The study has attempted in investigatingthe evolution, management, and outcome of such injuries which often go unattended. Medical records were collected from occupational medicine units and hand surgery units in order to spot the high-pressure gear accident cases. Records were analysed by dividing the subjects into two groups: those treated within 6 h and after 6 h of the trauma. A follow-up was carried out at least 1 year after treatment; the post-treatment outcomes were assessed. Of the 71 (100%) subjects, 26 (37%) were treated ≤6 h and 45 (63%) >6 h. A total of 28% (n = 20) underwent amputation. In 61% of cases, accidents had occurred in the iron and steel sector. High viscosity materials with a delayed treatment beyond six hours led to compartmental syndrome and following amputation. In this type of injury early management is crucial for better outcome.This study contributes to providing guidelines to occupational physicians in order to best manage this type of emergency.

Methodology:-

Over a 12-month period of all doctorsworking in the department of emergency and trauma care, working in the private and govt. sectors of the state of West Bengal, were asked to solve the questionnaire based on clinical scenarios of hand injuries which included evaluation of the same and the primary management . The clinical experience of these doctors varied from post graduate trainees to senior consultants in the field of emergency and trauma care. All replies were assessed by one individual.

Study Design:

The study was a prospective, multi-centric, observational, questionnaire-based study. For the purpose of this thesis, a descriptive correlational analytical survey was used, in which a qualitative approach was undertaken to determine the answers of above mentioned research questions. According to Cormack (2000), this research approach wasallow a large collection of empirical evidence through a series of steps according to a pre-specified plan of action. Essentially, descriptive and correlational are classed as non-experimental research methods and in a survey; its purpose is to observe, describe, and document aspects of a situation as it naturally occurs and to describe the interrelationship or association between variables.

Study population:

Study Sample: For the purpose of this proposal, data was collected, from all participants fulfilling the inclusion criteria. The expected sample size that was recruited for this study is calculated with the help of "Raosoft" sample Size calculation. The following data were entered:

Population Size: 250
Confidence Level: 99%
Margin of Error: 5%
Response of Distribution: 50%

The sample size required for this survey was calculated as 152, rounded to 150 with the following formula:

Sample size n and margin of error E are given by,

$$x = z(c/100)\text{^}2\, r(100 - r)$$
$$n = Nx/((N - n)\, E\text{^}2 + x)$$
$$E = sqrt[(N - n)x/n(N - 1)]$$

Where N is the population size, r is the fraction of responses that you are interested in, and z(c/100) is the critical value for the confidence level c.

Inclusion Criteria:
All doctors who deals with trauma patients and working as a resident or a consultant in the Dept. of emergency and trauma care.

Exclusion Criteria:
Doctors who specialized in the field of orthopaedics and/or plastic surgery Dept.

Study Sample:
A sample plan is an important feature of a qualitative research. According to one of the crucial task in designing a research project is to decide on the number and characteristics of the respondent who was invited to take part in the study.

According to quantitative research the larger the sample the more representative of the population it is likely to be. For the purpose of this proposal, data was collected, from all participants fulfilling the inclusion criteria.

The Survey:
The author proposes to carry out a mixed methodology of data collection using one-to-one interviews and electronic survey using the Web-based software Survey Monkey (http://www.surveymonkey. com), which was allow secure, anonymous distribution of the questionnaire via the Internet. An e-mail message containing the aims and objectives of the study with a link to the survey was distributed through an email to the Emergency physicians all over India. After initial e-mailing, two reminders were sent out approximately every 3 weeks to physicians who had not responded to the survey. There is no incentive for participation and physicians who do not want to take part in the study they do not have to, and that the non-participation was have no bearing on their professional careers since questionnaires are anonymous.

Ethical consideration:
Ethics refer to the rights and protection of subjects and according to Cormack, there are ethical considerations at every stage of a research process, including the choice of topic to research.
A written explanation of the nature of the study was given to the participants alongside the questionnaire. Participants can make an informed decision whether to enter into the study, by the informed consent form (Appendix I). No names were attached to the questionnaires, which were allow for participant anonymity. Confidentiality of data gathered from participants was respected at all times. This research proposal was submitted to the Research Ethics Committee of Peerless Hospital & B. K. Research Center, Kolkata for scrutiny and was undertaken if approval is granted.

Anticipated benefits:
Emergency physicians deal daily withthe hand injuries,Emergency physicians must rapidly identify limb-threatening injuries, obtain critical clinical information, navigate diagnostic uncertainty, and facilitate specialist consultation, when required.This study was help us in the following ways;
1. No studies to assess the magnitude of the problem amongst doctors in India have been so far.
2. Improvement in the quality of knowledge and awareness.
3. Improvement in the quality of care was provided to the patients.

Statistical Analysis:
For statistical analysis data were entered into a Microsoft excel spreadsheet and sent to the statistician. He then analyzed by SPSS (version 25.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5.Data had been summarized as meanand standard deviation for numerical variables and count and percentages for categorical variables.

Z-test (Standard Normal Deviate) was used to test the significant difference of proportions.
p-value ≤ 0.05 was considered for statisticalsignificance.

Result and Analysis:-

Table 1:- Distribution of Age in Years.

Age in Years	Frequency	Percent
≤30	25	16.7%

31-40	61	40.7%
41-50	64	42.7%
Total	150	100.0%

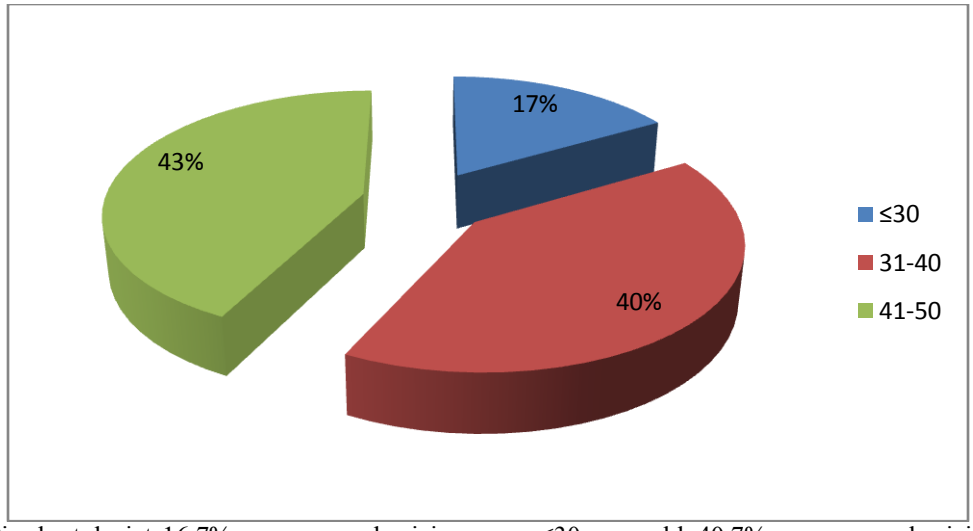


Figure 1:- Pie chart depicts16.7% emergency physicians were ≤30 years old, 40.7% emergency physicians were 31-40 years old and42.7% emergency physicians were 41-50 years old. The value of z is 0.3513. The value of p is .72634. The result is not significant at p < .05.

Table 2:- Distribution of mean Age.

	Number	**Mean**	**SD**	**Minimum**	**Maximum**	**Median**
Age	150	37.7733	6.9157	23.0000	50.0000	38.0000

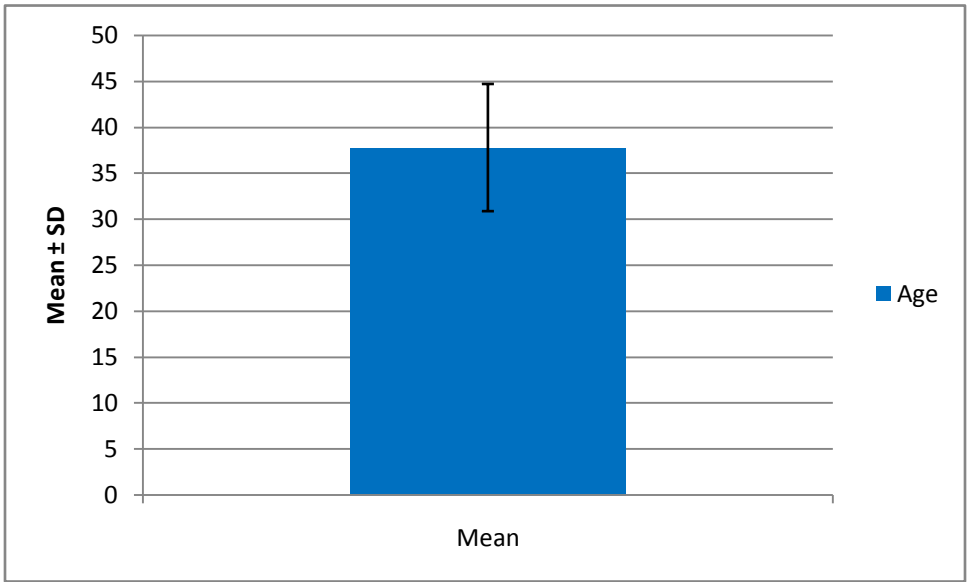


Figure 2:- Depicts The mean Age (mean± s.d.) of emergency physicians was 37.7733 ± 6.9157 years.

Table 3:- Gender distribution.

SEX	**Frequency**	**Percent**
Female	43	28.7%
Male	107	71.3%
Total	150	100.0%

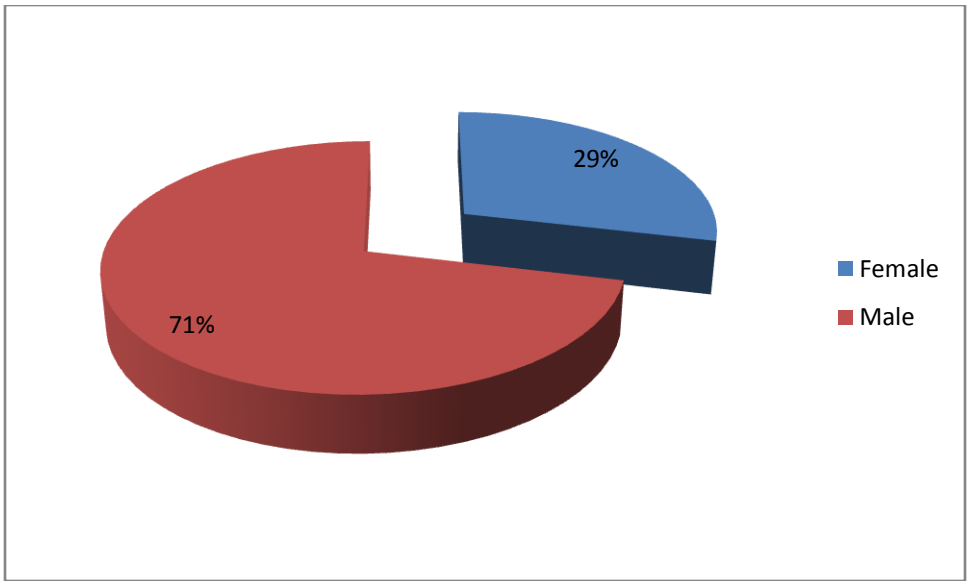


Figure 3: Pie chart depicts28.7%emergency physicians were Female and 71.3% emergency physicians were Male.The value of z is 7.3901. The value of p is < .00001. The result is significant at p < .05.

Q1: Which of the following describes the appropriate storage method for an amputated part?

Q1: Which of the following describes the appropriate storage method for an amputated part?	Frequency	Percent
Amputated part placed in a bag with Iceland water (a)	20	13.3%
Amputated part wrapped in moist gauze in bag, then placed into a second bag containing ice (b)	48	32.0%
Amputated part wrapped in moist gauze placed in bag with ice (c)	39	26.0%
Amputated part kept in a bag, that bag placed into a second bag containing ice (d)	43	28.7%
Total	150	100.0%
Correct option: (b)		

20(13.3%) emergency physicians answered Amputated part placed in a bag with Iceland water, 48(32.0%) emergency physicians answered Amputated part wrapped in moist gauze in bag, then placed into a second bag containing ice, 39(26.0%) emergency physicians answeredAmputated part wrapped in moist gauze placed in bag with ice , 43(28.7%) emergency physicians answered Amputated part kept in a bag, that bag placed into a second bag containing ice. The value of z is 0.628. The value of p is .5287. The result is not significant at p < .05.

