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"THE CLINICAL PROFILE AND ELECTROCARDIOGRAPHIC CHANGES IN SCORPION ENVENOMATION"

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CERTIFICATE

This is to certify that this dissertation entitled **"THE CLINICAL PROFILE AND ELECTROCARDIOGRAPHIC CHANGES IN SCORPION ENVENOMATION"** submitted by **Dr. N.THIRUPPATHIRAJA** at madras medical college, Chennai, appearing for M.D. Branch I - General Medicine Degree examination in MAY2020 is a bonafide record of work done by him under my direct guidance and supervision in partial fulfilment of regulations of The TamilNadu Dr. M.G.R. Medical University, Chennai. I forward this to The TamilNadu Dr.M.G.R. Medical University, Chennai, Tamil Nadu, India.

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LIST OF ABBREVIATIONS

CPK	–	Creatine Phosphokinase
CK MB	–	Creatine kinase-muscle/brain
DIC	–	Disseminated intravascular coagulation
ECG	–	Electrocardiograph
EF	–	Ejection Fraction
IFN	–	Interferon
IL	–	Interleukin
NTG	–	Nitroglycerin
SGOT	–	Serum glutamic oxaloacetic transaminase
SGPT	–	Serum glutamic pyruvic transaminase
SPSS	–	Statistical package for the social sciences
TNF	–	Tumor necrosis factor
TnI	–	Troponin I
VMA	–	Vanillyl mandelic acid

CONTENTS

INTRODUCTION

INTRODUCTION

Scorpion stings are a major public health problem in many underdeveloped countries. In India, many people are stung by the red scorpion (Mesobuthus tamulus) with fatalities in adults and children. Scorpion sting is a life threatening medical emergency of villagers in India.[1] Numerous envenomations are unreported. So true incidence is not known. Among the eighty six scorpion species in India, Mesobuthus tamulus and Palamneus swammwe-dami are of medical importance.[2]

Scorpions live in warm, dry regions throughout India. Scorpion stings are primarily due to accidental contact with scorpion. The scorpions use their stings only when roughly handled or trodded on. Scorpion does not always inject venom when it stings , thus the sting may be total, partial , or nonexistent. [3] Scorpions capable of inflicting fatal stings in humans are all members of the families Buthus and Scorpionidae. [2] Fatalities due to sting by Buthidae have been reported from Chennai, Rayalaseema, Pondicherry and rural Maharashtra.[4,5]

Scorpion venoms are species-specific complex mixtures of short neurotoxic[6] proteins. The scorpion toxins target sodium, potassium, calcium and chloride channels causing direct effects and the release of neuro transmitters such as acetylcholine and catecholamine. Species difference, venom dose/weight relationship determine the toxicity and the clinical picture in India.

In Israel, Brazil and Mexico cardiac manifestations are common. Symptoms after scorpion sting progress to a maximal severity in about five hours and subside in a day or two. Alpha receptor stimulation by the toxin plays a major role, resulting in hypertension, tachycardia, myocardial dysfunction, pulmonary edema and cold extremities. Excess catecholamines cause accumulation of endothelins and vasoconstriction. Central nervous system manifestations are infrequently encountered in strings due to Mesobuthus tamulus. This is found to occur mainly in children.

Symptoms vary depending on the species and geographical area. The most frequently encountered symptom is excruciating local pain. Early symptoms include vomiting, profuse sweating , piloerection, alternating bradycardia and tachycardia, abdominal colic, diarrhoea, loss of sphincter control and priapism. Later severe life threatening cardio respiratory effect may appear: hypertension, shock and bradyarrhythmias, ECG changes and pulmonary edema with or without myocardial dysfunction.[9]

Literature on the manifestation of scorpion envenomation are lacking due to lacunae in reporting and there is no universally accepted protocol for the treatment of scorpion envenomation, although hospitals in Saudi Arabia follow a national protocol for the management of scorpion sting cases. [10]

OBJECTIVES OF THE STUDY

OBJECTIVES OF THE STUDY

1. To assess the clinical profile and electrocardiographic changes caused by scorpion envenomation.

2. To study the severity of scorpion envenomation.

REVIEW OF

LITERATURE

REVIEW OF LITERATURE

EPIDEMIOLOGY

Scorpion sting is common and endemic in various regions of the world. Scorpion species of medical importance are encountered in India, Middle East, North Africa[11], Brazil [12], Mexico, the Southern States of United States of America [13,14,15], Central Africa, and South Africa[16].

The Indian red scorpion Mesobuthus tamulus is the most lethal among the all the poisonous species of

scorpions. The scorpion envenomations reported frequently from Pondicherry, Karnataka, Tamil nadu, Andhrapradesh, Saurashtra, Uttar Pradesh, Bihar and western maharastra. Thousands of scorpion stings are reported annually from india and 15% to 20% stings presenting with features of systemic envenomations. Farmers are more prone to get stung by scorpions while handling debris and paddy husk in the months of April to early June and September to October as due to sudden rise in environmental temperature due to which the scorpions come out of their hides. Scorpion is nocturnal in habit and people walking bare foot become their victim more commonly.

Nearly 1000 species of scorpion are known worldwide, which belongs to six families. However only the scorpion belonging to the family Buthidae, secretes neurotoxic venom which is toxic to human. Around 86

species of this family are found in india. M. tamulus , the Indian red scorpion is venomous and it's fatal if not treated in time.

Because most envenomations occur in developing countries, where regular reporting systems are lacking, data on scorpion stings in several countries are based on estimates. High fatality rates were reported from scorpion envenomation in India, Saudi Arabia, Israel, Tunisia, Brazil & Mexico in the 1970s. In recent years there has been a marked reduction in mortality, owing to the improvement in supportive care and increased availability of antivenom therapy.

In Saudi Arabia, 2240 cases of scorpion sting were recorded in the Hail region, with an incidence of 18.7 per 1000 over a 15 month period[10]. The peak season for scorpion stings is June through September.

In Tunisia; almost 40,000 scorpion stings in humans are recorded annually, 1000 of them with systemic manifestation requiring hospitalization, about 100 patients die annually. In Mexico, it has been estimated that 400 to1000 people die annually as a result of 100,000 to 200,000 scorpion stings. There were about 370 documented fatalities annually until the 1990's when immunotherapy was introduced. 15,687 exposures to scorpions have been reported to the American Association of poison control center's Toxic Exposure surveillance system – 508 involved moderate symptoms, 28 involved major symptoms and there were 2 fatalities.

CLASSIFICATION OF ARACHNIDS

Kingdom	:	Metazoa (Animals)
Phylum	:	Arthropoda
Subphylum	:	Chelicerata
Class	:	Arachnida
Order	:	Scorpiones
Superfamily	:	Buthoidea
Family	:	Buthidae
Genera	:	Mesobuthus

SCORPION – Habitat, Habits

Scorpions are arthropods with a hard exoskeleton, two anterior pinching claws and a tail. The poison gland and the stinger are located at the distal part of the tail. Scorpions are nocturnal, preferring to hunt insects after sunset. During day times they lie under rocks or logs.

The Mesobuthus tamulus has red coloured claws but tails,legs and body is covered with khaki coloured cuticles. It is 2.5 to 4 inches in length. The tail consists of stout segments with terminal bulb containing pair of telson venom secreting salivary glands. It actively secretes venom at the time of sting by a sharp semi curved stinger.The stinger is 2 to 4mm in size and human skin thickness is 1.5 to 4mm. Scorpion venom is rich in neurotoxin.

MESOBUTHUS TAMULUS

PALMANEUS GRAVIMANUS

The black scorpion Palmaneus gravimanus is less poisonous. It is seen in Kerala, Vidharba and Marathvada region in india. This scorpion is bigger in size as compared to red scorpion. But it causes severe and excruciating painful sting. Its claws are broad and thick while tail consists of thin segments.

Scorpions often sting human in the extremities, frequently after hiding in shoes or other clothing. children represent half of all envenomation. The scorpions sting when they are attacked or when their territory is trespassed. They seldom attack (sting) on their own without being attacked first.

Venomous apparatus

It consists of venom vesicle comprising of pair of glands in the last segment of the abdomen. The venom vesicle is surrounded by a striated muscular layer which regulates the ejection of venom. This mechanism of ejection of venom explains the variation in intensity of symptoms and the possibility of dry stings. The maximum volume of venom injected in one sting by Indian red scorpion is 1.5 ml.The maximum dose of antivenom required is 30 ml, however more may be required for severe sting.

Constituent of the venom

The venom consist of toxins and enzymes. The toxins are alpha and beta. The enzymes are hyaluronidase, phosphodiesterases, phospholipases. It also contains glycosaminoglygans, histamine, serotonin, tryptophan, and cytokines. Scorpion venom composed of toxins and enzymes with neurological tropism acting on ion channels of excitable cells. Classification of toxins based on four distinct criteria

1. The involved ion channel

2. The specific receptor to which the toxin binds with in the ion channel

3. The three dimentional structure of the toxin

4. The type of response induced(activation/inactivation of the receptor)

The venom of the scorpion can have multiple toxins that may interact with each other, modulating the response of the ion channels involved and leading to complex and rapidly progressive symptoms.

Mechanism of action of toxins

The most potent toxin is neurotoxin, which contains two classes - alpha toxin and beta toxin.

Alpha toxin - it is long acting polypeptide neurotoxin. It blocks voltage dependent inactivation of sodium channel, without modifying the opening channel. keeping the sodium channel open leading to continuous, prolonged, repetitive tiring of somatic, sympathetic, parasympathetic neurons causing paralysis and arrhythmias.

Beta toxin - short chain polypeptide neurotoxin. It blocks the potassium channel. It causes myoclonus and spastic muscular response.

The stimulation of the sodium channel and the inhibition of potassium channels, both lead to intense, persistent stimulation of autonomic nerves leading to massive release of neurotransmitters from adrenal medulla, stimulating parasympathetic and sympathetic nerve endings, thus initiating autonomic storm.

Cardiotoxicity

The stimulation of autonomic nervous system with predominantly sympathetic stimulus and release of tissue and medullary

catecholamines.Typical effects are initial bradycardia followed by tachycardia and also initial short period of hypotension due to cholinergic effect and followed by prolonged hypertension. It also produces catecholamine induced myocardial necrosis due to vasospasm that leads to more severe lesion at cardiac apex. The early & persistent cardiac defects observed in scorpion envenoming are caused by release of catecolamines.

Peripheral vasoconstriction probably due to action of kinins, accentuates cardiac ischemia which is evidenced by changes on electrocardiography like QT prolongation, tall or inverted T waves and ST segment abnormalities. Echocardiography and cardiac scintigraphy confirm decreased myocardial perfusion. These changes lead to myocardial necrosis leading to heart failure and death.

The systolic ejection fraction is significantly lowered which explains the respiratory effects of acute pulmonary edema, acute heart failure and cardiogenic shock. All these events are related to adrenergic storm and exacerbation of inflammatory response which is evidenced by high circulating levels of bradykinins, prostaglandins, and inflammatory cytokines like interleukin 1 and 6, interferon gamma and tumor necrosis factor alpha.

Hypertension is due to massive outpouring of catecholamines from adrenal medulla and also from post ganglionic neurons.

Hypotension is due to early cholinergic vasodilator effect, increased quantities of potent vasodilators like kinin, prostaglandins.

CNS toxicity

CNS manifestations mainly due to neurotoxins alpha and beta. It also acts on the respiratory centre, vasomotor centre, nerve terminalsand on end plate of both striated and non-striated muscles. Stroke may occur due to thrombus or hemorrhage or intense cerebral vasospasm due to autonomic storm.

The neuromuscular hyperexcitability leads to abnormal movements, twitching , tremor, convulsion, cramps which affecting all the skeletal muscles but predominantly the cranial nerves. Rapid aberrant eye movements are more frequent due to envenomation by centruroids species which found in north and central America. The eye movements are bilateral and symmetrical , horizontal or rotatory which suggesting a peripheral origin, some other authors attribute this to cerebral edema due to vasoconstriction of brain capillaries including those in thalamus. The convulsive forms sometimes attributed to hyperthermia and dehydration that occurs in very young children could be due to same origin.

Respiratory toxicity

Respiratory manifestations and pulmonary edema are due to direct toxin induced increase in pulmonary vessel permeability. Pulmonary edema may be due to catecholamine induced myocarditis, myocardial injury, decrease in left ventricular compliance and diastolic dysfunction.

Abnormal coagulation profile, acute DIC and dysfibrinogen syndrome are secondary to action of epinephrine on blood vessels.

Renal toxicity - is due to decreased renal blood flow and afferent arteriolar constriction, toxin induced acute tubular necrosis, immune complex glomerulonephritis and rhabdomyolysis.

Acute pancreatitis is due to conversion of trypsinogen to trypsin by scorpion venom.

Systemic inflammatory response syndrome (SIRS) is due to increased level of IL-6, IL-1,TNF-alpha, IFN-gamma.

Priapism is due to stimulation of nitrergic nerves which liberate nitric oxide produced by neuronal nitric oxide synthase supplying penile smooth muscle, in severe scorpion envenomation.

Pathophysiology

Scorpion venom contains several distinct and pharmacologically active protein components. Venom from Buthidae act at ion channels on neurons, precipitating massive release of neurotransmitters [17,18,19,20,21]. After envenomation by centruroides, significant parasympathetic stimulation may lead to contraction of visceral smooth muscle, resulting in clinical effects such as micturition, defecation and Priapism[21]. The yellow scorpion, Leirus quinquestriatus, found in middle eastern countries, and other members of the buthidae family found in India and other parts of the world are reported to cause the release of enormous amounts of catecholamines, precipitating a hyperadrenergic reaction characterized by hypertension, myocardial injury, dysrhythmias, pulmonary edema, severe hypertension and possibly death [21,22]. The North African genus Androctonus, one of the most venomous of that region, is often reported to cause death in infants and young children from a similar hyperadrenergic syndrome[23].

Hypotension and shock often follow the hyperadrenergic state and are thought to result from neuronal and adrenal catecholamine depletion.

Envenomation from Tityus (found throughout south America), Leiurus, and other Buthidae frequently cause pulmonary edema from both cardiac and noncardiac factors, [23,24,25,26,27] proposed causes of the pulmonary edema include rapid increases in peripheral vascular resistance [19], dysrhythmias[18], and direct venom induced depressions in myocardial contractility[24,26].

Most scorpions found in United States cause little more than localized pain. Centruroides exilicauda venom, however contains at least two types of neurotoxins, differentiated by their effects on axonal membranes[28]. The first group maintains the sodium channel in a ion–conducting state by causing incomplete sodium channel inactivation during depolarisation[29]. The effect of these toxinsis causing widening of the action potential [29].

The second group of neurotoxins initiates a slowly developing inward sodium current after membrane depolarization. Together, these toxins widen the action potential and enhance membrane depolarization, causing repetitive firing of axons[28]. All excitable membranes using sodium channels and undergoing depolarization are susceptible to this toxic effect.

Some scorpion species may cause other specific organ damage after envenomation. Tityus trinitatis, found in Trinidad and Venezuela, is reported to cause acute pancreatitis in up to 60 percent of victims [21]. Tissue destruction,

notably absent from most scorpion stings owing to a lack of proteolytic enzymes, can be produced along with bleeding disorders and hemolysis by Hemiscorpius lepturus and related species found[19] in the middle east[21].

The symptom complex of Scorpion envenomation includes sympathetic and parasympathetic stimulation. The non specific signs of tachycardia, tachypnoea, hypothermia, or hyperthermia, and leucocytosis are explained by cytokine release (Particularly interleukin-6 and interleukin-1)[33] and increased autonomic neurotransmission. The mechanism of cardio toxicity in scorpion envenomation is multifactorial : catecholamine over stimulation causing hypertension and a transient phase of increased contractility. There is a diminished systolic performance in addition to the catecholamine effect. The combination of myocardial ischemia , excessive catecholamine effect, cardiac arrhythmia, and increased oxygen demand may result in acute myocardial ischemia and infarction.

Respiratory failure, caused by pulmonary edema, is a common complication of severe scorpion envenomation. The latter is thought to occur as a result of increased vascular permeability induced by release of vasoactive substances[34]. Central nervous system involvement is more frequent in children with severe envenomation. In the case of L. quinquestriatus sting, central nervous system symptoms are explained partially on the basis of hypertension, causing hypertensive encephalopathy and may respond to antihypertensive therapy.

Central nervous system manifestations, such as agitation, hyperthermia, hypertonia, seizures, and coma [10,34] also occur. However, in the presence of normal blood pressure suggesting a more direct central mechanism of toxicity[34]. Intra ventricular injection of extremely small does of toxic L. quinquestriatus venom to rabbits (1/500 to 1/1000 of the intravenous lethal dose) caused complex neurotoxicity.[34] Some scorpions, such as the Centruroides sculpturatus of the southern United States, exert neurotoxicity without cardiotoxicity.

CLINICAL MANIFESTATIONS

The severity of scorpion envenomation varies with the scorpion's species, age, and size and is much greater in children. Clinical severity ranges from local pain to fatal cardiotoxicity and encephalopathy.

In most cases, adults sting by scorpions experience only local symptoms and signs consisting of pain, erythema, pruritus, edema, and parasthesia [30]. Parasthesia and localized percussion tenderness at the sting site are common.[16,30,35] Parasthesia occasionally involving the extremities and peri -oral area also occur. [35] Local necrosis of any degree is rare and has been documented only from stings of Hemiscorpius lepturus in Iran [36].

Systemic intoxication reflects stimulation or depression of the central nervous system and stimulation of the sympathetic, Parasympathetic, and

skeletal motor nervous systems, skeletal motor hyperactivity, gastric and pancreatic hyper secretion, and occasionally bradycardia [13,32] Salivation, abdominal pain ,nausea, vomiting are common and can be attributed to stimulation of salivary glands and to pancreatitis. [25]

"Scorpion sting syndrome" was defined by Neale[42] to be "the varied manifestations of presumed Scorpion envenomation". The typical case can be described as: local pain, occasionally with proximal radiation, often with tenderness, swelling and redness at the site of envenomation. This may be followed by the onset of systemic symptoms, which most commonly include hypertension and / or tachycardia, often with nausea and epigastric discomfort.

In the cardiac vascular system, the increased sympathetic tone prevails, as reflected by the high incidence of tachycardia and hypertension (72% and 58%) and the much lower incidence of bradycardia and hypotension (14% and 5%) in victims of scorpion envenomation. [13] In a report of 386 children with scorpion stings from Saudi Arabia, tachycardia occurred in 32% of children and bradycardia in 0.77%.

Symptoms of envenomation due to sting by C. Sculpturatus, a predominantly neurotoxic scorpion in 151 patients were, in decreasing of frequency : restlessness, nystagmus, parasthesia, hypersalivation, fasciculation, blurred vision, difficulty in swallowing, local pain and slurred speech.[15] In the United States a clinical gradation has been suggested for scorpion envenomation from this species. [11]

ADRENERGIC STORM:

- Cardiac: tachycardia, peripheral vasoconstriction, hypertension, diaphoresis.
- Metabolic: Hyperthermia, Hyperglycemia.
- Urogenital: Urinary retention, ejaculation.
- Respiratory: bronchial, dilatation, tachypnoea.
- Neuromuscular: Mydriasis, tremors, agitation, convulsion.

CHOLINERGIC SYNDROME:

- Salivation, sweating, vomiting, lacrimation, urinary incontinence, bronchial hypersecretion, diarrhoea, abdominal pain, miosis, bronchospasm, bradycardia with hypotension and in the male priapism.

INFLAMMATORY RESPONSE:

High kinins, prostaglandins, IL-1, IL-6, IFN-γ, TNF-α

Increased peripheral vascular resistance and local edema of the tissues

Ischemia and infarction in kidney, mesentry, heart and brain.

Grades of envenomation

Grade	Clinical characteristics
I	Severe excruciating local pain radiating along the corresponding dermatomes, mild local edema at the site of sting without systemic involvement.
II	Signs and symtoms of autonomic storm characterized by parasympathetic and sympathetic stimulation.
III	Cold extremities, tachycardia, hypotension or hypertension with pul monary edema.
IV	Tachycardia, hypotension with or without pulmonary edema with warm extremities and multi visceral involvement

Envenomations by the main venomous scorpion species in North Africa and the Middle East (L. quinquestriatus and Androctonus crassicauda) and India (Mesobuthus tamulus) has a similar clinical course. Symptoms of mild envenomation are agitation, tachycardia, and sweating. In more severe cases, particularly in young children, additional symptoms include vomiting, abdominal pain, salivation, dehydration priapism, extreme agitation, generalized erythema, muscle rigidity and twitching, tremors, seizures, coma,

pupillary changes, hyperthermia, hypertension (less of then hypotension)cardiac and respiratory failure, and death. Idiopathic dilated cardiomyopathy was found to be eight times more frequent in patients with a past history of scorpion sting in India, despite their apparently complete recovery from the acute envenomation.[43]

Studies have shown that if severe toxicity occurs it usually does so within 6 hrs of envenomation [14].

Scorpion envenomation by species, Regions and characteristic toxicity

Scorpion species	**Geographic Region**	**Cardiotoxicity**	**Neurotoxicity**	**Ref**
Mesobuthus tumulus (Indian red scorpion)	India	+++	++	7,40,41,43,44
Leiurus quinquestriatus Androctonus crassicauda	middle east	+++	++	18,32,34,35,37
A.Crassicanda, A.austrails, A.Bicolor	N.Africa and Middle East	+++	++	15
Tityus Serrulatus	Brazil	+++	++	12
Centruroides Suffusus	Mexico	+	++	45
C. Sculpturatus	U.S (south)	nil	++	13,14,37
Parabuthus transvaalicus, P. Granulatus	Central& South Africa	+	++	16

MANAGEMENT

Diagnosis and Laboratory findings

The diagnosis of scorpion envenomation is made by the characteristic clinical presentation of the patient in an area where scorpions are endemic. Ocassionally the scorpion is seen, or the sting may be witnessed.

Laboratory abnormalities have been reported mainly from scorpion stings from Middle East, North Africa and India. Hyperglycemia and leucocytosis are nonspecific but common[9,12]. Cardiac ischemia is expressed in transient elevation of cardiac enzymes[34] and electrocardiogram with depressed or elevated ST segment, Q waves in leads I and avL, Prolonged QTc interval and peaked T wave[34] . Cardiac dysfunction is evidenced by echocardiography as diminished global wall motion with decreased systolic left ventricular performance and diminished ejection fraction. Left ventricular dysfunction also has been shown by cardiac radionuclide scan[38.] Transient elevation of pancreatic enzymes has been reported[39].

Complete blood Count - Polymorphonuclear Leukocytosis found which will be elevated according to the grades of envenomation.

Urine analysis - smoky/ cola coloured urine in nephritis. VMA levels may be raised in the urine due to increased metabolism of catecholamines.

Blood sugar– hyperglycemia will be seen

Serum electrolytes - may produce hyponatremia, hyperkalemia, hypocalcemia

Serum Enzymes - SGOT, SGPT elevated in liver cell damage and myocarditis. Serum amylase level may be elevated.

Renal Function Test - increased blood urea and serum creatinine levels in case of acute renal failure

ECG - arrow head tented T waves looks like Ashoka tree indicates acute injury. While tent shaped looks like Christmas tree indicates recovery. PQRST or T wave alternans indicates serious myocardial injury. Prolonged QTc and conduction defectrestore to normal within 1 week. T wave inversion persists for few weeks. Low **v**oltage, wide QRS complex tachycardia, hemiblock and marked ST depression carries had prognosis. The other common findings are ventricular premature contraction, bigemini, transient non sustained ventricular tachycardia and rarely fatal ventricular arrhythmias. Sinus tachycardia, injury to conducting system in the form of left anterior hemiblock, bundle branch block, complete heart block and marked tented T waves are the other common findings. The tall T waves may mimic acute myocardial infarction. Severe pulmonary edema cases showed low voltage pattern with PQRST alternans with ST depression. The severity of ECG changes didn't correlate with clinical condition.