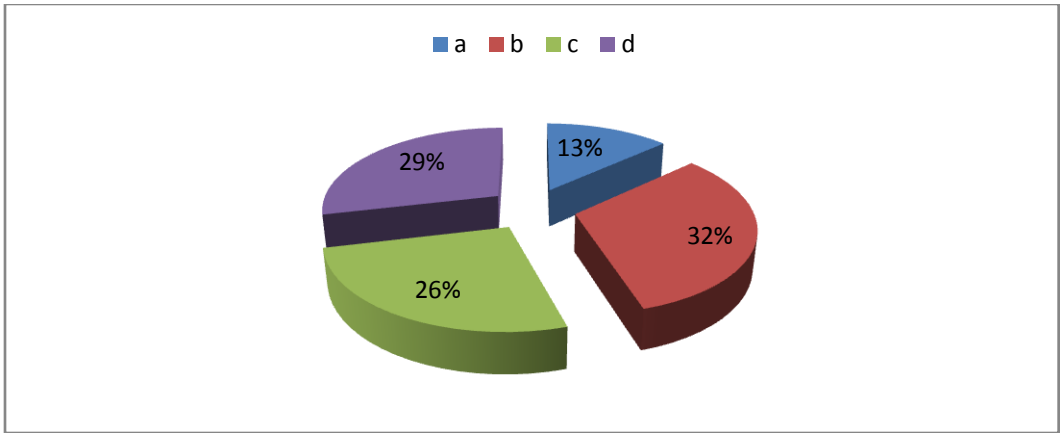


Figure 4 pie chart depicts: 20(13.3%) emergency physicians answered Amputated part placed in a bag with Iceland water, 48(32.0%) emergency physicians answered Amputated part wrapped in moist gauze in bag, then placed into a second bag containing ice, 39(26.0%) emergency physicians answeredAmputated part wrapped in

moist gauze placed in bag with ice , 43(28.7%) emergency physicians answered Amputated part kept in a bag, that bag placed into a second bag containing ice.

Q2: Which of the following is the correct method of physical examination of the median nerve in the hand?

Q2:Which of the following is the correct method of physical examination of the median nerve in the hand?	Frequency	Percent
Light touch second fingertip; resistance against thumb adduction (b)	20	13.3%
Light touch second fingertip; resistance against thumb opposition (c)	121	80.7%
Light touch dorsal aspect thumb carpal metacarpal joint; resistance against wrist extension (d)	9	6.0%
Total	150	100.0%
Correct answer option (c)		

13.3%emergency physicians had answered Light touch second fingertip; resistance against thumb adduction, 80.7% emergency physicians had answered Light touch second fingertip; resistance against thumb opposition and 6.0% emergency physicians had answered Light touch dorsal aspect thumb carpal metacarpal joint; resistance against wrist extension.0% emergency physicians answered Light touch fifth fingertip; resistance against finger abduction.The value of z is 11.6835. The value of p is < .00001. The result is significant at p < .05.

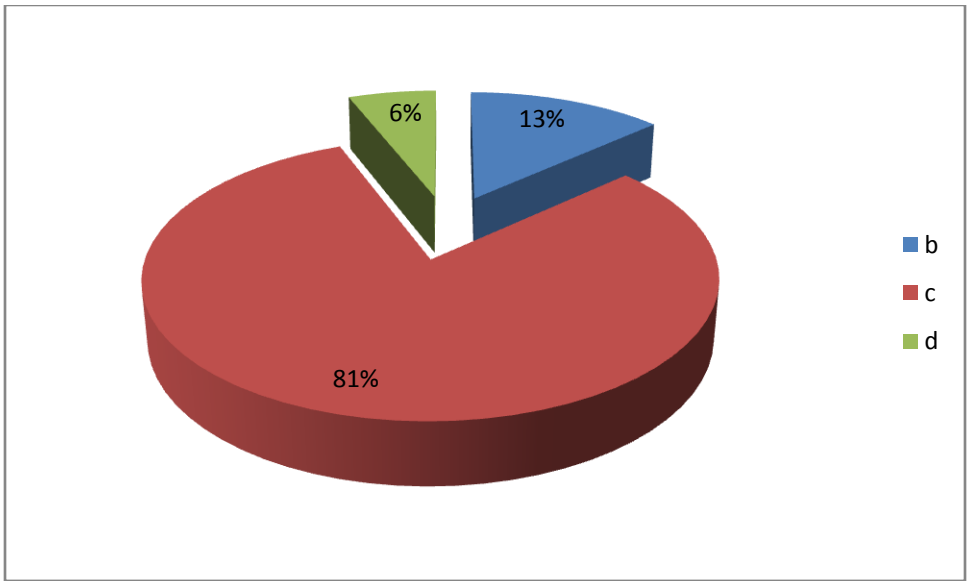


Figure 5:- Pie chart depicts13.3%emergency physicians had answered Light touch second fingertip; resistance against thumb adduction, 80.7% emergency physicians had answered Light touch second fingertip; resistance against thumb opposition and 6.0% emergency physicians had answered Light touch dorsal aspect thumb carpal metacarpal joint; resistance against wrist extension.0% emergency physicians answered Light touch fifth fingertip; resistance against finger abduction.The value of z is 11.6835. The value of p is < .00001. The result is significant at p < .05.

Q3: Proximal tourniquet placement is the recommended method of haemorrhage control in persistent haemorrhagefrom a radial artery injury despite direct pressureand limb elevation. True or False?

: Proximal tourniquet placement is the recommended method of haemorrhage control in persistent haemorrhage from a radial artery injury despite direct pressure and limb elevation?	Frequency	Percent
True (a)	103	68.7%
False (b)	47	31.3%
Total	150	100.0%
Correct answer option (a)		

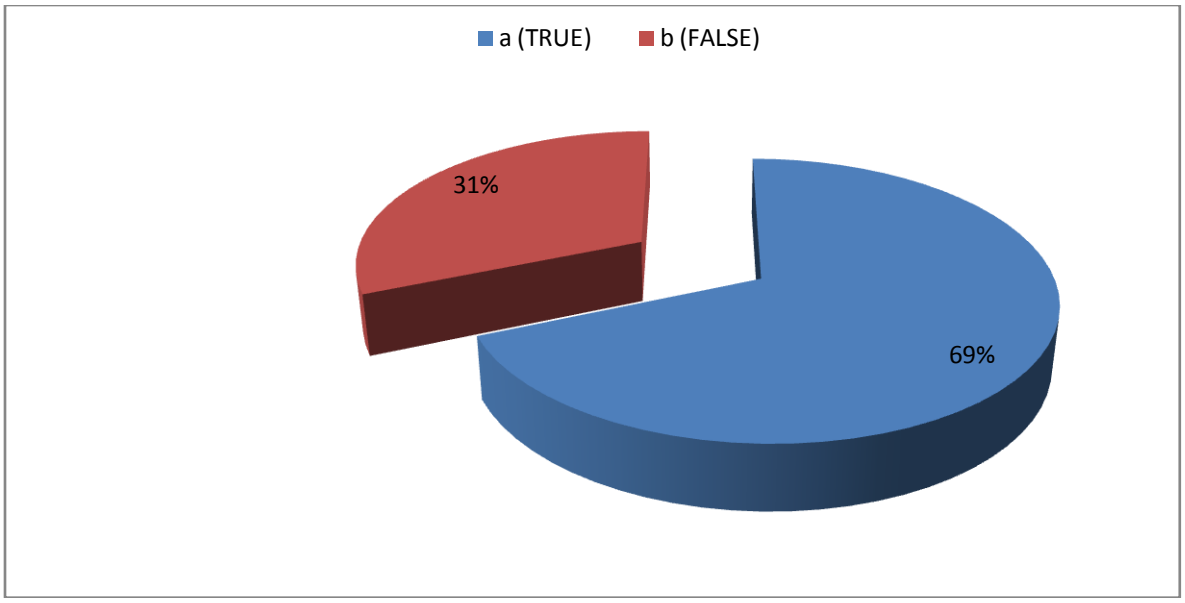


Figure 6:- Pie chart depicts68.7% emergency physicians answered True and 31.3% emergency physicians had answered False.The value of z is 6.4663. The value of p is < .00001. The result is significant at p < .05.

Q4: Which of the following regarding high-pressure injection injury is FALSE?

Q4: Which of the following regarding high-pressure injection injury is FALSE?	Frequency	Percent
Early high-pressure injection injury often appears clinically innocuous (a)	13	8.7%
The injected material tracks along the neurovascular bundles along the path of least resistance. (b)	30	20.0%
These injuries are associated with a high rate of infection, necrosis, and considerable amputation risk.(c)	32	21.3%
All patients should receive intravenous antibiotics and immediate hand surgery consultation for operating room wound exploration and admission. (d)	52	34.7%
Pain management with ice compression, digital nerve block, and local infiltration of anaesthetic drugs(e)	23	15.3%
Total	150	100.0%
Correct answer option (e)		

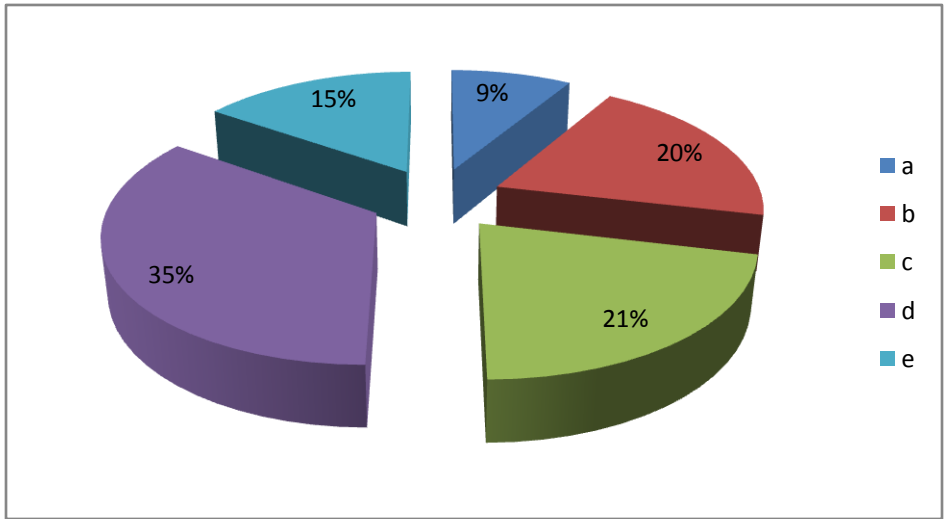


Figure 7:- Pie chart depicts 8.7% emergency physicians had answered Early high-pressure injection injury often appears clinically innocuous,20.0%emergency physicians had answered the injected material tracks along the

neurovascular bundles along the path of least resistance,21.3% emergency physicians had answered injuries which are associated with a high rate of infection, necrosis, and considerable amputation risk and 34.7% emergency physicians had answered that all patient should receive intravenous antibiotics and immediate hand surgery consultation for operating room wound exploration and admission. 15.3 % of emergency physicians answered Painmanagement with ice compression, digital nerve block,and local infiltration of anaesthetic drugs

The value of z is 2.5717. The value of p is .01016. The result is significant at p < .05.

Q5: Which of the following is the most common site of a fight bite wound?