Chest X-ray – Cardiogenic pulmonary edema characterized by unilateral distribution or Batwing appearance of lung haziness. At times secondary

respiratory infection in the form of consolidation seen in hospitalised patients who is recovering from pulmonary edema. Mild cardiomegaly may be present.

Echocardiography - shows poor global myocardial contractility 12 -15 hours after the sting with low EF, decreased LV performance and mitral incompetence. Abnormal diastolic filling will persist for 5 days to 4weeks after the sting.

There is good echocardiographic correlation seen between clinical improvement and return of LV function. Mild envenomation causes severe vasoconstriction and hypertension. At the same time severe envenomation causes left ventricular dysfunction with normal systemic vascular resistance with pulmonary edema. Severe hypotension depends mainly on fluid balance while hypotension and shock with warm extremities occurs in terminal stage due to biventricular failure and terminal vasodilatation (warm shock)

Biochemical markers in scorpion envenomation

Cardiac: Increased levels of CK-MB, Troponin I seen.

Hepatic: Increased levels of Alanine Amoinotransferase,Gamma Glutamyltransferase, Alkaline Phosphatase seen.

Pancreatic: Amylase, Lipase levels will be increased.

Electrolyte imbalance: Hyponatremia, Hypocalcemia, Hyperkalemia

Biological disorders: Leucocytosis, Hyperglycemia, Lactic Acidosis, $Sp0_2<90$.

Treatment

1. Fluid loss due to vomiting, sweating and salivation should be corrected by adequate IV fluids.

2.Pain management - Local ice packs reduce the pain and slows the absorption of toxin due to vasoconstriction. Severe pain can temporarily be relieved by local anaesthesia by lignocaine injection without adrenaline. This is associated with oral diazepam and non steroidal anti inflammatory drugs(NSAIDs) can give more prolonged pain relief. More excruciating pain can be dealt with injectable opioids like pentazocine.

3. **Reassurance** of the patient, vitals monitoring and Airway, Breathing,Circulation should be maintained.

4.Adrenergic storm management: Prazocin is a simple scientific pharma-cologicaland physiological antidote for scorpion venom. Prazosin is an alpha 1receptor blocker and phosphodiesterase inhibitor. It reduces the preloadand left ventricular impedence without rising heart rate. Prazocin reverses the metabolic syndrome caused by excessive catecholamine release. So prazosin is useful in this setting. Prazosin 30 µg/kg 6th hourly until the signs of clinical improvement appear or till dry and cool extremities persist. It also inhibits sympathetic outflow in CNS. It inhibits phosphodiesterase by which it enhances the cGMP level which is one of the mediators of nitric oxide synthesis. It increases the insulin secretion which is inhibited by the venom. So it's pharmacological effects reverse the hemodynamic, hormonal, and metabolic effects of scorpion venom. Care should be taken to avoid postural fall in blood pressure which is a

known side effect of prazocin (first dose phenomenon). This can be managed by head down position and intra venous fluids. With the use of prazocin the fatality due to scorpion sting has reduced to less than 1%. So it is called as poor man's scorpion antivenom.

5.Heart failure management : If patient presented with severe myocardial dysfunction and decompensated shock in addition to dobutamine, responded to nitroglycerine infusion 0.5-5µg/kg/min by improving the heart dysfunction and reduction in pulmonary congestion.Nitroglycerine reduce the preload, improve the intrapulmonary shunt and relax the epicardial coronary vessels and its collaterals.

Patient with severe envenomation and cardiogenic shock should not be treated with vasodilators, the inotropic agents like dobutamine or vasopressors like dopamine must be infused immediately. Vasodilators should introduce only after the shock is recovered.

If patient presented in hypokinetic phase due to both ventricular dysfunction, clinically charecterized by hypotension, shock, tachycardia, deliriumwith or without pulmonary edema and warm extremities, these case improves with dobutamine 5-20 µg/kg/min.

6. Acute pulmonary edema management : Pulmonary edema should be treated with propped up position, nasal O2, IV loop diuretics and oral prazocin. But massive pulmonary edema with accelerated hypertension can be managed with NTG infusion and non invasive or invasive mechanical ventilation. Pulmonary edema with hypotesion or shock managed with dobutamine or dopamine 5 to 15

microgram/kg/min. Inotrope support may require upto 36 to 48 hrs in warm hypotensive shock patients.

7. **Neuromuscular Symptom Management:**Diazepam 0.5mg/kg 1V or rectally every 12 hours; midazolam 0.05 to 0.2µg/kg intravenously or intramuscularly**.**

8. **Passive immunotherapy**

Scorpion antivenom is the specific treatment of scorpion sting, has been a matter of debated and controversial during last fewyears. Without skin test anti scorpion venom can be administered as early as possible through intravenous route. Signs and symptoms suggestive of parasympathetic stimulation indicates circulating unbound venom and can be neutralized by antivenom.

Initially 1 vial in 250m1 NS over 30 minutes or slow direct IV then subsequent dose according to symptom resolution in Mesobuthustamulus. The advantages of passive immunotherapy are:

1.The antivenom is removed from the plasma in less than one hour as compared to placebo.

2. The benzodiazepine dosage needed was very low.

3. The cure was achieved in less than one hour.

4. The elimination of antigen antibody complex from plasma attracts venom from tissue compartment

Specific antivenom therapy has been used for several decades. Numerous reports exist on the clinical use of specific antivenom preparation from seven geographic regions. Because of ethical consideration most are retrospective, observational or historical controls. There are only a few prospective, randomized control trials.

Ismail [17] from Saudi Arabia reported data on 24,000 patients with scorpion envenomation treated by a National Protocol. Thousands of these patients were treated with antivenom with a reduction in the fatality rate from 4% to 6.8% to less than 0.005%.

Several reported from Mexico claimed a reduction in mortality from several hundred to zero. In a study from Arizona of 116 patients, mostly children, who received Centruroides antivenom, only 4 developed mild, self limited, immediate reactions. 60% developed some form of serum sickness, which responded to oral steroids, anti histaminics or both. Important features regarding optimal use of antivenom that can be inferred from literature are :

1. Because of regional variations in Scorpion species and specific antivenom preparation, always obtain the advice of local experts.
2. Reserve antivenom preparation for patients with significant toxicity
3. In the event of hypersensitivity decrease the rate & add anti histaminics, continue cautiously.

Scorpion antivenom is more effective if victim is brought in a stage of acetylcholine excess that is early stages of Scorpion sting. Early use of prazocin along with antivenom fastens the recovery. The total of antivenom required is 30 to 100 ml. The disadvantage is it is expensive. No test dose required for antivenom because anaphylaxis is very rare.

9.Prevention:

Scorpions can be killed by using organophosphorus compounds. A false ceiling of plastic sheet can be used under the roof to prevent scorpion from falling in bed from loose tiles of roof. Shoes and clothes should be properly checked before wearing in scorpion endemic areas. Otherwise shoes can be packed with paper or cloth to prevent entry of scorpions in night. Thick rubber gloves should be worn while harvesting fire wood, dry cow dung, lifting paddy, and sugar cane husk. One should not enter hand blindly in cervices, doors, or old storage material during night hours.Bedding or cot should be kept at distance from mud house wall.

Drugs to be avoided in the management of scorpion envenomation

●Salicylates should be used cautiously in children because of the incidence of Iyells syndrome and Reyes syndrome in children.

● Morphine and its derivatives has to be avoided because it prevents the reuptake of noradrenaline and potentiates the sympathetic symptoms of scorpion venom. It also causes respiratory depression.

● Hydralazine should not be used for the management of hypertension because of increased sympathetic system stimulation and further worsening of symptoms. It also causes urinary retention and progressive hypotensive response which is difficult to treat.

● Captopril is avoided because it inhibits degradation of bradykinin which plays an important role in development of pulmonary edema.

● Barbiturates in the management of neuromuscular symptom should be avoided because of respiratory depression.

●Atropine is avoided because it blocks sweating and cause loss of temperature regulation in children. It also potentiate the adrenergic effect of the venom. It is used only in severe bradycardia and complete heart block.

MATERIALS AND METHODS

MATERIALS AND METHODS

SETTING

This study was carried out in the Toxicology ward of Madras Medical College and RajivGandhi Government General Hospital, Chennai-3.

Design of study

This is a single centre prospective study.

Period of Study

This study was carried out in R.G.G.G.H from June 2018 to August 2019 (15 months).

Consent

Informed consent was obtained in all cases.

Sample Size

All the patients admitted to the toxicology ward with scorpion envenomation during the study period were included in the study. A total number of 87 cases of scorpion envenomation were included in the study.

24 healthy patients from the outpatient department of RajivGandhi Government General Hospital , Chennai were taken as controls.

Selection of Study Materials

The patients admitted to the toxicology ward of R.G.G.G.H, Chennai who fitted the inclusion criteria were taken as study subjects.

Selection of Controls

The patients who attended the general health check up of the out patient department of the R.G.G.G.H and were healthy were taken as control subjects.

Inclusion Criteria

All patients who were admitted with scorpion sting in the toxicology ward during the study period.

Exclusion Criteria

1. The patients with doubtful history of scorpion sting were excluded from the study.
2. The patients who had history of diabetes and hypertension were excluded.
3. The patients who had history of recent myocardial infarction were excluded in the study.
4. Patients with history of liver diseases and muscle disorders were excluded from the study.

DETAILS OF STUDY SUBJECTS AND CONTROLS:

A detailed history was obtained from the patients admitted for scorpion envenomation and the following findings were recorded in the proforma-1.Time of envenomation, 2.Nature of the incident, 3.Description of the scorpion, 4.Local and systemic symptoms,5.Number of stings,6.Site of envenomation.

The cases of scorpion envenomation and controls were subjected to clinical examination, complete blood count. Blood urea, blood glucose, serum creatinine, serum creatinine kinase, serum creatinine kinase-MB were measured . The routine investigations were repeated twenty-four hours after admission for the study subjects. Chest X-ray and electrocardiogram were taken for both study and controls. The serial electrocardiogram was taken for the study subjects at twelve hours and twentyfour hours after admission. The study and control subjects also underwent echocardiography.

DETAILS OF MATERIALS

The complete blood count(Normal range of WBC:4,000-11,000cells/cu.mm), serum CK(Normal range:35-145U/L), serum CK-MB(Normal range:0-25U/L), routine biochemical analysis was done using semi-auto analyser.

STATISTICS

Data obtained from the records of the study were analysed with SPSS software, using analysis of Pearson's chi-square method and student t-test.

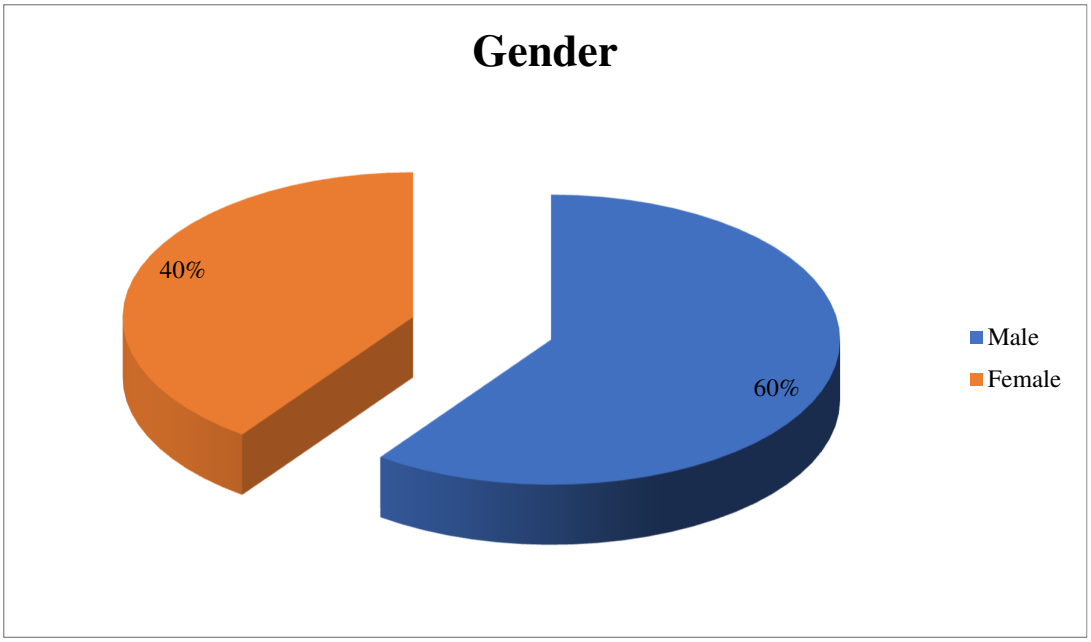
OBSERVATION

&RESULTS

OBSERVATION &RESULTS

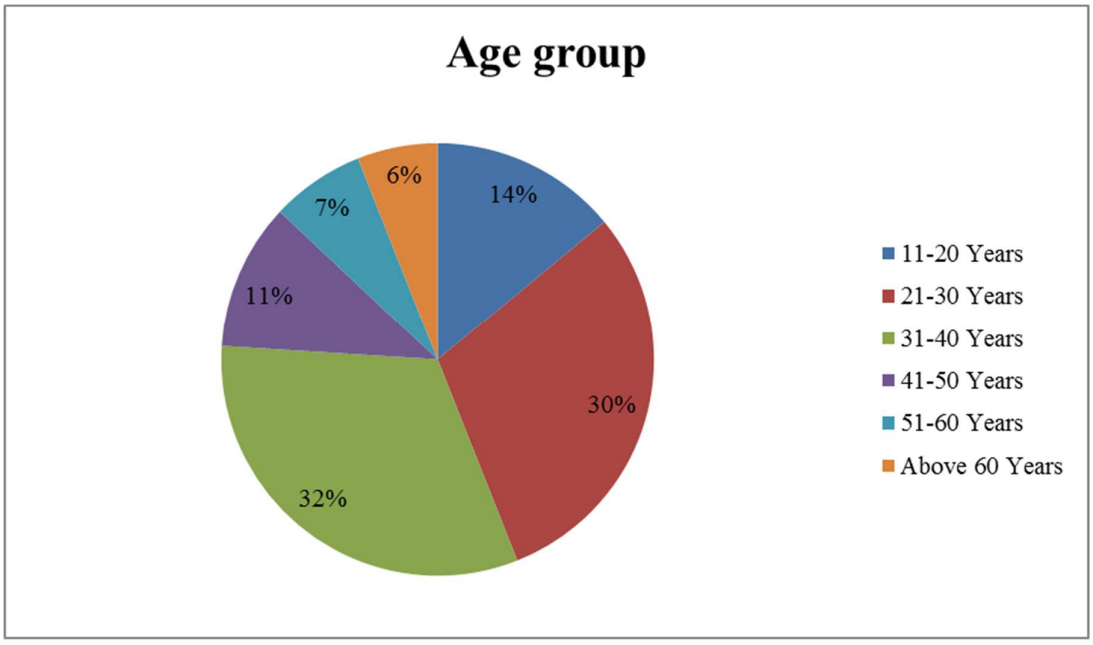
1.Distribution of scorpion sting cases according to patient's gender:

Gender	Frequency	Percent
Male	52	59.8
Female	35	40.2
Total	**87**	**100.0**



2.Distribution of scorpion sting cases according to patient's age:

Age group	Frequency	Percent
11-20 Years	12	13.8
21-30 Years	26	29.9
31-40 Years	28	32.2
41-50 Years	10	11.5
51-60 Years	6	6.9
Above 60 Years	5	5.7
Total	**87**	**100.0**

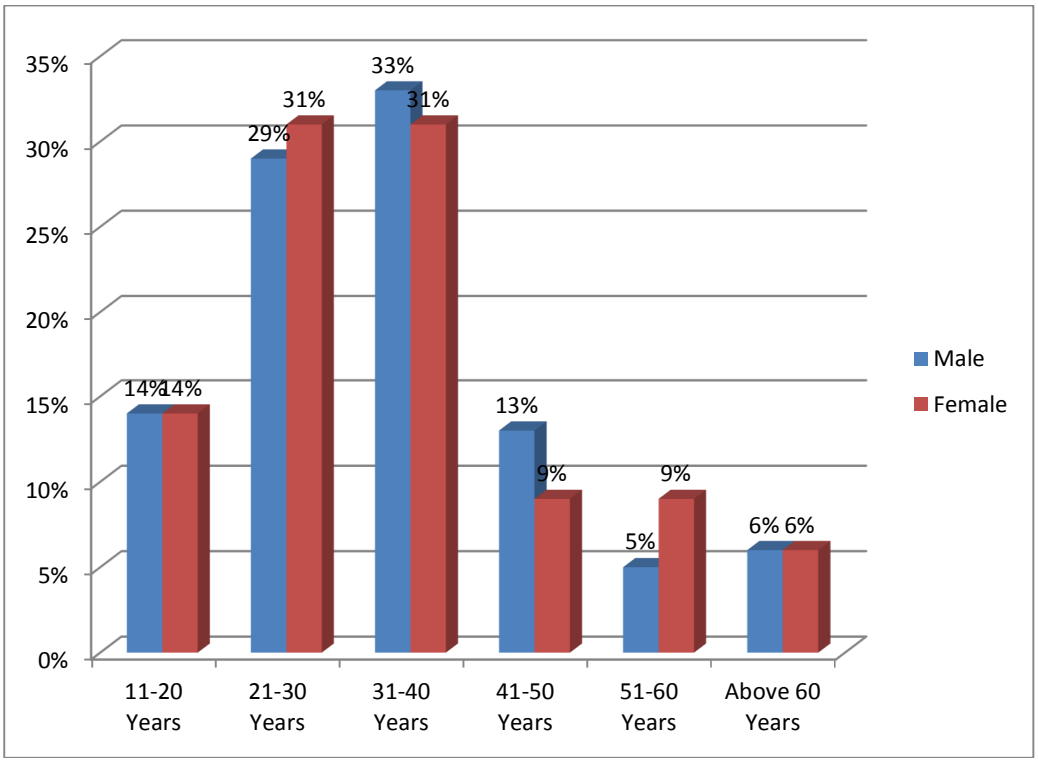


3.Distribution of scorpion sting cases according to patient's gender within the age group:

Age_group * sex Crosstabulation

Age group		Sex		Total
		Male	Female	
11-20 Years	Count	7	5	12
	% within sex	13.5%	14.3%	13.8%
21-30 Years	Count	15	11	26
	% within sex	28.8%	31.4%	29.9%
31-40 Years	Count	17	11	28
	% within sex	32.7%	31.4%	32.2%
41-50 Years	Count	7	3	10
	% within sex	13.5%	8.6%	11.5%
51-60 Years	Count	3	3	6
	% within sex	5.8%	8.6%	6.9%
Above 60 Years	Count	3	2	5
	% within sex	5.8%	5.7%	5.7%
Total	Count	52	35	87
	% within sex	100.0%	100.0%	100.0 %

Pearson Chi-Square=0.741 p=0.981


35%
30%
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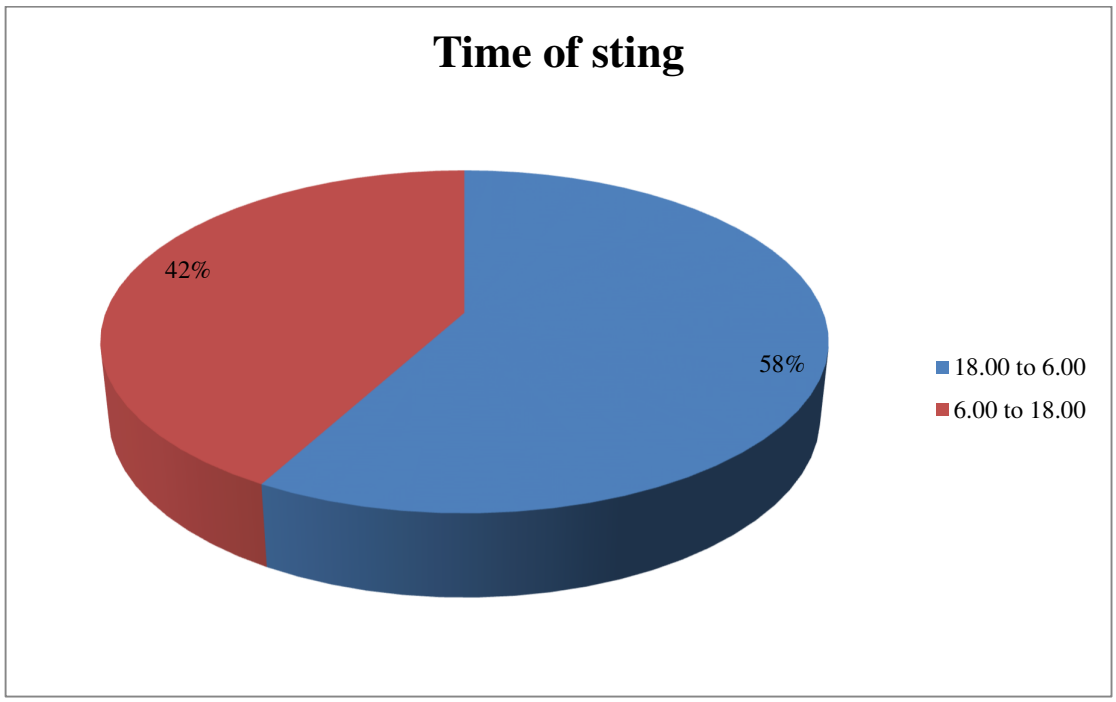
9%
5%
9%
6%
6%
11-20 Years
21-30 Years
31-40 Years
41-50 Years
51-60 Years
Above 60 Years
Male
Female

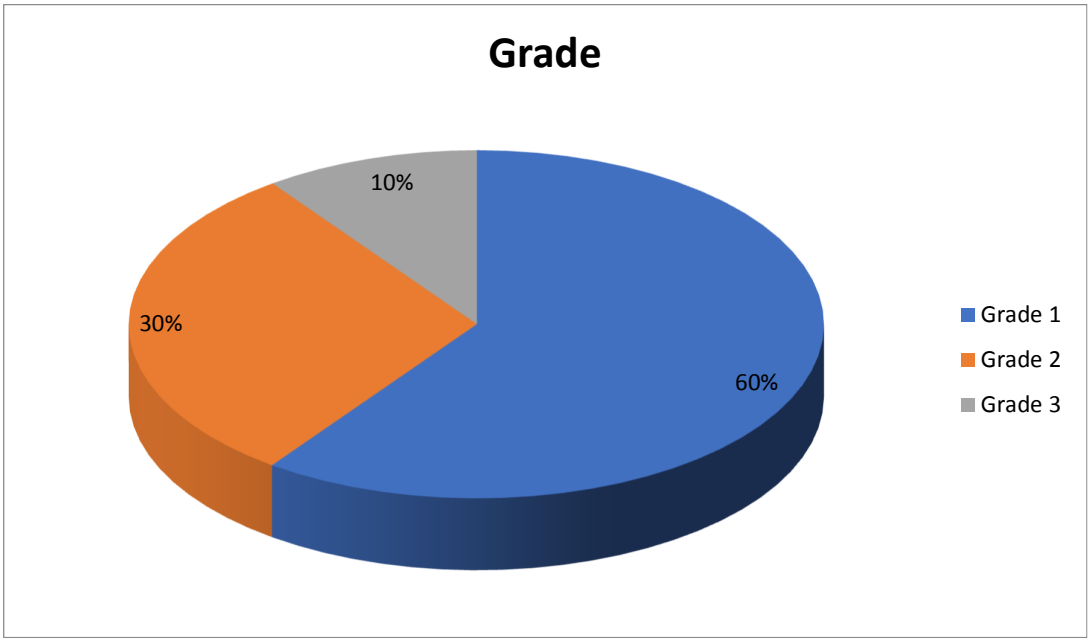
4. Distribution of cases according to time of sting:

Time of sting	Frequency	Percent
18.00 to 6.00	50	57.5
6.00 to 18.00	37	42.5
Total	**87**	**100.0**



5. Distribution of cases according to severity:

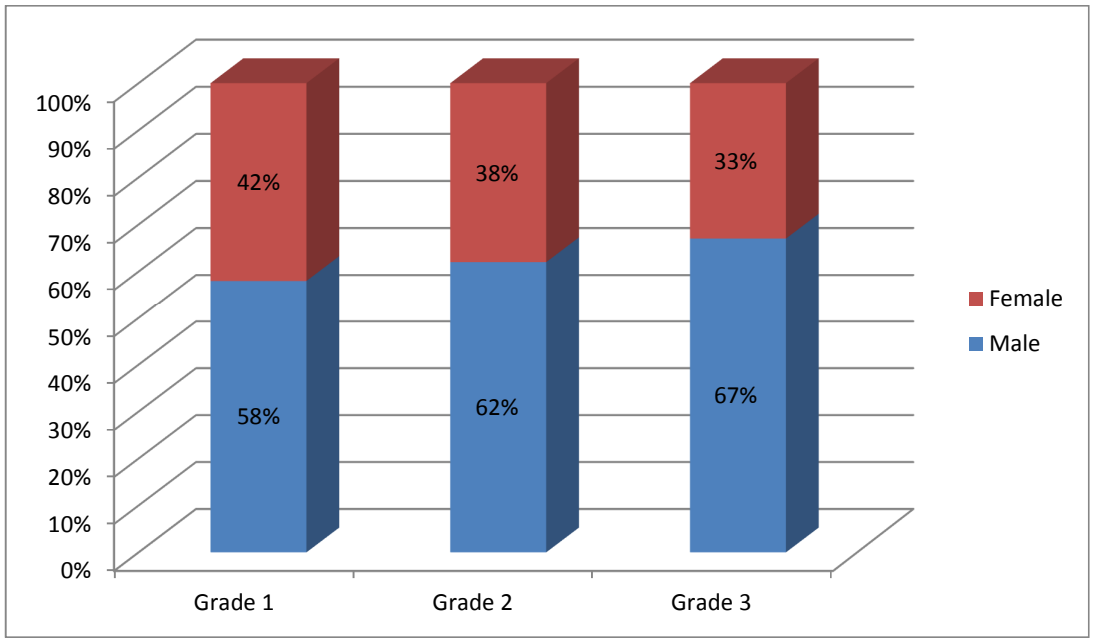
Grade	Frequency	Percent
Grade 1	52	59.8
Grade 2	26	29.9
Grade 3	9	10.3
Total	**87**	**100.0**



6. Comparison between severity of sting and sex:

Sex		Grades			Total
		Grade 1	Grade 2	Grade 3	
Male	Count	30	16	6	52
	% within Grade	57.7%	61.5%	66.7%	59.8%
Female	Count	22	10	3	35
	% within Grade	42.3%	38.5%	33.3%	40.2%
Total	Count	52	26	9	87
	% within Grade	100.0%	100.0%	100.0%	100.0%

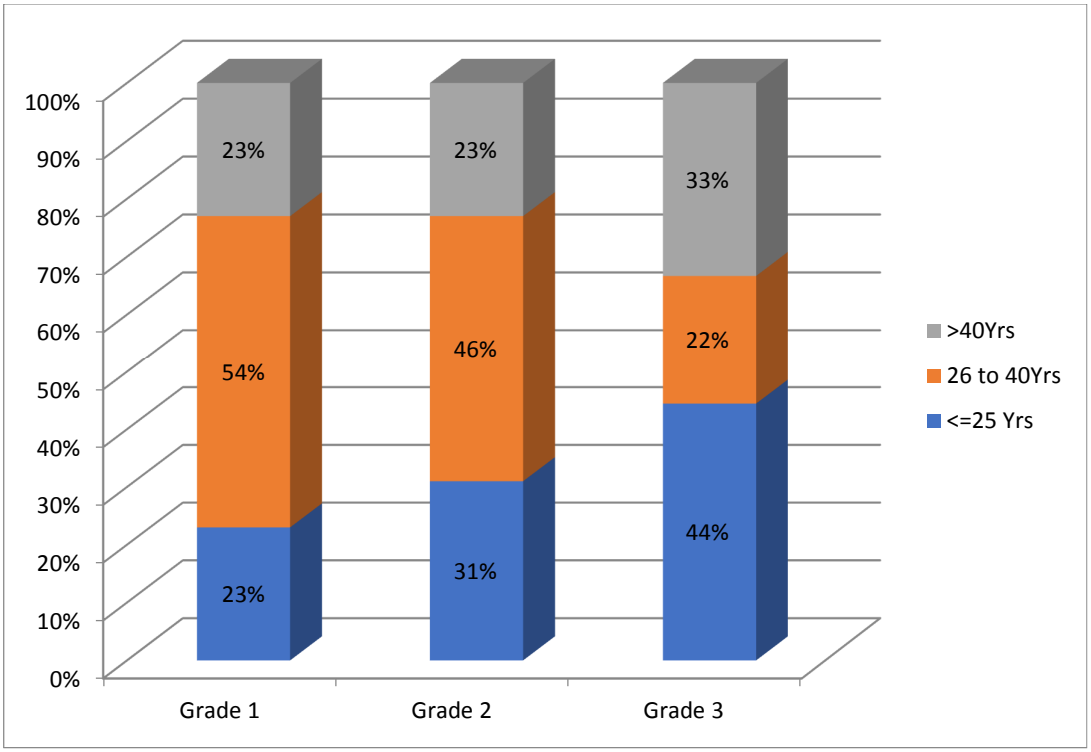
Pearson Chi-Square =0.305 p= 0.858



7. Distribution of cases according to severity by age group:

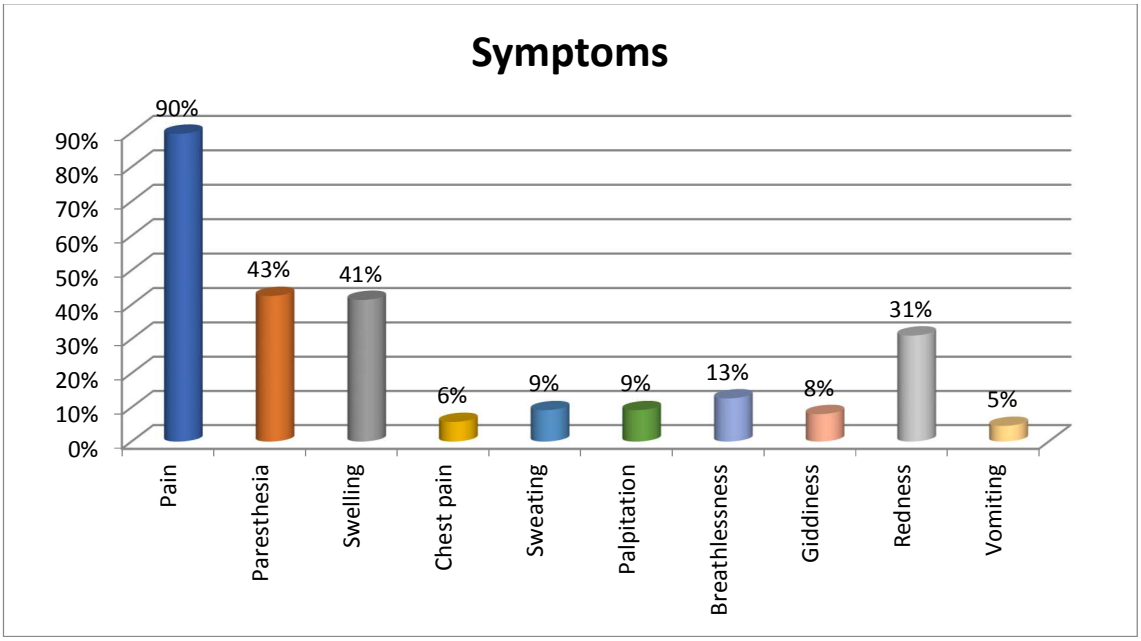
Age Group	Grades			Total
	Grade 1	Grade 2	Grade 3	
<25 Yrs	12	8	4	24
	23.1%	30.8%	44.4%	27.6%
26 to 40Yrs	28	12	2	42
	53.8%	46.2%	22.2%	48.3%
>40Yrs	12	6	3	21
	23.1%	23.1%	33.3%	24.1%
Total	**52**	**26**	**9**	**87**
	100.0%	100.0%	100.0%	100.0%

Pearson Chi-Squar3.382 p= 0.496



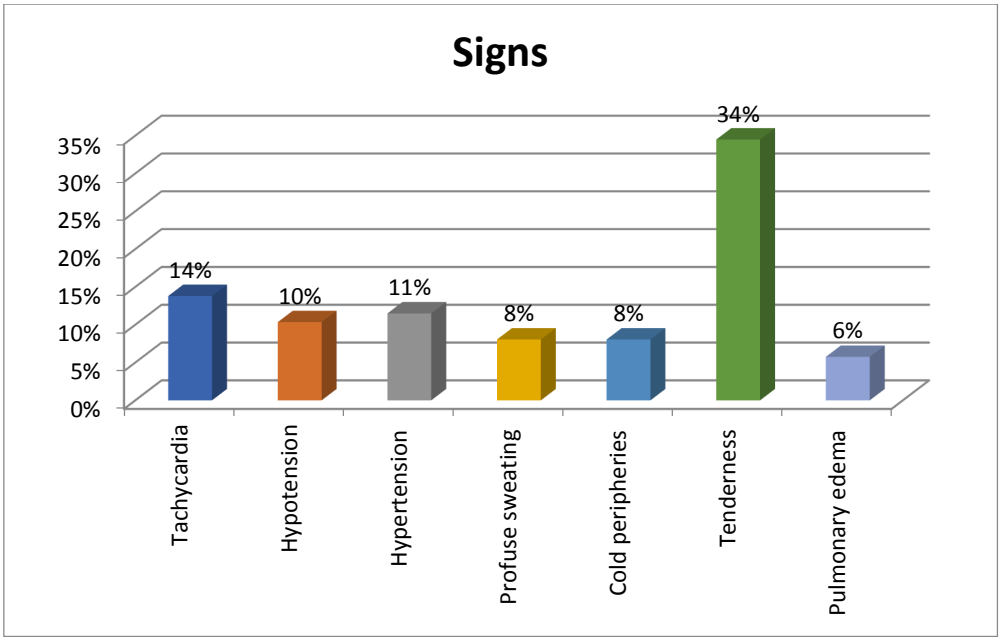
8. Frequency distribution of symptoms:

Symptoms	No of patients	Percentage
Pain	78	89.7%
Paresthesia	37	42.5%
Swelling	36	41.4%
Redness	27	31.0%
Breathlessness	11	12.6%
Palpitation	8	9.2%
Sweating	8	9.2%
Giddiness	7	8.0%
Chest pain	5	5.7%
Vomiting	4	4.6%