Q5: Which of the following is the most common site of a fight bite wound?	Frequency	Percent
Dominant hand, fifth MCP joint (a)	87	58.0%
Non dominant hand, third MCP joint (b)	32	21.3%
Dominant hand, third MCP joint (c)	31	20.7%
Total	150	100.0%
Correct answer option (a)		

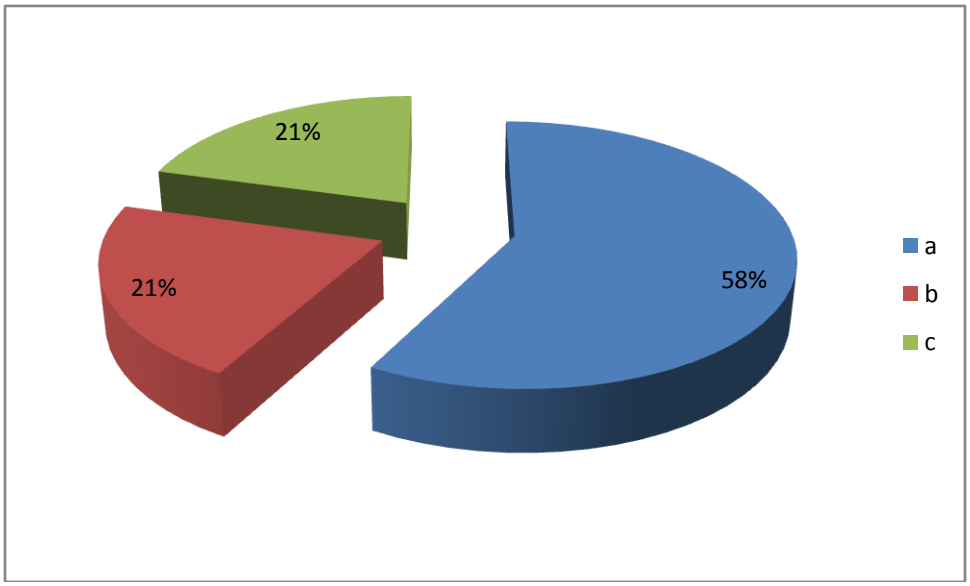


Figure 8:- Pie chart depicts58.0% emergency physicians had answered Dominant hand, fifth MCP joint wound, 21.3% emergency physicians had answered Non dominant hand, third MCP joint wound and 20.7% emergency physicians had answered Dominant hand, third MCP joint wound.The value of z is 6.491. The value of p is < .00001. The result is significant at p < .05.

Q6: What percentage of subungual hematoma can undergo nail trephination in ED?

Q6: What percentage of subungual hematoma can undergo nail trephination in ED?	Frequency	Percent
Hematoma<50% with disrupted nail plate (a)	63	42.0%
Hematoma>50% with associated nail bed injury (b)	65	43.3%
Hematoma of any size with intact nail plate (c)	22	14.7%
Total	150	100.0%
Correct answer option (c)		

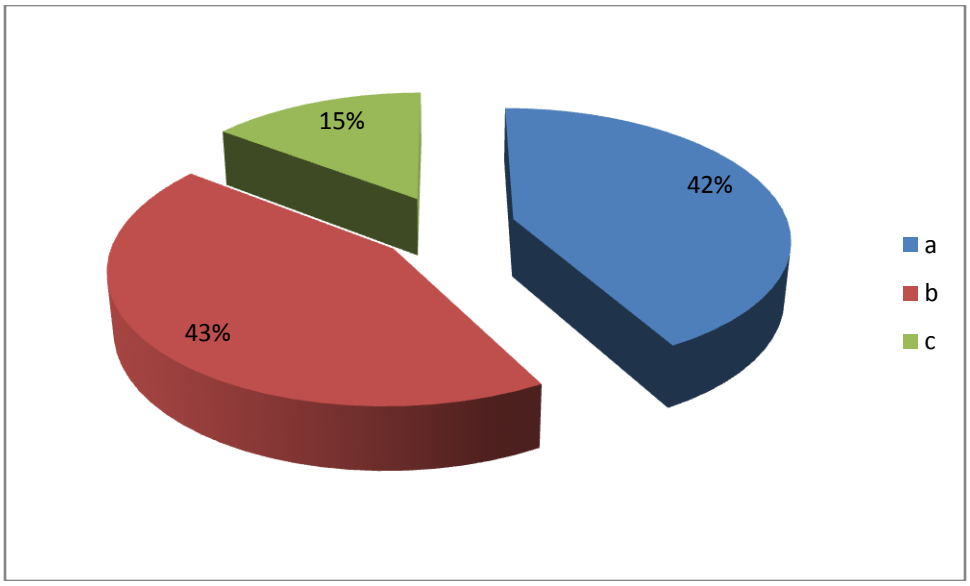


Figure 9:- Pie chart depicts42.0% emergency physicians had answered Hematoma<50% with disrupted nail plate,43.3% emergency physicianshad answered hematoma of <20% with associated nail bed injury and 14.7% emergency physicians had answered hematoma of any size with intact nail plate.The value of z is 0.2335. The value of p is .8181. The result is not significant at p < .05.

Q7: What is the most appropriate splint for mallet finger?

Q7: What is the most appropriate splint for mallet finger?	Frequency	Percent
Splint entire digit mild DIP flexion (a)	8	5.3%
Splint spanning middle and distal phalanx, in mild DIP extension (b)	97	64.7%
Splint spanning middle and distal phalanx, in mild DIP flexion (c)	22	14.7%
Splint entire digit, in DIP extension (d)	23	15.3%
Total	150	100.0%
Correct answer option (b)		

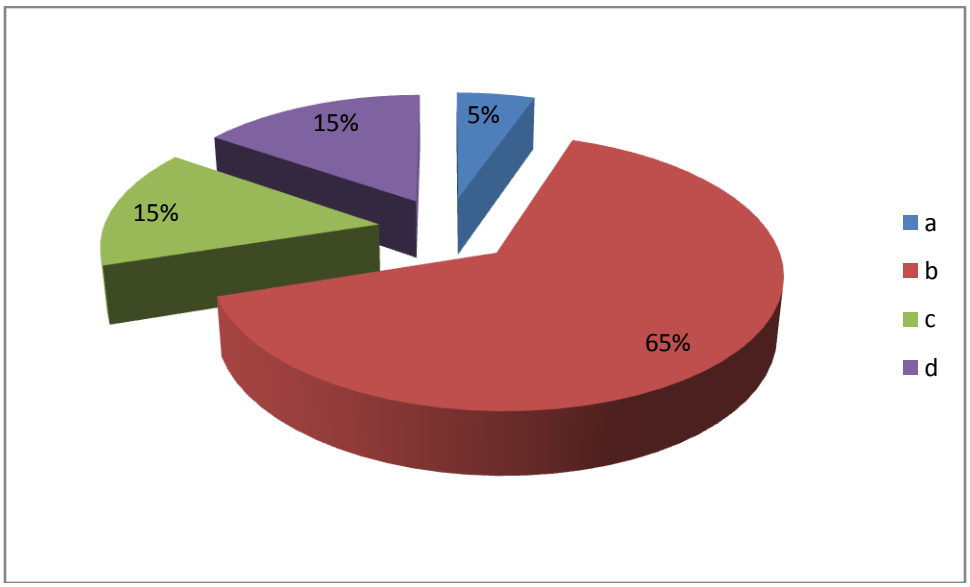


Figure 9:- Pie chart depicts5.3% emergency physicians had answered Splint entire digit mild DIP flexion,64.7% emergency physicians had answered Splint spanning middle and distal phalanx, in mild DIP extension,14.7% emergency physicians had answered Splint spanning middle and distal phalanx, in mild DIP flexion and

15.3%emergencyphysicians had answered Splint entire digit, in DIP extension.The value of z is 8.721. The value of p is < .00001. The result is significant at p < .05.

Q8: How would you test the motor function and integrity of the ulnar nerve?

Q8: How would you test the motor function and integrity of the ulnar nerve?	Frequency	Percent
Test flexion of the wrist against resistance (a)	16	10.7%
Test flexion of the fifth finger against resistance (b)	6	4.0%
Test Abduction of the little finger against resistance (d)	6	4.0%
Test flexion of the fifth finger against resistance and Test Abduction of the Index finger against resistance (e)	44	29.3%
check for clawing of the 4th and 5thfingers (f)	16	10.7%
All of the above (g)	62	41.3%
Total	150	100.0%
Correct answer option (g)		

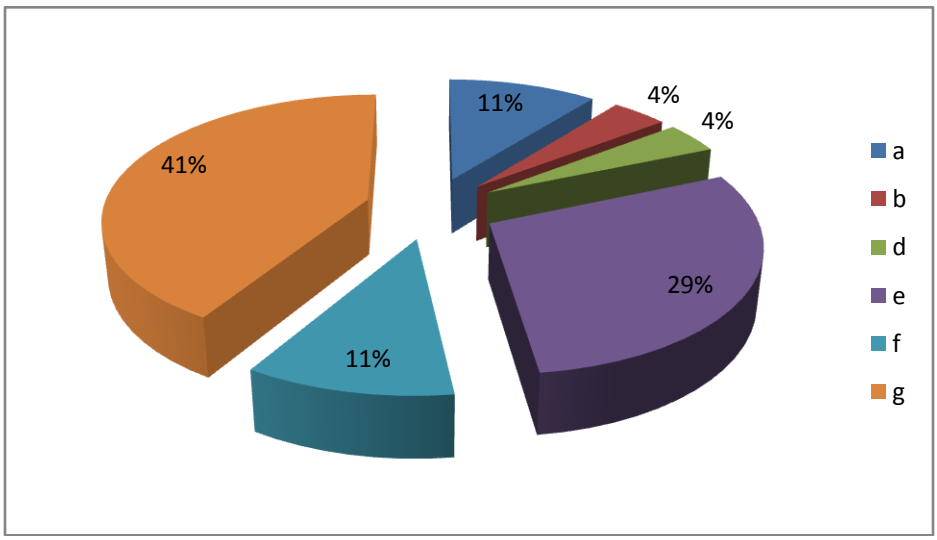


Figure 10:- Pie chart depicts110.7% emergency physicians had answered Test flexion of the wrist against resistance, 4.0% emergency physicians had answered Test flexion of the fifth finger against resistance, 4.0% emergency physicians had answered Test Abduction of the Index finger against resistance, 29.3% emergency physicians had answered Test flexion of the fifth finger against resistance and Test Abduction of the Index finger against resistance, 10.7% emergency physicians had answered check for clawing of the 4th and 5thfingers and 41.3% emergency physicians had answeredTest Abduction of the index finger against resistanceAll of the above tests.0% emergency physicians had answered The value of z is 2.1741. The value of p is .03. The result is significant at p < .05.

Q9: Which of the following describes the best method to reduce a Bennett fracture?	Frequency	Percent
Axial traction and valgus pressure (a)	8	5.3%
Axial traction and varus pressure (b)	12	8.0%
Axial traction, thumb opposition, and radial pressure over the metacarpal base (c)	102	68.0%
Axial traction, thumb adduction, and ulnar pressure over the metacarpal base (d)	28	18.7%
Total	150	100.0%
Correct answer option (c)		

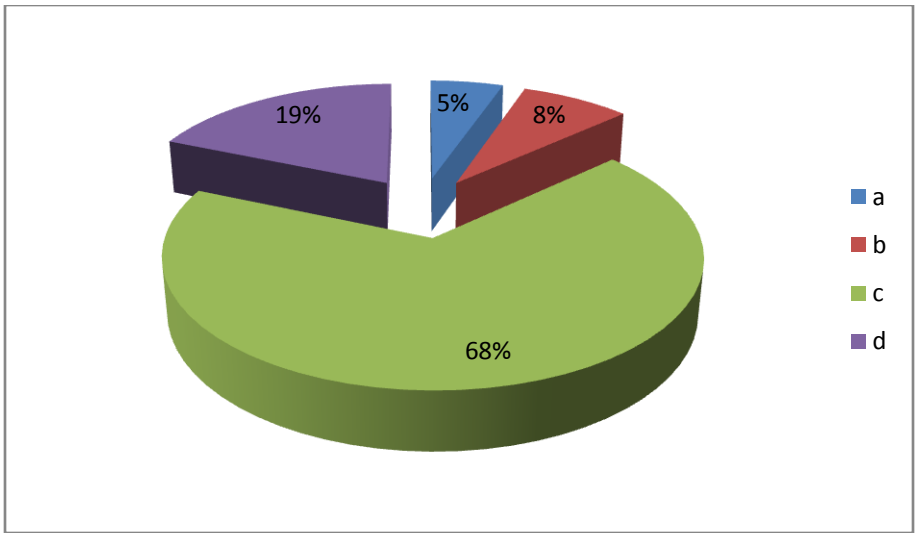


Figure 11:- Pie chart depicts5.3% emergency physicians had answered Axial traction and valgus pressure, 8.0% emergency physicians had answered Axial traction and Varus pressure, 68.0% emergency physicians had answered Axial traction, thumb opposition, and radial pressure over the metacarpal base and 18.7% emergency physicians had answered Axial traction, thumb adduction, and ulnar pressure over the metacarpal base.The value of z is 8.6218. The value of p is < .00001. The result is significant at p < .05.

Q10: True or False?

Nail plate removal is not indicated for subungual hematomas and only Nail plate trephination is done, if there is no nail plate disruption.	Frequency	Percent
True (a)	16	10.7%
False (b)	134	89.3%
Total	150	100.0%
Correct answer option (a)		

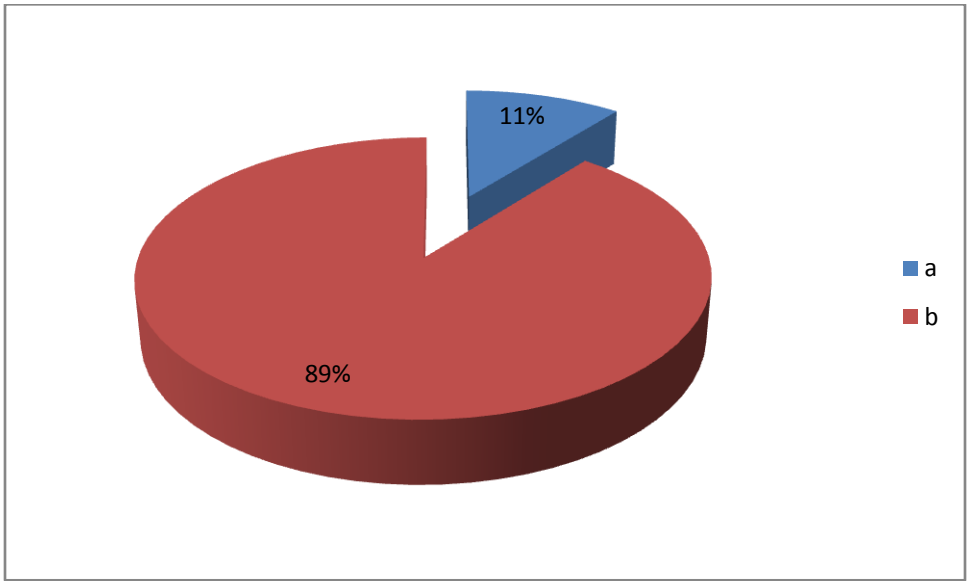


Figure 12:- Pie chart depicts10.7% emergency physicians had answered Nail plate removal is not indicated for subungual hematomas and only Nail plate trephination is done, if there is no nail plate disruption.89.3% emergency physicians had answered it as False statement.The value of z is 13.6255. The value of p is < .00001. The result is significant at p < .05.

Q11: Arrange in order priority wise the treatment protocol for Bite injuries.

Q11: Arrange in order priority wise the treatment protocol for Bite injuries.	Frequency	Percent
A.Thorough irrigation and debridement, B. Prophylaxis for tetanus (and rabies if warranted) must be initiated. D. Prophylactic antibiotics (In patients with compromised immune systems, such as those with asplenism, underlying hepatic disease, or diabetes mellitus, to prevent potentially life-threatening infections.), C. Wounds should be left open and cleansed frequently to minimise bacterial load (a)	60	40.0%
B. Prophylaxis for tetanus (and rabies if warranted) must be initiated. C. Wounds should be left open and cleansed frequently to minimise bacterial load, D. Prophylactic antibiotics (In patients with compromised immune systems, such as those with asplenism, underlying hepatic disease, or diabetes mellitus, to prevent potentially life-threatening infections.) A.Thorough irrigation and debridement (b)	25	16.7%
A.Thorough irrigation and debridement, B. Prophylaxis for tetanus (and rabies if warranted) must be initiated. C. Wounds should be left open and cleansed frequently to minimise bacterial load, D. Prophylactic antibiotics (In patients with compromised immune systems, such as those with asplenism, underlying hepatic disease, or diabetes mellitus, to prevent potentially life-threatening infections.) (c)	65	43.3%
Total	150	100.0%
Correct answer option (c)		

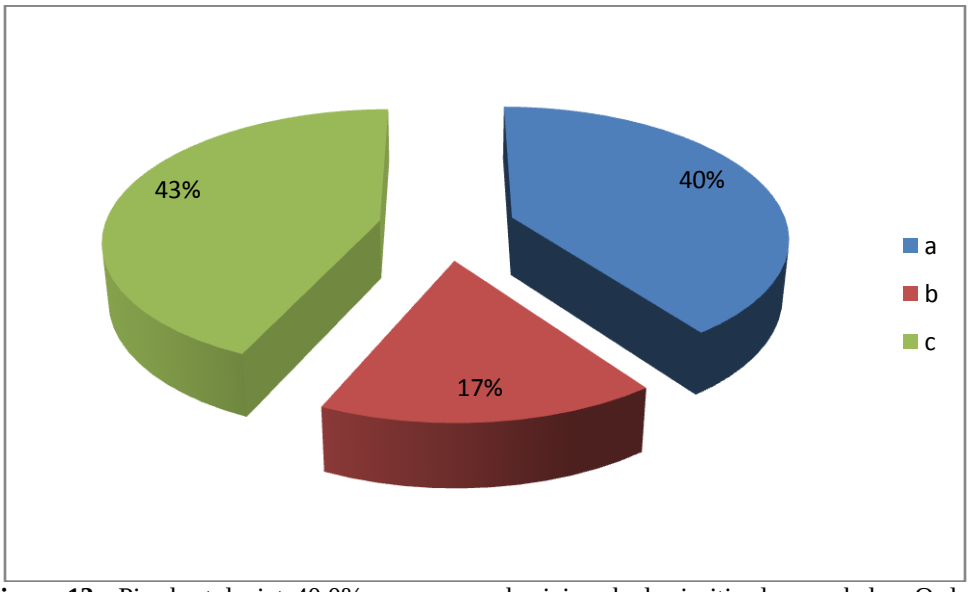


Figure 13:- Pie chart depicts40.0% emergency physicians had prioritised as per below Order:
A. Thorough irrigation and debridement,
B. Prophylaxis for tetanus (and rabies if warranted) must be initiated,
D. Prophylactic antibiotics (In patients with compromised immune systems, such as those with asplenism, underlying hepatic disease, or diabetes mellitus, to prevent potentially life-threatening infections.),
C. Wounds should be left open and cleansed frequently to minimise bacterial load
16.7%emergency physicians had prioritised as per below Order
B. Prophylaxis for tetanus (and rabies if warranted) must be initiated,
C. Wounds should be left open and cleansed frequently to minimise bacterial load,
D. Prophylactic antibiotics (In patients with compromised immune systems, such as those with asplenism, underlying hepatic disease, or diabetes mellitus, to prevent potentially life-threatening infections.),
A. Thorough irrigation and debridement (b)

43.3% emergency physicians had prioritised as per below Order

A. Thorough irrigation and debridement,
B. Prophylaxis for tetanus (and rabies if warranted) must be initiated,
C. Wounds should be left open and cleansed frequently to minimise bacterial load,
D. Prophylactic antibiotics (In patients with compromised immune systems, such as those with asplenism, underlying hepatic disease, or diabetes mellitus, to prevent potentially life-threatening infections.)
The value of z is 0.5855. The value of p is .5552. The result is not significant at p < .05.

Q12: A five-year-old average sized patient presents with a laceration to the finger. Which of the following statements is True regarding anaesthetic choice for this patient?

Q12: A five-year-old average sized patient presents with a laceration to the finger. Which of the following statements is True regarding anaesthetic choice for this patient?	Frequency	Percent
A digital block is the preferred anaesthetic choice(a)	88	58.7%
When giving lidocaine with epinephrine, the maximum safe dose Is lower than when giving lidocaine without epinephrine. (b)	29	19.3%
Lidocaine with epinephrine has been definitely shown to cause digit ischemia when applied to the finger. (c)	33	22.0%
Total	150	100.0%
Correct answer option (a)		

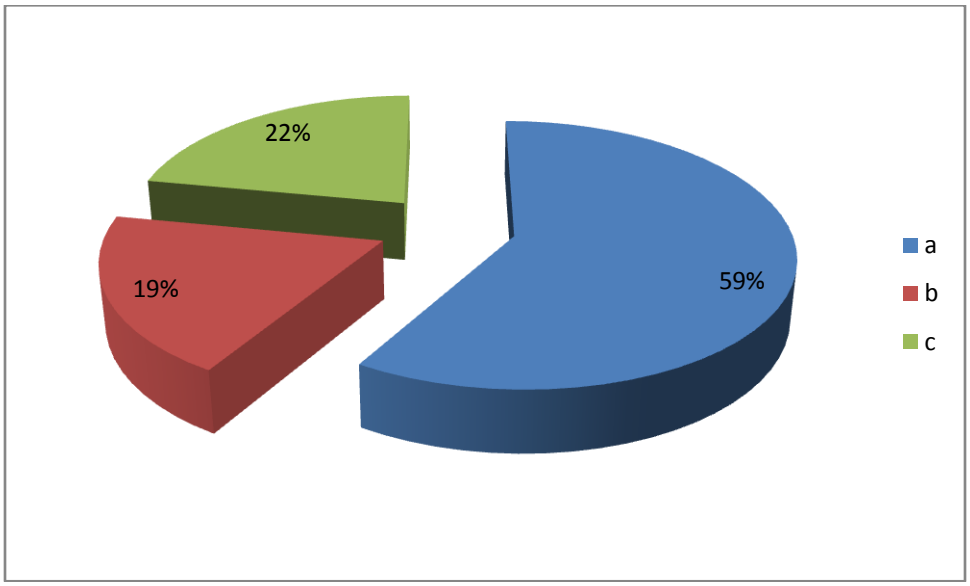


Figure 14:- Pie chart depicts 58.7% emergency physicians had answered digital block is the preferred anaesthetic choice. 19.3% emergency physicians had answered when giving lidocaine with epinephrine, the maximum safe dose Is lower than when giving lidocaine without epinephrine and 22.0% emergency physicians had answeredLidocaine with epinephrine has been definitely shown to cause digit ischemia when applied to the finger.The value of z is 6.473. The value of p is < .00001. The result is significant at p < .05.

Q13: What one should do if a patient presents with DIP, PIP, MCP dislocation?

Q13: What one should do if a patient presents with DIP, PIP, MCP dislocation?	Frequency	Percent
Splint, prescribe analgesics and send the patient home (a)	8	5.3%
Reduce, Splint and prescribe analgesics and send home (b)	36	24.0%
Reduce, splint, and refer to hand surgeon (c)	106	70.7%
Total	150	100.0%
Correct answer option (c)		