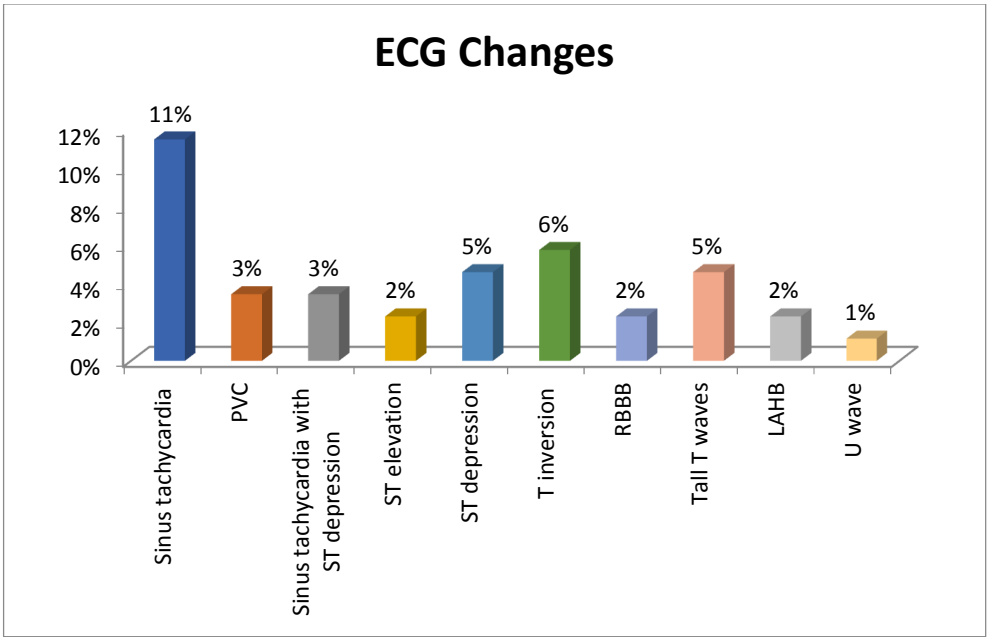
9. Frequency distribution of signs:

Signs	No of patients	Percentage
Tenderness	30	34.5%
Tachycardia	12	13.8%
Hypertension	10	11.5%
Hypotension	9	10.3%
Cold peripheries	7	8.0%
Profuse sweating	7	8.0%
Pulmonary edema	5	5.7%



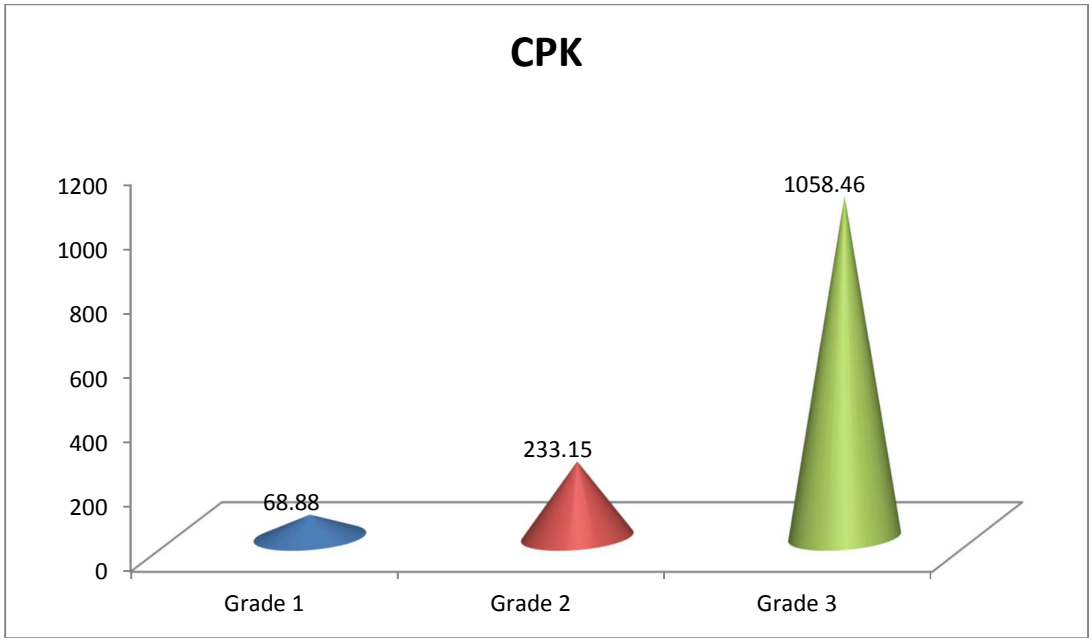
10. Frequency distribution of ECG chances:

ECG changes	No of patients	Percentage
Sinus tachycardia	10	11.5%
T inversion	5	5.7%
ST depression	4	4.6%
Tall T waves	4	4.6%
PVC	3	3.4%
Sinus tachycardia with ST depression	3	3.4%
RBBB	2	2.3%
ST elevation	2	2.3%
LAHB	2	2.3%
U wave	1	1.1%



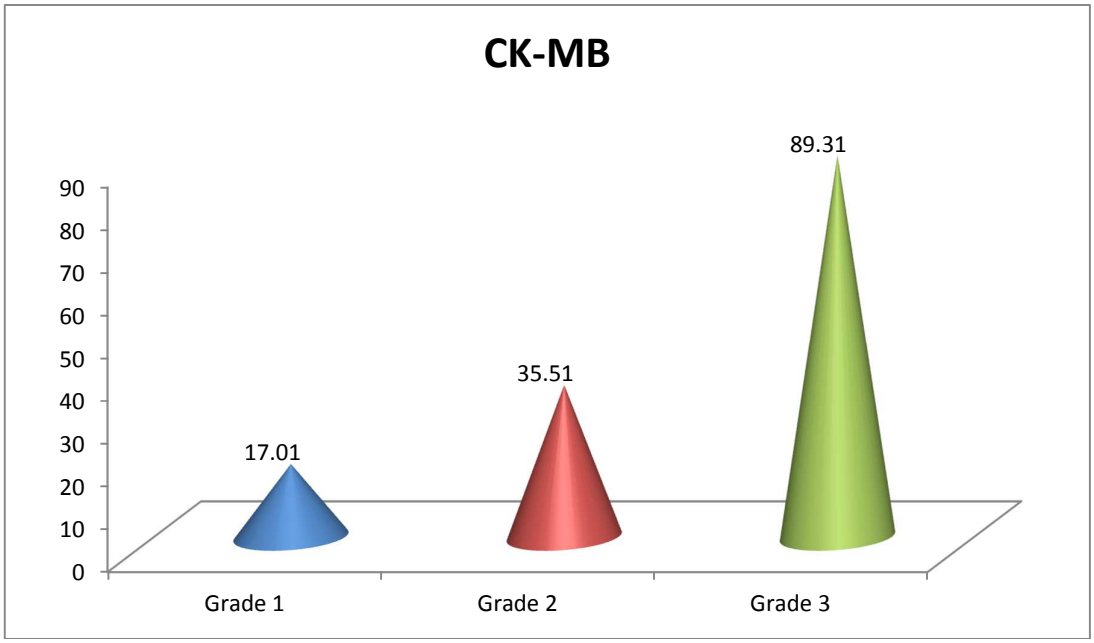
11. Significance of assessment of CPK in different grades of sting:

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean			
						Lower Bound	Upper Bound		
CPK	Grade 1	52	68.88	27.07	3.75	61.35	76.42	172.144**	p<0.001
	Grade 2	26	233.15	103.73	20.34	191.25	275.05		
	Grade 3	9	1058.46	437.06	145.69	722.50	1394.41		
	Total	87	220.34	329.79	35.36	150.05	290.63		



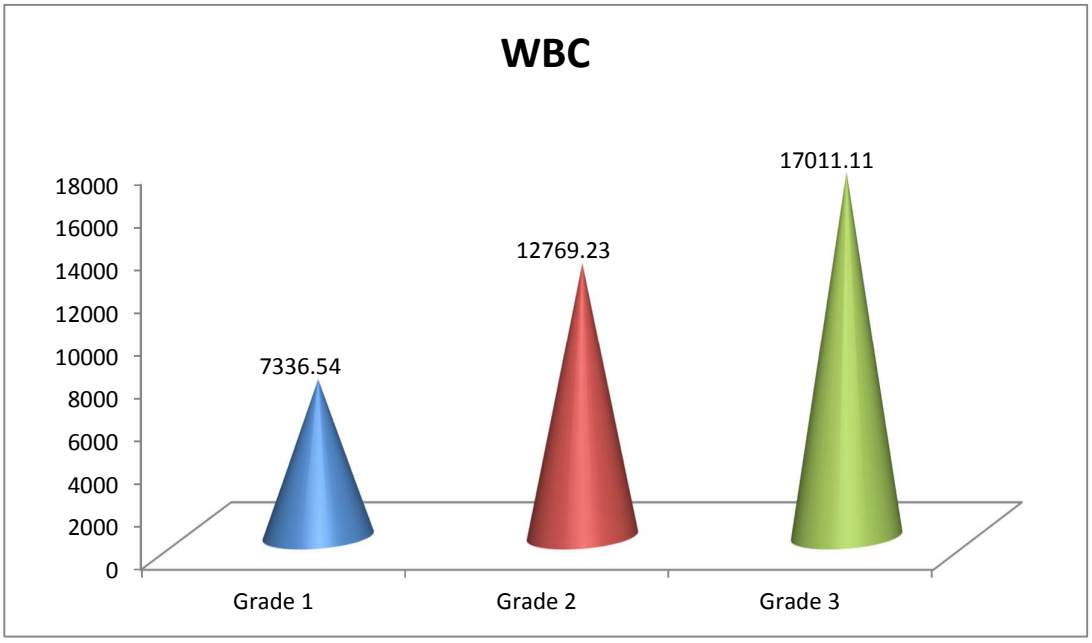
12. Significance of assessment of CK-MB in different grades of sting:

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound		
CKMB	Grade 1	52	17.01	7.38	1.02	14.96	19.07	120.5	p<0.001
	Grade 2	26	35.51	5.74	1.13	33.19	37.83	88**	
	Grade 3	9	89.31	36.67	12.22	61.13	117.50		
	Total	87	30.02	25.42	2.73	24.60	35.44		



13. Significance of assessment of WBC Count in different grades of sting:

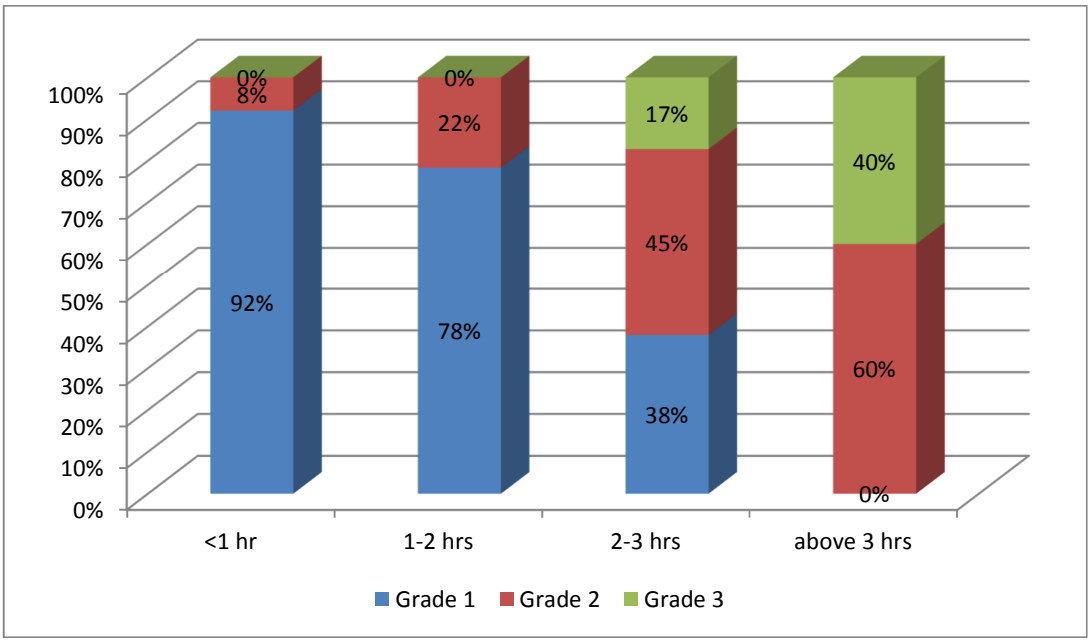
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean			
						Lower Bound	Upper Bound		
WBC count	Grade 1	52	7336.54	2342.70	324.87	6684.33	7988.75	96.128**	p<0.001
	Grade 2	26	12769.23	2440.45	478.61	11783.51	13754.95		
	Grade 3	9	17011.11	1261.39	420.46	16041.52	17980.70		
	Total	87	9960.92	4109.08	440.54	9085.16	10836.68		