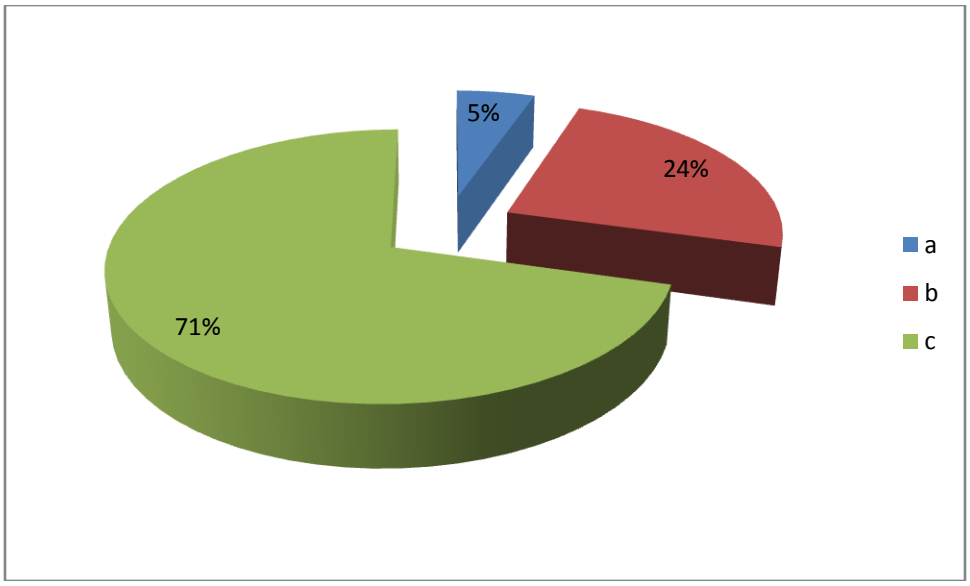
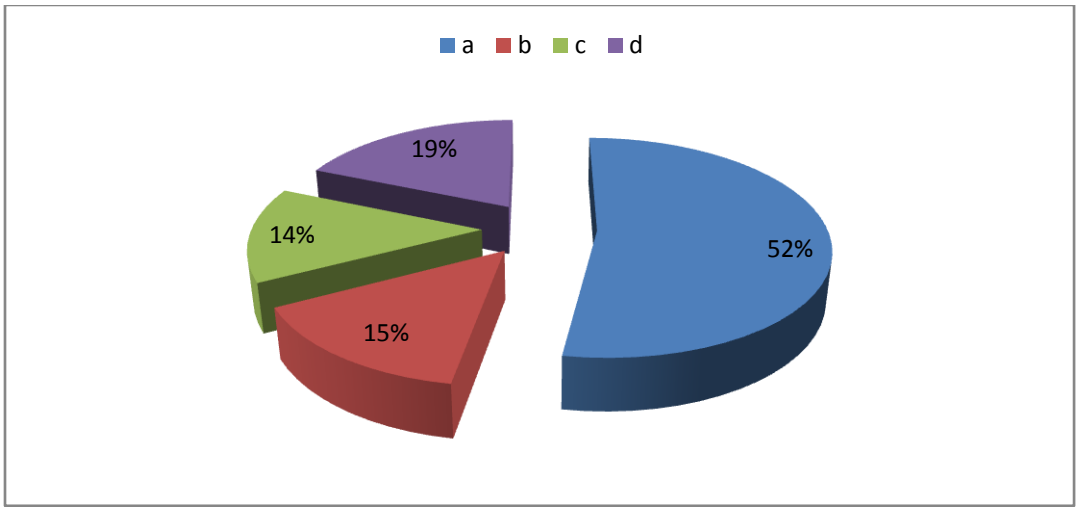


Figure 15:- Pie chart depicts 5.3% emergency physicians had answered Splint, prescribe analgesics and send the patient home, 24.0%emergency physicians had answered Reduce, Splint and prescribe analgesics and send home and 70.7% emergency physicians had answered Reduce, splint, and refer to hand surgeon.The value of z is 8.0944. The value of p is < .00001. The result is significant at p < .05.

Q14: Which amongst the following presentations are limb threatening or having very high morbidity?

Q14: which amongst the following presentations are limb threatening or having very high morbidity?	Frequency	Percent
Compartment syndrome (a)	79	52.7%
High-pressure injection injury (b)	22	14.7%
Arterial injury (c)	21	14.0%
Allofthe above (d)	28	18.7%
Total	150	100.0%
Correct option : (d)		

79(52.7%) emergency physicians answered Compartment syndrome, 22(14.7%) emergency physicians answered High-pressure injection injury, 21(14.7) emergency physicians answered Arterial injury, 28(18.7%) emergency physicians answered all of the above.The value of z is 6.147. The value of p is < .00001. The result is significant at p < .05.



Q15: True or false?

Diagnosis of Jersey finger is made by physical examination with evidence of DIP swelling, Volar DIP tenderness, and impaired DIP flexion.	Frequency	Percent
Yes	132	88.0%
No	18	12.0%
Total	150	100.0%
Correct answer option (yes)		

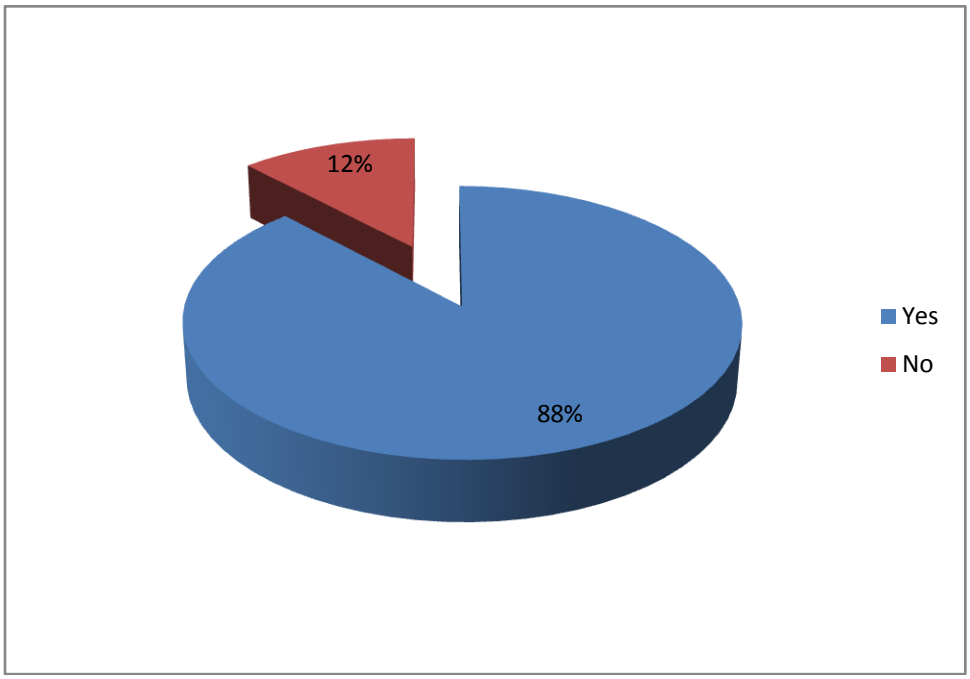


Figure 17:- Pie chart depicts 132(88.0%) emergency physicians had answered Diagnosis of Jersey finger was made by physical examination with evidence of DIP swelling, Volar DIP tenderness, and impaired DIP flexion.18 (12%) emergency physicians answered the statement as wrong. The value of z is 13.1636. The value of p is < .00001. The result is significant at p < .05.

Q16: Which of the following statements are FALSE regarding Mallet finger?

Q16: Which Of the following statements are FALSE regarding Mallet finger?	Frequency	Percent
Mallet finger is an injury of the extensor tendon distal to the DIP joint (a)	35	23.3%
Mallet finger is an injury of the flexor tendon distal to the DIP joint (b)	86	57.3%
Most commonly due to forced flexion of the DIP joint during extension (c)	17	11.3%
Uncomplicated Mallet finger requires a splint immobilising the DIP in extension and allowing full range of motion of the PIP joint (d)	12	8.0%
Total	150	100.0%
Correct answer option (b)		

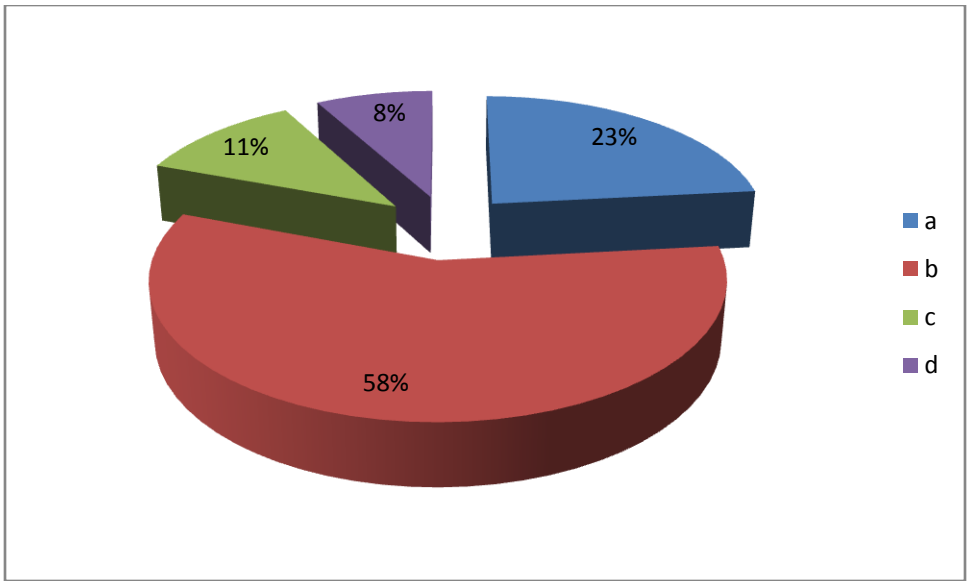


Figure 18:- Pie chart depicts 23.3% emergency physicians had answered Mallet finger is an injury of the extensor tendon distal to the DIP joint,57.3% emergency physicians had answered Mallet finger is an injury of the flexor tendon distal to the DIP joint, 11.3%emergency physicians had answered Most commonly due to forced flexion of the DIP joint during extension and 8.0% emergency physicians had answered had Uncomplicated Mallet finger requires a splint immobilising the DIP in extension and allowing full range of motion of the PIP joint.The value of z is 8.3899. The value of p is < .00001. The result is significant at p < .05.

Q17: Which among the following about Scapholunate dissociation is true?

Q17: Which among the following about Scapholunate dissociation is True?	Frequency	Percent
Scapholunate dissociation results from injury of the scapholunate interosseous ligament. (a)	15	10.0%
The most common mechanism is a high-impact FOOSH with wrist hyperextension and ulnar deviation. (b)	55	36.7%
Patients with scapholunate diastases > 3 mm, Or clinical suspicion of scapholunate dissociation with equivocal imaging are placed in a thumb spice splint and referred to a hand surgeon. (c)	64	42.7%
All of the above (d)	16	10.7%
Total	150	100.0%
Correct answer : (d)		

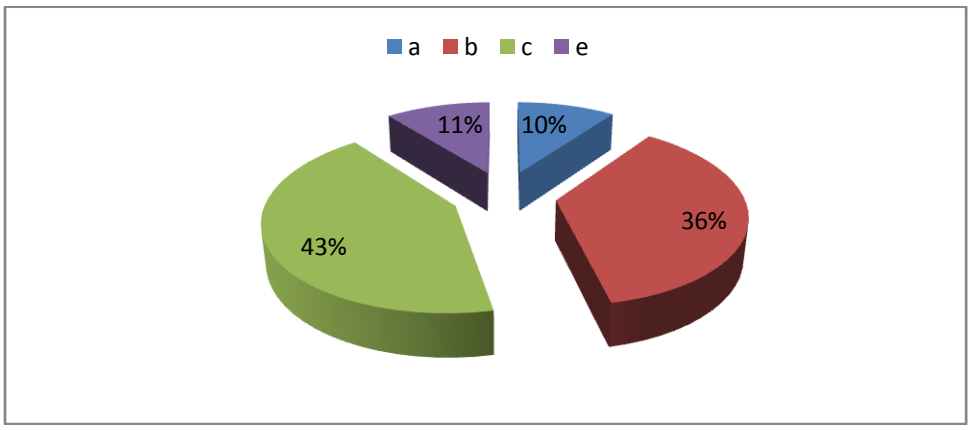


Figure 18: pie chart depicts:15(10.0%) emergency physicians answered Scapholunate dissociation results from injury of the scapholunate interosseous ligament as the true option,55(36.7%) emergency physicians answered The

most common mechanism is a high-impact FOOSH with wrist hyperextension and ulnar deviation as the true option, 64(42.7%) emergency physicians answeredPatients with scapholunate diastases > 3 mm, Or clinical suspicion of scapholunate dissociation with equivocal imaging are placed in a thumb spice splint and referred to a hand surgeon, as the true option,16(10.7%) emergency physicians answeredall the options as the true . The value of z is 1.0622. The value of p is .28914. The result is not significant at p < .05.

Q18: Subungual hematoma with nail plate disruption, what is the treatment?

Q18: Subungual hematoma with nail plate disruption, what is the treatment?	Frequency	Percent
ED nail plate removal and Consult with hand surgeon for nail bed matrix repair (a)	25	16.7%
Nail plate trephination alone (b)	61	40.7%
Dressing,antibiotics, and follow up in OPD (c)	64	42.7%
Total	150	100.0%
Correct answer option (a)		

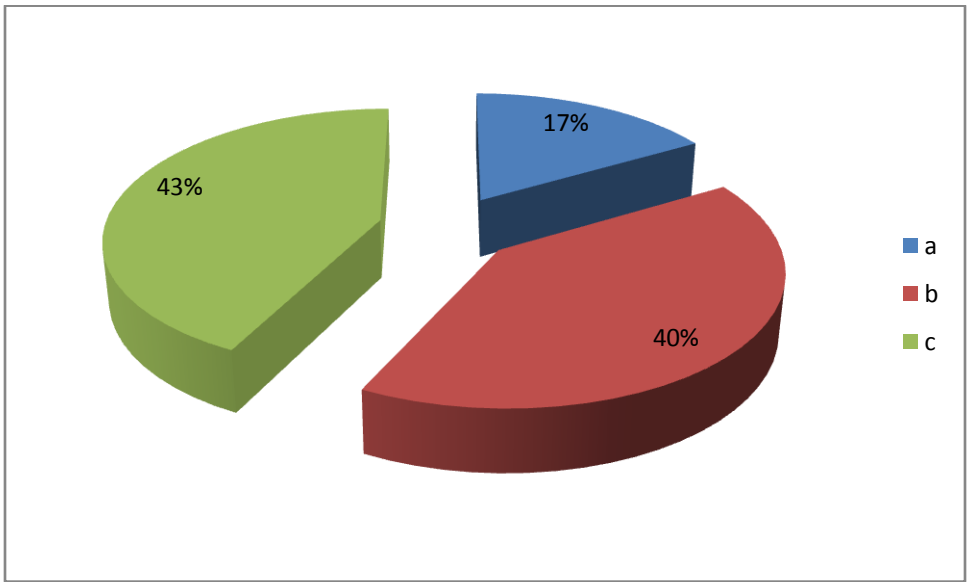


Figure 20:- Pie chart depicts 16.7% emergency physicians had answered ED nail plate removal and Consult with hand surgeon for nail bed matrix repair,40.7% emergency physicians had answered Nail plate trephination alone and 42.7% emergency physicians had answered Dressing, antibiotics and follow up in OPD.The value of z is 0.3513. The value of p is .72634. The result is not significant at p < .05.

Q19: Which among the following is wrong about the management of burn injury of hand?

Q19: Which among the following is Wrong about the management of burn injury of hand?	Frequency	Percent
Fluid Resuscitation according to Parkland Formula (a)	27	18.0%
Splinting in anti-claw position to prevent contracture (c)	6	4.0%
None (d)	117	78.0%
Total	150	100.0%
Correct answer option (d)		

27(18.0%) emergency physicians had answered Fluid Resuscitation according to Parkland Formula, 6(4.0%) emergency physicians had answered Splinting in anti-claw position to prevent contractureand117(78.0%) emergency physicians had answered option none.The value of z is 10.4006. The value of p is < .00001. The result is significant at p < .05.

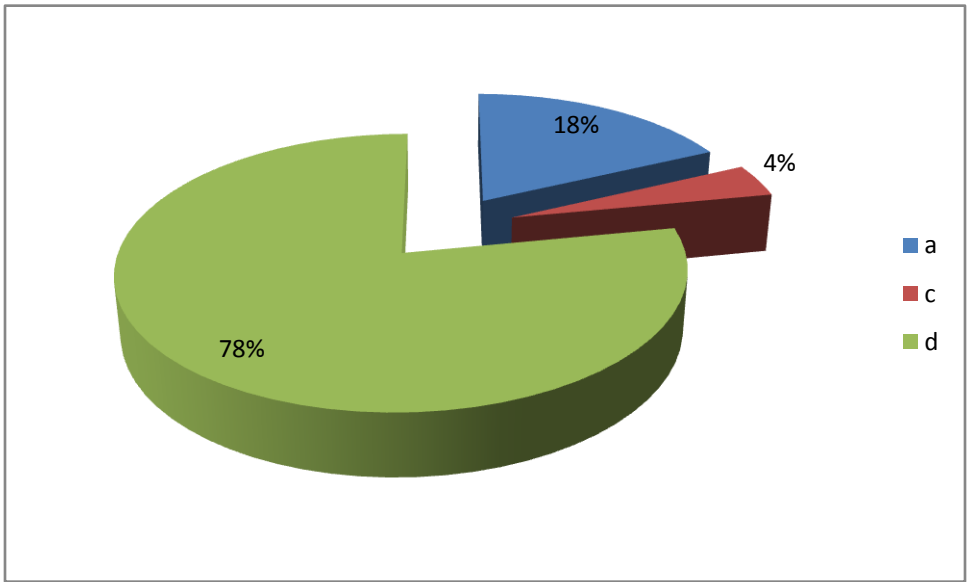


Figure 21:- Pie chart depicts18.0% of emergency physicians had answered Fluid Resuscitation according to Parkland Formula, 4.0%of emergency physicians had answered Splinting in anti-claw position to prevent contractureand78.0%emergency physicians had answered option none.

Q20: Which among the following is correct?

Q20:Which among the following is correct?	Frequency	Percent
If initial films of Hand injuries do not visualise an opaque foreign body, consider a xeroradiogram of the hand (a)	26	17.3%
In patients with persistent pain from an injury to hand, Computed tomography, scintigraphy or MRI may be used to identify an occult fracture (b)	13	8.7%
In occult fractures of radius, scaphoid bone,or the hook of the hamate bone, MRI may allow early evaluation of avascular necrosis (c)	21	14.0%
All of the above (d)	90	60.0%
Total	150	100.0%
Correct answer option (d)		

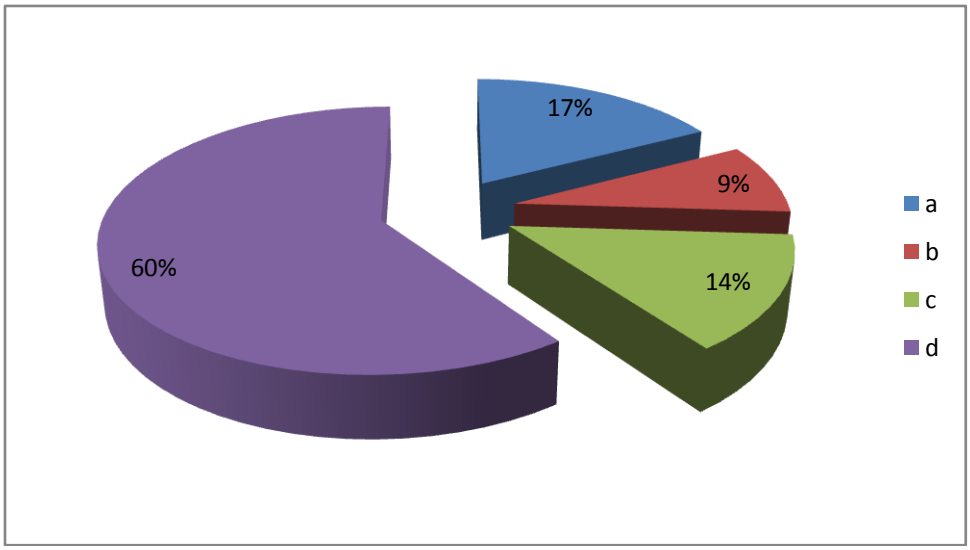
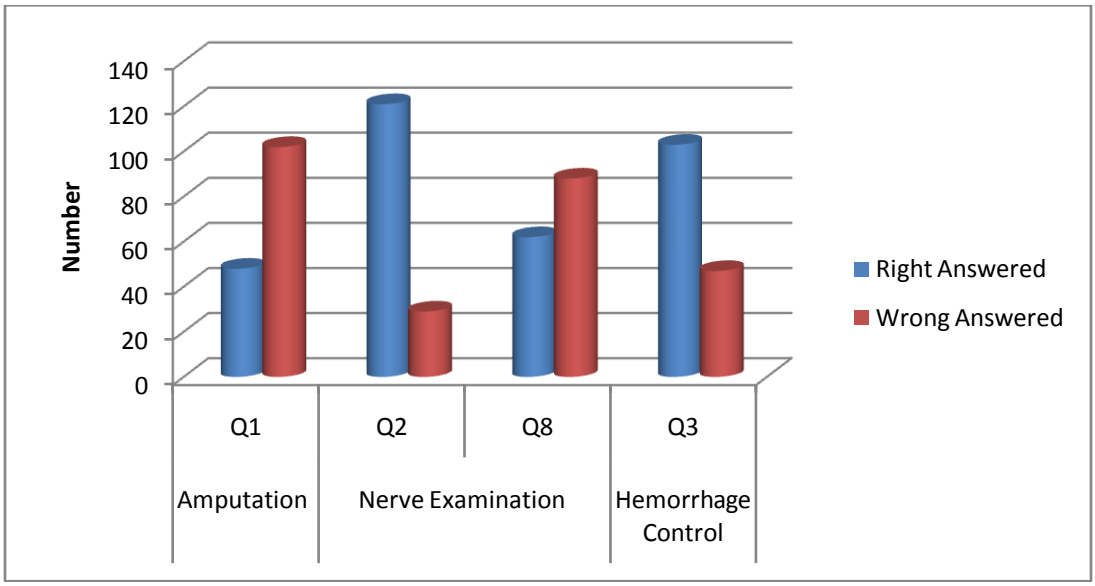


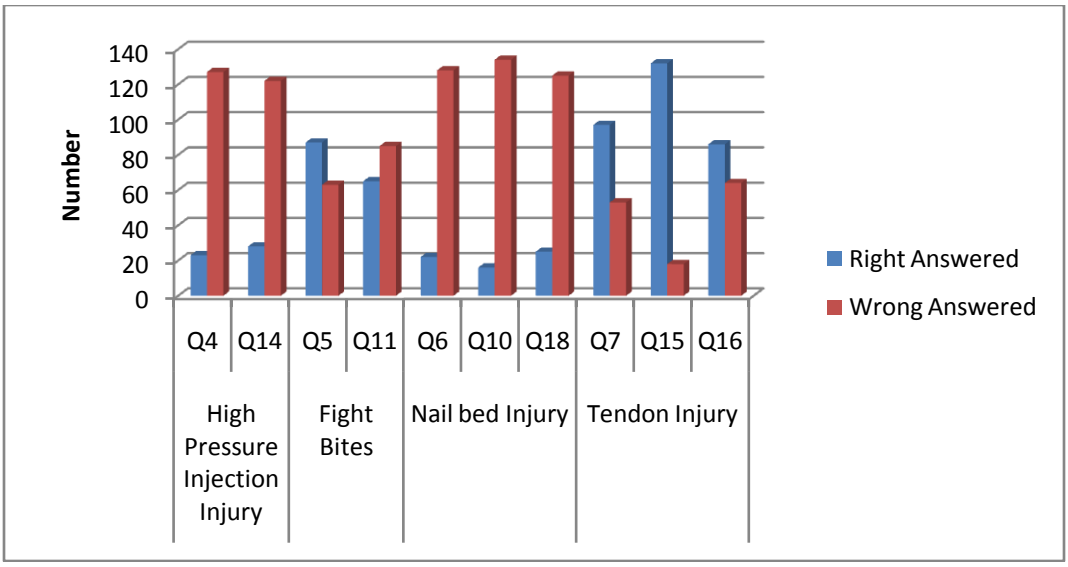
Figure 22:- Pie chart depicts: 26(17.3%) emergency physicians had answered initial films of Hand injuries do not visualise an opaque foreign body, consider a xeroradiogram of the hand, 13(8.7%) emergency physicians had

answered persistent pain from an injury to hand, Computed tomography, scintigraphy or MRI may be used to identify an occult fracture, 21(14.0%) emergency physicians had answered In occult fractures of radius , scaphoid bone ,or the hook of the hamate bone , MRI may allow early evaluation of avascular necrosis and 90(60.0%) emergency physicians had answered all of the above mentioned as correct. The value of z is 7.5876. The value of p is < .00001. The result is significant at p < .05.

Table:- Distribution of Type of hand Injury in Questionnaire.