14. Time Interval and Grade :

GRADE			Time Group				Total
			<1 hr	1-2 hrs	2-3 hrs	above 3 hrs	
	Grade 1		23	18	11	0	52
			92.0%	78.3%	37.9%	0.0%	59.8%
	Grade 2		2	5	13	6	26
			8.0%	21.7%	44.8%	60.0%	29.9%
	Grade 3		0	0	5	4	9
			0.0%	0.0%	17.2%	40.0%	10.3%
Total			**25**	**23**	**29**	**10**	**87**
			100.0%	100.0%	100.0%	100.0%	100.0%

Pearson Chi-Square=38.470* p<0.001



13.Comparison between clinical signs and grade:

		Tachycardia		Hypotension		Hypertension		Profuse sweating		Cold peripheries		Tenderness		Pulmonary edema	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%
	Grade 1	2	16.7%	1	11.1%	2	20.0%	1	14.3%	2	28.6%	16	53.3%	0	0.0%
	Grade 2	6	50.0%	3	33.3%	4	40.0%	1	14.3%	2	28.6%	12	40.0%	0	0.0%
	Grade 3	4	33.3%	5	55.6%	4	40.0%	5	71.4%	3	42.9%	2	6.7%	5	100.0%
		12	100%	9	100%	10	100%	7	100%	7	100%	30	100%	5	100%

Pearson chi square =11.37 p=0.001

13. Scorpion envenomation : Relationship between various factors:

Variables	P value
Symptoms and age group	0.20447^{NS}
Symptoms and gender	0.44008^{NS}
Variation between gender	0.8091^{NS}
Variation between age group	0.9810^{NS}
Grade and time interval	<0.001**
Grade and CK	<0.001**
Grade and CKMB	<0.001**
Grade and leucocytosis	<0.001**
CK and ecg changes	<0.001**
CKMB and ecg changes	<0.001**
Grade and Clinical signs	<0.001**

** denotes significance at1% level

NS denotes Not Significant at5% level

DISCUSSION

DISCUSSION

Eighty-seven patients fit the inclusion criteria for the time period studied. Fifty two patients (59.8%) were male and thirty five (40.2%) were female. The age range was 14 years-68 years. Majority of the patients were in the age group of twenty-six to forty years (48.3%) . Twenty four patients (27.6%) were below 25 years of age and twenty one patients (24.1%) were above the age of forty years. There was no significant difference in the gender distribution and the age distribution of the patients by statistical analysis. In Tunisia, Egypt, Saudi Arabia, Argentina and Brazil, epidemiological studies showed that most scorpion stings were seen in males, while in a study in turkey it was predominantly seen in females. In epidemiological studies done in different regions of Morocco, male preponderance of scorpion sting was seen in southwest regions and high incidence of scorpion stings in females in the rest of the regions. The analysis of data shows that in the present study there were more males than females both in total cases and in the age group data during the study period. This shows that male- female distribution varies according to regions .The higher incidence of males in this study could be due to the fact that some of the men work in places with poor lighting and improper storage facilities which makes it ideal for the scorpions to hide.

In the present study, the majority of the patients were in the age group of 21-40 years. Twenty six of the patients were in the age group of 21-30 years, Twenty eight were inthe age group of 31-40 years. In a ten year retrospective study of scorpion stings in Saudi Arabia which included both adults and children, seventy three patients of the patients were thirty years or younger. In the study carried out by K. Radha Krishnamurthy et al. in G.G.H, Kurnool, India, out of the twenty five patients of scorpion sting studied, the highest incidence was found to be in the age group of 13 to 30 years.The male to female ratio was 2:1.Of the eighty seven patients, 52 patients (59.8%) had grade one envenomation. Twenty six patients(29.9%) were classified as grade two and nine patients(10.3%) fitted the criteria for grade three envenomation. In the 15 months period, from first week of June 2018 to the last week of August 2019, maximum number of patients were admitted in the months of May to October. The highest number of admissions was recorded in the month of August. The study from Kurnool G.G.H showed the incidence of scorpion stings was high between July and December. The study from Saudi Arabia states that the six months from May through October were responsible for 75% of the ER visits. In another study from Saudi Arabia by Mahaba, the frequency was highest in the summer months from June to September[10]. Similar incidence has been reported from Brazil, Egypt, Morocco and Turkey. Scorpion stings increase dramatically in summer months and are lowest in winter.[3]

This study also shows the incidence to be higher in summer months when compared to the winter months. This is due to the fact that scorpions are intolerant to high temperatures and so live under ruins and stones to protect themselves from heat during summer months.

Fifty patients (57.5%) were admitted to the ward in the time period 18.00 hrs to 06.00 hrs. Thirty seven patients (42.5%) were admitted in the time period 6.00 hrs to18.00 hrs. In the study carried out at Kurnool Medical College, Kurnool, India, 72% of scorpion stings occurred during day at work, while the rest took place at night as the subjects were sleeping on the floor. In the Saudi Arabian study, 59% of patients presented to the Emergency Room between the hours of 8pm and 2 am. 53 of this shows the nocturnal predatory pattern of the scorpion. In another study by Mahaba, most of the stings(60%) occurred at night.[10]

All the patients presented with stings on exposed areas of the body- upper or the lower extremities. Sixty patients(69%) presented with scorpion sting in the upper extremity while the rest had sting (31%) in the lower extremity. Epidemiological studies have shown that the ratio of patients affected in the extremities (hand, arm, thigh, leg and foot) is 86% in Saudi Arabia, 83% in Argentina and 85% in Egypt. Scorpion sting was mostly seen in the upper limbs in Morocco and Brazil.Similar results were obtained in the present study. The same pattern was seen in a study from Turkey.[55]

The reason for the high ratio of scorpion sting in extremities is considered to be due to the socioeconomic structure depending on agriculture in rural area, wearing sandals in warm season, walking barefoot, lifting up stones in an unsafe manner, cleaning old racks with bare hands, shaking the hands during sleep. Sting in the head, neck and other sites mostly happened at sleep or resting because of putting on clothes without checking and also not checking bed mattresses before sleep.[55] Scorpion stings are primarily due to accidental contact with the scorpion. Scorpions become active at night for their own protection against humans. According to the study by Ken Dittrich et al., the lower limb stings comprised the majority and the incidence of toxicity did not vary significantly in relation to the location of the sting[53]. The study by Mahaba on scorpion sting in Saudi Arabia recorded stings on the foot to be the most common site of occurrence.[10] Closer proximity of the sting site to the head and torso results in venom absorption in to the central circulation and quicker onset of symptoms. None of the patients in the present study presented with multiple stings.

Local pain was the commonest symptom on presentation in this study. Seventy eight patients (89.7%) presented with pain at the sting site during admission. Thirty six patients (42.5%) presented with presented with swelling at the sting site.

Thirty seven patients (42.5%) presented with parasthesias like tingling sensation at the sting site. Redness was present at the sting site in approximately 31% of the patients. The other symptoms were sweating, palpitations, breathlessness, giddiness, chest pain and vomiting in the frequency of 9.2%, 9.2%, 12.6%, 8%, 5.7% and 4.6% respectively.

Cardiovascular and autonomic symptoms dominated the clinical presentation in this study. The table below contrasts the findings in the present study with other studies.

Authors	**Clinical presentations observed in the study**	**Year of Study**
Ken Dittrich et al., Saudi Arabia	Pain (92%), Radiation of pain(7%), Redness (51%), swelling (28%),Tenderness(12%)	2015
Ozkan O;kat I., Turkey	Intense pain (98.7%), Hyperemia (88.8%), Swelling (54.6%), burning (19.7%), numbness and itching.	2005
Mahaba M.A., SaudiArabia	Pain(98.3%), vomiting, sweating, restlessness, tachycardia, hypertension	2010
K.Radha Krishna Murthy, India	Sweating(100%), palpitations(80%),chest pain (50%), breathlessness (90%), cough (50%), restlessness(50%), Salivation(90%),nausea(30%),vomiting(30%),abdominal pain (40%), headache (10%), convulsions (5%), blurred vision(15%)	2009

Scorpion venom is a powerful stimulant of the autonomic nervous system. It's effect has been described as a "sympathetic storm"[53]. Scorpion venom acts by three mechanisms:

1) Peripheral action through stimulation of the postganglionic elements of both components of the autonomic system and the adrenal gland with significant catecholamine release;

2) Central sympatheticaction and a reflex mechanism through the carotid sinus or carotid body;

3) A direct stimulant effect on the heart.[57]

The Clinical presentation of scorpion sting is broad and has been aptly described by Neale as" scorpion sting syndrome". On examination, twelve patients (13.8%) had tachycardia, nine patients (10.3%) presented with hypotension. 10 (11.5%) patients presented with hypertension. Seven patients (8%) had profuse sweating on examination. Seven patients (8%) had cold peripheries on admission. Five of the eighty seven cases (5.7%) had features suggestive of pulmonary edema on admission. Thirty patients (34.5%) had sting site tenderness on examination.

Tenderness followed by tachycardia were the commonest finding among the patients presented to the toxicology ward. The patients who presented with systemictoxicity were treated with Prazosin. The patients who presented with hypertension became normotensive during the course of their stay in the hospital.

A 24 year old female patient who presented with pulmonary edema, Type 1 respiratory failure and ECG suggestive of myocarditis was immediately treated with antifailure measures, back rest. ionotropic support with dopamine and mechanical ventilation with PEEP for respiratory support. The pulmonary edema resolved over 2 days. Her general condition improved and she was extubated. The echocardiogram after stabilization revealed a normal cardiac status. She was discharged a week after admission.

No case fatality reported due to scorpion sting during the study period.

The following table gives the signs observed in other studies.

Authors	Clinical presentations observed in the study	Year of Study
Ozkan O.; Kat I., Turkey	Dry mouth(8.6%), sweating(5.3%), hypotension (3.9%),Hypertension(1.3%), tachycardia (0.7%), dyspnoea(1.3%),Cyanosis(0.7%)	2005
K.Radha Krishna murthy	Sweating(100%),cold clammy skin(100%), tachycardia (80%), bradycardia (80%), gallop rhythm (70%), systolic murmur(20%),pulmonary edema (40%),hypertension(20%)	2009
Ken Dittrich et al., Saudi Arabia	Hypertension (75/111), tachycardia (19/111), hypertension With tachycardia (13/111), Hypotension (1/111),seizure (1/111), drowsiness (6/111), hyperventilation (6/111)	2015

By the Pearson's Chi- Square test, there was no statistical significance (P value >0.05) in the difference in local symptoms with respect to age group and gender in this study. There was no statistical significance in the signs with respect to age group and gender in this study.

Electrocardiographic abnormalities were detected in thirty six of the eighty seven (41.3%) patients admitted with scorpion envenomation. The commonest abnormality observed in this study was sinus tachycardia which occurred in twelve patients. Three patients presented with sinus tachycardia associated with ST depression. The second commonest in frequency was T wave inversion was observed in five patients. Tall `T' waves were noted in four patients with ECG changes. An equal number of cases had ST depression.

Two of the scorpion sting cases had right bundle branch block. Two patients had Left anterior hemi block. One patient presented with U wave.

In a study in G.G.H., Kurnool, India, ECG changes were studied in 25 scorpion sting patients (age range:13 to 57 years),sinus tachycardia was the commonest abnormality noted. This is similar to the present study. It was noted in 80% of patients. Sinus bradycardia was noted in 10%. Supraventricular tachycardia was present inn 8%. ST depression and ST elevation in 55% and 10% of the patients studied in kurnool. `T' wave inversion was found in 50% of the patients. Tall `T' waves in 20%. This study too demonstrates the increased frequency of ST and `T' wave changes in scorpion envenomation indicating myocarditis.