	Type of hand Injury	Question Number	Right Answered	Wrong Answered	p-Value
1	Amputation	Q1	48(32.0%)	102 (68.0 %)	<0.0001
2	Nerve Examination	Q2	121(80.7%)	29 (19.3%)	<0.0001
		Q8	62(41.3%)	88 (58.6%)	0.0027
3	Haemorrhage Control	Q3	103(68.7%)	47(31.3%)	<0.0001
4	High Pressure Injection Injury	Q4	23(15.3%)	127 (84.7%)	<0.0001
		Q14	28(18.7%)	122 (81.3%)	<0.0001
5	Fight Bites	Q5	87(58.0%)	63(42.0%)	0.0056
		Q11	65(43.3%)	85 (56.7%)	0.0208
6	Nail bed Injury	Q6	22(14.7%)	128 (85.3%)	<0.0001
		Q10	16(10.7%)	134 (89.3%)	<0.0001
		Q18	25(16.7%)	125 (83.3%)	<0.0001
7	Tendon Injury	Q7	97(64.7%)	53 (35.3%)	<0.0001
		Q15	132(88.0%)	18 (12.0%)	<0.0001
		Q16	86(57.3%)	64 (42.7%)	0.01108
8	Fractures and Dislocation	Q9	102(68.0%)	48 (32.0%)	<0.0001
		Q13	106(70.7%)	44 (29.3%)	<0.0001
		Q17	16(10.7%)	134 (89.3%)	<0.0001
9	Burns	Q19	117(78.0%)	33 (22.0%)	<0.0001
10	Anaesthesia	Q12	88(58.7%)	62 (41.3%)	0.0027
11	Radiology	Q20	90(60.0%)	60 (40.0%)	0.0005





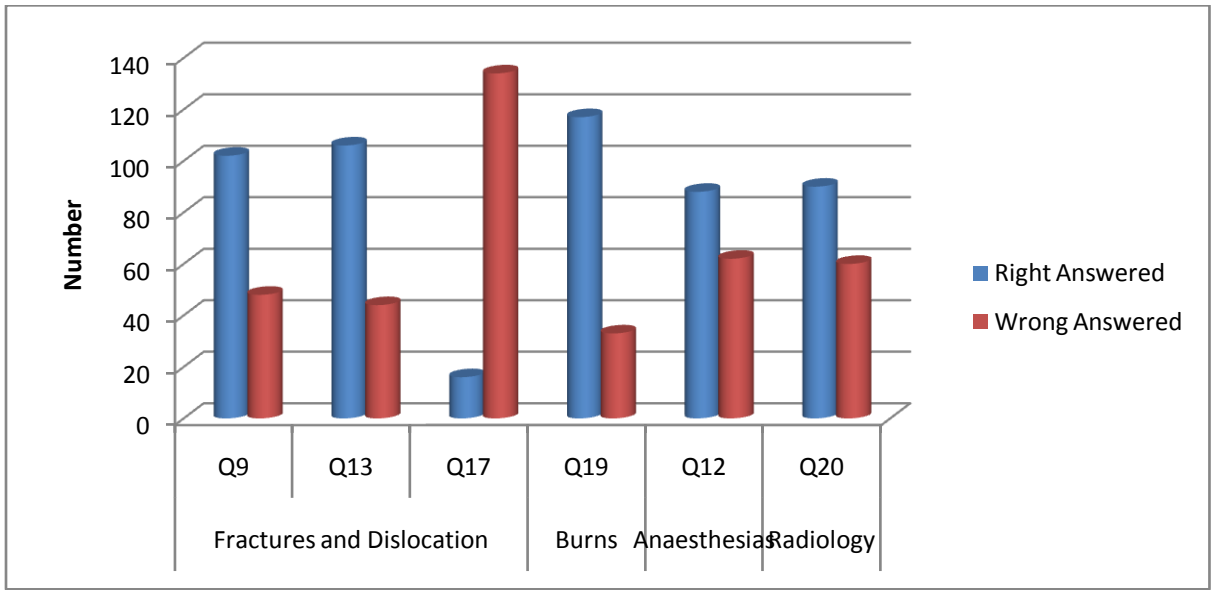


Table: Distribution of Correction
Correction Frequency Percent
100% Correct Answered 10 6.7%
50% Correct Answered 35 23.3%
Bellow 50% Correct Answered 105 70.0%
Total 150 100.0%
10(6.7%) emergency physicians had 100% correct answered, 35(23.3%) emergency physicians had 50% correct answered and 105(70.0%) emergency physicians had bellow 50% correct answered.
7%
23%
70%
100% Corr
Table: Distribution of Correction
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100% Correct Answered 10 6.7%

50% Correct Answered 35 23.3%
Bellow 50% Correct Answered 105 70.0%
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10(6.7%) emergency physicians had 100% correct answered, 35(23.3%) emergency physicians had 50% correct answered and 105(70.0%) emergency physicians had bellow 50% correct answered.
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23%
70%
100% Corr
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Tot

Table:- Distribution of Correction

Correction	Frequency	Percent
100% Correct Answered	10	6.7%
50% Correct Answered	35	23.3%
Bellow 50% Correct Answered	105	70.0%
Total	150	100.0%

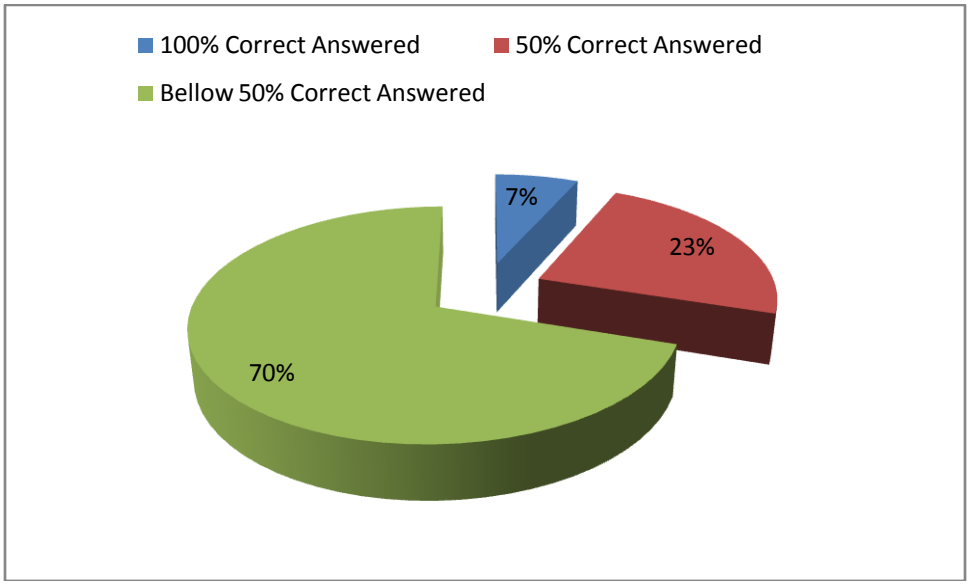

Figure 23:- Pie chart depicts:Overall in our study, 10 (6.7%) emergency physicians gave 100% correct answers, 35(23.3%) emergency physicians gave 50% correct answers and 105(70.0%) emergency physicians had below 50% correct answers. Hence this study showed significant knowledge deficit in assessment and management of hand injuries amongst Emergency Physicians.

Discussion:-

In our study we found that 25(16.7%) emergency physicians were ≤30 years old, 61(40.7%) emergency physicians were 31-40 years old and 64(42.7%) emergency physicians were 41-50 years old. The value of z is 0.3513. The value of p is .72634. The result is not significant at $p < .05$. 43(28.7%) emergency physicians were Female and 107(71.3%) emergency physicians were Male. So the male was higher in this study.

Altman RS et al [44] (1987) found that initial ED management of acute hand injury needs prompt recognition of surgical emergencies which may be initially innocuous, proper initial treatment of tendon and nerve injuries, splinting, and record keeping.

Bowen WT et al [47] (2014) found that care of patients with acute hand injury begins with a focused history and physical examination. In most cases, a diagnosis is achieved clinically or with plain radiographs. Some of the patientspresenting to emergency department with hand injuries may require straightforward treatment, andin others the emergency clinician must rapidly identify limb-threatening injuries, obtain critical clinical information, navigate diagnostic uncertainty, and facilitate specialist consultation, when required.

Wieschhoff GG et al [50] (2016) this article explains the intricate anatomy of the hand as it relates to common finger injuries, illustrates the imaging diagnosis, presents optimal imaging modalities and imaging parameters for the diagnosis of different injury types, and addresses which findings have important management implications for the orthopaedic surgeon. This would guide thephysicians to recommend the most appropriate imaging studies, to make accurate diagnoses, convey clinically relevant imaging findings to the referring physician, and suggest appropriate follow-up examinations there by improving patient care and outcomes.

Pilling T et al 52 (2016) found that Hand Injury Severity Scores indicated a large percentage of cases within the severe category. According to the study, any interventions whether it is medical or surgical occurred within the first three to six hours post-injury and involved washout, cleaning, debridement and suturing. The predominant course of action was formalisation of amputation. Rehabilitation had a marked advantage over assessment and hand therapyand they ensured functional outcomes. Managing the symptoms of oedema, pain and stiffness, in amputation, fracture, or soft tissue injuries has a major impact on hand function outcomes.

In Amputation:
Our study found that in the question regarding Amputation, 48(32.0%) emergency physicians had rightly answered and 102(68.0%) emergency physicians had answered wrong. This difference was statistically significant ($p<0.0001$).

Nerve Examination:
Question regarding the correct method of physical examination of the median nerve in the hand was, correctly answeredby 121(80.7%)emergencyphysicians and 29 (19.3%) emergency physicians had wrongly answered. Correct answer was significantly higher than wrong answer ($p<0.0001$).

Question on the Test procedure of motor function and integrity of the ulnar nerve was, correctly answered by62(41.3%)physiciansand 88 (58.6%) emergency physicians had wrongly answered. This difference was statistically significant ($p=0.0027$).

GOLDWYN RM et al [53] (1974) found that the first section of Management of Acute Hand Injuries presents in detail the response to trauma of skin, cartilage, tendon, bone, and nerve.

Haemorrhage Control:
It was found that questions ofHaemorrhage Control, was correctly answered by 103(68.7%)emergency physicians and 47(31.3%) emergency physicians had wrongly answered. Correct answer was significantly higher than wrong answer ($p<0.0001$).

High Pressure Injection Injury:
Regarding question on High-pressure injection injury, only23(15.3%)emergency physicians had answered right and 127 (84.7%) emergency physicians had answered wrongly. Wrong answer was significantly higher than correct answer ($p<0.0001$).Question on choosing the trauma which are limb threateningor having very high morbidity, only 28(18.7%)emergency physicians had correctly answered and 122 (81.3%) emergency physicians had answered wrongly. Wrong answer was significantly higher than correct answer ($p<0.0001$).

Fight Bites:
Question on the most common site of a fight bite wound, was answered correctly by87(58.0%) emergency physiciansand 63(42.0%) emergency physicians had wrongly answered. Correct answer was significantly higher than wrong answer ($p=0.0056$). Question on Arranging in order priority wise the treatment protocol for Bite injuries,

was correctly answered by 65(43.3%) emergency physiciansand wrongly answered by and 85 (56.7%) emergency physicians. Wrong answer was significantly higher than correct answer (p=0.0208).

There was significant confusion whether wounds should be left open and cleansed frequently to minimise bacterial load, prior Prophylactic antibiotics (In patients with compromised immune systems, such as those with asplenism, underlying hepatic disease, or diabetes mellitus, to prevent potentially life-threatening infections.) or whether to administer Prophylactic antibiotics before the wound cleaning. 43.3% Emergency physicians were sticking on to the recent literatures emphasizing on wounds to be left open and cleansed frequently to minimize bacterial load prior Prophylactic antibiotics.

Nail bed Injury:

We found that in indication for nail plate removal and exploration for nail bed matrix injury,22(14.7%) emergency physicians had right answered and 128 (85.3%) emergency physicians had wrong answered. This difference was statistically significant (p<0.0001). Wrong answer was significantly higher than correct answer. In true or false question, statingNail plate removal is not indicated for subungual hematomas and only Nail plate trephination is done,if there is no nail plate disruption,16(10.7%) emergency physicians had answered option True and 134 (89.3%) emergency physicians had answered option False. This difference was statistically significant (p<0.0001). Question on the treatment ofSubungualhematoma with nail plate disruption, 25(16.7%) emergency physicians had answered correctly as ED nail plate removal and hand surgeon consultation for surgical repair of nail bed matrix repair and 125 (83.3%) emergency physicians had wrongly answered. This difference was statistically significant (p<0.0001). Wrong answer was significantly higher than correct answer.

Tendon Injury:

Our study showed that in question regarding appropriate splint for mallet finger, 97(64.7%) emergency physicians had answered correctly and 53 (35.3%) emergency physicians had answered wrongly. This difference was statistically significant and Correct answer was significantly higher than wrong answer (p<0.0001). the True or False question stating Diagnosis of Jersey finger is made by physical examination with evidence of DIP swelling, Volar DIP tenderness, and impaired DIP flexion, 132(88.0%) emergency physicians had answered True which was correct and 18 (12.0%) emergency physicians had answered False which was wrong.It was statistically significant (p<0.0001). Regarding question on Mallet finger, 86(57.3%) emergency physicianshad answered correctly but 64 (42.7%) emergency physicians answered wrongly. This difference was statistically significant (p=0.01108).

Cheung K et al [45] (2013)This study propagated a message that primary care physicians must follow proper assessment and management of traumatic hand injuries and it is essential to prevent substantial long-term morbidity in this generally otherwise healthy population. This study also showed that early recognition of injuries that require urgent or emergent referral to a hand surgeon is critical.

Fractures and Dislocation:

Present study showed that in question related to the best method to reduce a Bennett fracture, 102(68.0%) emergency physicians had correctly answered and 48 (32.0%) emergency physicians had wrongly answered. This difference was statistically significant (p<0.0001). In the question based on the management of DIP, PIP, MCP dislocation, 106(70.7%) emergency physicians had answered Reduce, splint, and refer to hand surgeon which was the right management and 44 (29.3%) emergency physicians had wrongly answered. This difference was statistically significant (p<0.0001).

About question regarding Scapholunate dissociation, 16(10.7%) emergency physicians had correctly answered and 134 (89.3%) emergency physicians had given incorrect answer. This difference was statistically significant (p<0.0001).

Jha S et al [51] (2014) found that Bite wounds may be contaminated with aggressive pathogens and the anatomical vulnerability of structures within the hand means that without early recognition and treatment with irrigation and antibiotics, alongside a low index of suspicion for deep structural involvement requiring formal surgical exploration and washout, the consequences of such injuries can be disastrous.

Burns:
For the question on the management of burn injury of hand, 117(78.0%) emergency physicians had answered correctly and 33 (22.0%) emergency physicians had incorrectly answered. This difference was statistically significant ($p<0.0001$).

Anaesthesia:
For the question on anaesthesia, to choose the correct statement regarding the anaesthetic choice for the patient where a five-year-old average sized patient presents with a laceration to the finger,88(58.7%) emergency physicians had answered correctly and 62 (41.3%) emergency physicians had wrongly answered.This difference was statistically significant ($p=0.0027$).

Ghiya MN et al [46] (2017) found that proper training and sensitization towards the need and technique of anaesthesia (particularly local anaesthesia) would improve the quality of patient care. Printed guidelines and periodic review of the charts would help to overcome poor adherence to tetanus prophylaxis. Hand injuries could be managed better by the EP, with training through rotations to the Plastic Surgery Unit.

Radiology:
Forthe question on Radiology90(60.0%) emergency physicians had right answered and 60 (40.0%) emergency physicians had wrong answered. This difference was statistically significant ($p=0.0005$).
Overall in our study, 10(6.7%) emergency physicians gave 100% correct answers, 35(23.3%) emergency physicians gave 50% correct answers and 105(70.0%) emergency physicians had below 50% correct answers. Hence this study showed significant knowledge deficit in assessment and management of hand injuries amongst Emergency Physicians.

Conclusion and Summary:-

The human hands play a pivotal role in our daily lives within our family, work, and recreational environments. Best patient care and clinical decision-making in the Emergency Department regarding hand injuries undoubtedly depends upon the anatomical knowledge, history taking, physical examination, rapidly identifying limb-threatening injuries, obtaining critical clinical information, navigating diagnostic uncertainty, facilitating specialist consultation, and recognition of the limitations of imaging modalities.

In our study , we included the commonest hand injuries presenting to emergency and prepared a questionnaire and distributed to all the emergency physicians in West Bengal both govt. and private sector, personally and via emails , to assess the knowledge of emergency physicians regarding initial management of hand injuries presenting to emergency department.

It was found that most of the emergency physicians had correctly answered the questions on the Haemorrhage Control, Fight Bites, Burns, Nerve Examination, Fractures, Tendon Injury, Radiology and local anaesthesia.

Our study showed that there was significant knowledge deficit in the areas of amputation as in the mode of transportation of an amputated part. Emergency physicians were opting options which were wrong and those modes of transportation of amputated part would lead to nonviability of the tissue.

We also found that most of the emergency physicians had wrongly answered the questions based on Nail bed Injury and HighPressure Injection Injury. Many of the emergency physicians were not thorough about nail trephination and its significance, and were unknown about the recent studies done on the nail bed injuries. Most of the emergency physicians were in favour of performing nail trephination alone rather than nail plate removal in emergency and hand surgeon consultation, hence possibility of delay in immediate referral to hand specialist.

Our study also showed that the knowledge of emergency physiciansregarding some injuries like scapholunate dissociation showed significant knowledge deficit.

Study also showed a narrow difference in the opinion regarding prioritisation of treatment protocol for bite injuries. Emergency physicians had also found to have a confined knowledge regarding triaging of acute hand injuries (Limb-threatening or very high morbidity, High morbidity if missed or if diagnosis is delayed and Moderate morbidity if missed).

In our study we have come across few areas of acute hand trauma , where the emergency physicians needed more training as in to identify the innocuous or hidden emergencies example high pressure injection injury which needed emergency referral to hand surgeon, we also found some lacunae in areas of amputation and nail bed injuries in which the emergency physicians needed updates from the recent studies done.

We can ensure quality practice of emergency physicians in Emergency Department as in promptly identifying and initiating emergent hand referral if demandedfor all acute hand injuries,and also fill the lacunae of these knowledge deficits by the following actions:

1. Appropriate workshops on the acute hand injuries for the ED physicians, should be designed and conducted at regular intervals.
2. Ensure more clinical experience in Plastic surgery, Orthopaedics and Vascular surgery during Emergency medicine training.
3. Conducting Journal clubs in every hospital and updating the emergency physicians about the recent advances in acute hand injuries.
4. Conduct similar surveys on larger scales with questionnaires on hand injuries.
5. Poster presentations on initial management and assessment of hand injuries.

Limitations of the Study:
In spite of every sincere effort my study has lacunae.
The notable short comings of this study are:

1. The study populations are being tested upon a confined set of questionnaire and it may not cover the entire range of questions.
2. Physicians will be selected randomly, which may not represent ideal demographic scenario of physicians in our country.
3. As some of the questionnaires are being distributed by e-mails, there is a high possibility of low response.

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Appendix – 1
Questionnaire:

Which of the following describes the appropriate storage method for an amputated part?
1. Amputated part placed in a bag with ice and water
2. Amputated part wrapped in moist gauze in bag, then placed into a second bag containing ice
3. Amputated part wrapped in moist gauze placed in bag with ice
4. Amputated part placed in an empty bag, that bag placed into a second bag containing

Which of the following is the correct method of physical examination of the median nerve in the hand?
1. Light touch fifth fingertip; resistance against finger abduction
2. Light touch second fingertip; resistance against thumb adduction
3. Light touch second fingertip; resistance against thumb opposition
4. Light touch dorsal aspect thumb carpal metacarpal joint; resistance against wrist extension

TRUE OR FALSE?
Proximal tourniquet placement is the recommended method of haemorrhage control in persistent haemorrhage from a radial artery injury despite direct pressure and limb elevation?
1. True
2. False

Which of the following regarding high-pressure injection injury is FALSE?
1. Early high-pressure injection injury often appears clinically innocuous.
2. The injected material tracks along the neurovascular bundles along the path of least resistance.
3. These injuries are associated with a high rate of infection, necrosis, and considerable amputation risk.
4. All patients should receive intravenous antibiotics and immediate hand surgery consultation for operating room wound exploration and admission.
5. Pain management with ice compression, digital nerve block, and local infiltration of anaesthetic drugs

Which of the following is the most common site of a fight bite wound?
1. Dominant hand, fifth MCP joint
2. Non dominant hand, third MCP joint
3. Dominant hand, third MCP joint

What percentage of subungual hematoma can undergo nail trephination in ED?
1. Hematoma<50% with disrupted nail plate
2. Hematoma>50% with associated nail bed injury
3. Hematoma of any size with intact nail plate

What is the most appropriate splint for mallet finger?
1. Splint entire digit mild DIP flexion
2. Splint spanning middle and distal phalanx, in mild DIP extension
3. Splint spanning middle and distal phalanx, in mild DIP flexion
4. Splint entire digit, in DIP extension.

How would you test the motor function and integrity of the ulnar nerve?
1. Test flexion of the wrist against resistance
2. Test flexion of the fifth finger against resistance
3. Test Abduction of the index finger against resistance
4. Test Abduction of the little finger against resistance
5. B and D
6. check for clawing of the $4^{th}$and 5^{th}fingers
7. All of the above.

Which of the following describes the best method to reduce a Bennett fracture?
1. Axial traction and valgus pressure
2. Axial traction and varus pressure
3. Axial traction, thumb opposition, and radial pressure over the metacarpal base
4. Axial traction, thumb adduction, and ulnar pressure over the metacarpal base

True or False?
Nail plate removal is not indicated for subungual hematomas and only Nail plate trephination is done, if there is no nail plate disruption.

Arrange in order priority wise the treatment protocol for Bite injuries.
A- Thorough irrigation and debridement.
B- Prophylaxis for tetanus (and rabies if warranted) must be initiated.
C- Wounds should be left open and cleansed frequently to minimise bacterial load.
D- Prophylactic antibiotics (In patients with compromised immune systems, such as those with asplenism, underlying hepatic disease, or diabetes mellitus, to prevent potentially life-threatening infections.)
1. A, B,D,C
2. B, C,D,A
3. A,B,C,D

A five-year-old average sized patient presents with a laceration to the finger.Which of the followingstatements isTrue regarding anaesthetic choice for this patient.
1. Lidocaine with epinephrine has been definitely shown to cause digit ischemia when applied to the finger.
2. When giving lidocaine with epinephrine, the maximum safe dose Is lower than when giving lidocaine without epinephrine.
3. A digital block is the preferred anaesthetic choice

What one should do if a patient presents with DIP, PIP, MCP dislocation?
1. Splint, prescribe analgesics and send the patient home.
2. Reduce, Splint and prescribe analgesics and send home.
3. Reduce, splint, and refer to hand surgeon.

Which amongst the following presentations are limb threatening or having very high morbidity?
1. Compartment syndrome
2. High-pressure injection injury
3. Arterial injury
4. all of the above

True or false?
Diagnosis of Jersey finger is made by physical examination with evidence of DIP swelling, Volar DIP tenderness, and impaired DIP flexion.

Which of the following statements are FALSE regarding Mallet finger?
1. Mallet finger is an injury of the extensor tendon distal to the DIP joint.
2. Mallet finger is an injury of the flexor tendon distal to the DIP joint.
3. Most commonly due to forced flexion of the DIP joint during extension.
4. Uncomplicated Mallet finger requires a splint immobilising the DIP in extension and allowing full range of motion of the PIP joint.

Which among the following about Scapholunate dissociation is True?
1. Scapholunate dissociation results from injury of the scapholunate interosseous ligament .
2. The most common mechanism is a high-impact FOOSH with wrist hyperextension and ulnar deviation.
3. Patients with scapholunate diastasis > 3 mm, Or clinical suspicion of scapholunate dissociation with equivocal imaging are placed in a thumb spica splint and referred to a hand surgeon.
4. All of the above.

Subungual hematoma with nail plate disruption, what is the treatment?
1. ED nail plate removal and Consult with hand surgeon for nail bed matrix repair.
2. Nail plate trephination alone.
3. Dressing, antibiotics, and follow up in OPD.

Which among the following is wrong about the management of burn injury of hand?
1. Fluid Resuscitation according to Parkland Formula.
2. Escharotomies for circumferential burns restricting perfusion.
3. Splinting in anti-claw position to prevent contracture.
4. None.

Which among the following is correct?
1. If initial films of Hand injuries do not visualise an opaque foreign body, consider a xeroradiogram of the hand.
2. In patients with persistent pain from an injury to hand, Computed tomography, scintigraphy or MRI may be used to identify an occult fracture.
3. In occult fractures of radius, scaphoid bone, or the hook of the hamate bone, MRI may allow early evaluation of avascular necrosis.
4. All of the above.