Gueron et al.,[27] hypothesized that catecholamine storm post envenomation may cause cardiac dysfunction by catecholamine – induced hypoxia and death might result from myocarditis and congestive cardiac failure[19]. Some authors suggested that cardiac dysfunction in scorpion envenomation may be due to a direct effect of scorpion venom evoking the so called scorpionic myocarditis characterized by non-specific ultra-structural changes. Nouira et al. showed the presence of right and left ventricular dysfunction after scorpion envenomation providing further augumentation to the hypothesis of scorpionic myocarditis.[58]

In a study carried out by Ajay kumar R, M Jayarajah et al. In Sri Ramachandra Medical College and Research Institute, Chennai, nine cases were studied (mean age-42.6 years). On presentation all of them had tachycardia, 7 had diaphoresis, 6 had severe hypertension, 2 had persistent chest discomfort and 2 had palpitations. These patients were found to have typical clinical and electrordiographic features of severe myocarditis and cardiogenic shock. One patient with myocartitis showed acute ST elevation in lateral leads mimicking acute myocardial infarction. Other ECG changes noted were Tall t waves, pseudo infarct Q waves and QTc prolongation[59]

All the patients with ECG changes in this study were found to have elevated serum levels of creatine kinase and creatine kinase isoenzyme-MB. Statistical analysis showed it to be significant at 1% level. This indicates the presence of myocarditis in these patients of the study group.

In studies done in pediatric age group in JIPMER, by S.Das, P.Nalini etal[60].ECG changes were observed in 63% of the envenomated Childrenfifty percent of the children in the study were diagnosed to have Myocarditis, of these in four children the presentation was subclinical. ECG changes were found to be a sensitive indicator of myocarditis. Sixty –nine percent of the children with myocarditis had left ventricular dysfunction as shown by echocardiography. In those children who came for follow up, the left ventricular function was found to be reversed to normal.

Five patients out of the eighty seven patients in this study had pulmonary edema. All five of them recovered. One patient required ventilatory support.

A study was done at the King Edward Memorial Hospital, Bombay, India, by D R Karnad[44] to assess the haemodynamic patterns in patients with scorpion envenomation. Eight patients with Mesobuthus tamulus stings who were admitted to the intensive care unit were studied, (mean age-25.9 years).

From the study it was concluded that two hemodynamic patterns

were Observed[46] a predominantly vascular effect and[47] a predominantly myocardial effect. One patient in the study had intense vasoconstriction and tachycardia which caused hypertension. The cardiac output, pulmonary artery pressure, pulmonary wedge pressure, and right atrial pressures were normal. The author has concluded that hypertension and tachycardia may represent the mildest form of cardiovascular involvement in scorpion envenomation. The predominant myocardial dysfunction resulting in acute left ventricular failure was observed in the rest of the patients in the study. These patients either presented as pulmonary edema if the hydration status was good or hypovolemic shock if there was dehydration.

In the present study, 11.5% of patients had hypertension and another 10.3% had hypotension. There was no significant relationship between the abnormal clinical signs and age group and gender. The echocardiography demonstrated a decreased ejection fraction in those patients with pulmonary edema. While some of the patients with abnormal ECG indicative of myocarditis maintained good ejection fraction.

The patients in this study were graded according to the clinical presentation and the ECG abnormalities . The majority had grade one envenomation-59.8%, 29.9% had grade two envenomation. Nine(10.3%) patients had grade three scorpion envenomation. There was no statistical significance between age groups and gender according to this study with respect to grade.

The serum Creatine Kinase levels of all the scorpion envenomed patients was found to be high compared to the controls. On applying the t-test, there was statistical significance in the difference between the serum CPK levels of the cases and controls. The serum CPK levels of grade three patients were found to be significantly higher than those with grade one or grade two envenomation .

In the study by Ajay kumar et al59., they have found serum CPK to be markedly elevated in all cases with myocarditis. Two out of nine cases developed features of acute respiratory distress syndrome without features of myocarditis.

The mean serum CK-MB levels of grade one, grade two and grade three patients were 17.01, 35.51 and 89.31 respectively showing statistical significance in the difference in the serum levels of the enzyme on applying the Kruskal Wallis 1-way Anova. The mean levels of serum CK-MB in all three grades of scorpion envenomated cases were found to be significantly higher than that of controls.

In this study there was statistical significance in the relation between the serum levels of patients and the electrocardiographic manifestations. Those with ECG changes were found to have high levels of serum CK and serum CK-MB.

In a study by Abdel-Raheim A.M et al[64] on the significance of assessment of serum Troponin I and Interleukin-6 in scorpion envenomed children in Upper Egypt, the authors documented that all the envenomed victims showed significantly higher mean values of CPK,CK-MB and IL-6 on admission in comparison to control group. cTnI was not detectable in the sera of control groups as well as patients with mild envenomation. Adams et al., stated that the increases inTnI don't occur despitesevere acute or chronic muscle injury even when level of creatine phosphokinase and CK-MB isoenzyme are increased unless cardiac injury is present. Troponin I could not be estimated in our study due to technical reasons. The authors have concluded that cTnI is the most specific marker for diagnosis of myocardial injury.

The mean leucocyte count of the study group in this study was found to be significantly higher than the mean of the control group. In those patients who had leucocytosis, the polymorphonuclear cell count was high. Similar observation was also made in a study by D.R Karnad in King Edward Memorial Hospital,[44]. The leucocyte count increases with the grading of the sting. The same observation was also made in a study on scorpion stingin Tunisia.[46]

There was hyperglycemia noted in most of the patients with grade2 and grade 3 sting. This is due to the excessive catecholamine release. The B.sugar decreased to normal levels on subsequent testing. The unopposed action of scorpion venom toxins that cause alpha receptor stimulation lead to suppression of insulin secretion, hyperglycemia, hyperkalemia , freefatty acids and freeradicals accumulation injurious to the myocardium. In a study by K. Radha Krishna murthy et al., they had recorded in 40%of their study subjects[54]

The time interval between the scorpion sting and admission to the hospital was found to influence the severity of clinical manifestations. There was statistical significance in the time interval between the grade of severity and the time taken for hospital admission. In the study at kurnool, India, the authors have noted the increasing severity of clinical manifestations as the time delay between sting and admission is increased.[54] In the study by Ken Dittrich et al. , the average time delay was not more than 2hrs.[53]

The patients in the study group were symptomatically managed with analgesics, local infiltration of lidocaine, prazosin and antibiotics. The patients were given anxiolytics-diazepam/alprazolam if it was needed. Serial blood pressures were taken in those presenting with hypertension.

The patients did not require antihypertensive medications. Patients who presented with shock were resuscitated with intravenous fluids and inotropic agents . One patient with pulmonary edema and type1 respiratory failure required mechanical ventilation. Antivenom was not given for any patient. There was no mortality during the period of study due to scorpion envenomation.

Ken Dittrich et al. have noted that with grade1 and grade envenomation, pain management is the main stay of therapy .Local analgesia, systemic analgesia ,application of ice at the sting site were all found to be useful.

Agents such as paracetamol, NSAID's are useful in recommended doses. Patients can be discharged safely after one hour if they do not fall in to one of the high risk categories and their vital signs are within normal limits. Patients with tachycardia or hypertension should be observed until vital signs return to normal. Since systemic toxicity usually within six hours of the sting, there is no need to retain the patient greater than this time period unless there is risk of serious toxicity. Grades 3 and 4 envenomation require full supportive measures as necessary. All these patients should be admitted to the hospital and followed in an intensive care setting until their condition stabilizes[53]

The use of the following drugs are controversial with studies showing conflicating reports regarding their benefit: lytic cocktail, morphine, steroids (excepting type1 hypersensitivity to antivenom), nifedipine, ACE inhibitors[3,44,53]

SUMMARY

SUMMARY

1. In this study, the incidence of scorpion sting in males (59.8%) was found to be higher than females(40.2%).

2. The incidence of scorpion envenomation was found to be maximum in the age group of 31-40 years (32.2%) and 21-30 years (29.9%). This indicates the risk of exposure to the scorpion sting at work place and during household chores.

3. More patients presented to the Poison center in the night (57.5%) than in the morning. This is in line with the predatory pattern of the scorpions and the risk of disturbing scorpion homes in the darkness of the night.

4. 59.8% of the patients presented with Grade 1 envenomation. 29.9% with Grade2 and 10.3% with Grade3 envenomation.

5. Hand was the commonest site of sting in this study. Most of the scorpion stings were accidental and occurred indoors.

6. Pain (89.7%) and Tenderness (34.5%) were the commonest presenting symptom and sign respectively.

7. Sinus tachycardia (11.5%) was the commonest ECG abnormality seen in the study.

8. There was no significant difference in clinical presentation with respect to age group and gender.(P value=0.496)

9. The patients who presented late to the emergency room after scorpion sting were found to have greater morbidity.(P value<0.001)

10. There was statistical significance in the relationship between ECG changes and biochemical markers like CPK and CK-MB.

11. In grade 1 scorpion sting all the biochemical parameters were with in normal limits. More severe the grading the biochemical values were abnormal.

12. Patients with Grade 1 envenomation treated with local infiltration of lidocaine at the pain site, anxiolytics and observed. Those with Grade 3 envenomation required oxygen and managed with intravenous fluids and inotropic agents for shock. One of the five patients with pulmonary edema required endotracheal intubation.

13. The transient hyperglycemia and hypertension observed in patients with severe envenomation resolved in 48 hours.

CONCLUSION

CONCLUSION

Scorpion sting is common in tropical countries like India. Although majority of the stings are harmless. They have been found to cause significant morbidity, especially in children. Fatalities in both adults and children have also been reported from various studies around the globe.

There is no report of the actual cases of scorpion sting in India because most of the scorpion stings occur in the rural areas and go unreported. Scorpion envenomation in adults needs to be studied to identify the high risk groups and to assess the morbidity caused it.

In this study 36 out of 87 cases had ECG changes. Five of the patients presented with pulmonary edema. There was no mortality due to scorpion sting in the present study.

There was significant correlation between the time delay and severity of envenomation. This indicates a need for immediate medical care following scorpion sting.

According to this study it is seen that patients were stung by the scorpions due to their lack of knowledge about scorpions and due to their carelessness, like putting their hands in to scorpion homes. People living in regions where scorpion stings are common must be educated to be careful while cleaning / searching probable scorpion homes. They must be educated to clean homes or search at work places in bright day light or in artificial light.

Follow up studies are still required to assess the long term complications of scorpion stings.

LIMITATIONS

LIMITATIONS

1. ECG and echocardiograph could not be repeated after 2 weeks due to difficulty in follow up

2. History about the colour of the scorpion could not be asked as most of the scorpion stings happening at night times

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ANNEXURE

PROFOMA

1.NAME :

2.AGE :

3.SEX :

4.IP NO :

5.HISTORY :

1.Time of envenomation

2.Nature of the incident

3.Local and systemic symptoms

4.Number of stings

5.Site of envenomation

6. SYMPTOMS :

I. Local pain

II. Swelling

III. Paresthesia

IV. Chest pain

V. Palpitation

VI. Sweating

VII. Breathlessness

VIII. Giddiness

IX. Redness at the sting site

X. Vomitting

7. PAST HISTORY:

8. VITALS

- Blood pressure
- Pulse rate
- Temperature
- Respiratory rate

9. SYSTEMIC EXAMINATION:

- CVS
- RS
- P/A
- CNS

10. LOCAL EXAMINATION OF STING SITE:

11. INVESTIGATIONS:

- Total count
- Blood sugar
- Blood urea
- Sr Creatinine
- Sr CPK
- Sr CK MB
- ECG
- CXR
- ECHO

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

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CERTIFICATE OF APPROVAL

To
Dr.N.Thiruppathiraja
Post Graduate in MD General Medicine
Institute of Internal Medicine
Madras Medical College
Chennai 600 003

Dear Dr.N.Thiruppathiraja,

The Institutional Ethics Committee has considered your request and approved your study titled **"CLINICAL PROFILE AND ECG CHANGES IN SCORPION ENVENOMATION" - NO.39052018**

The following members of Ethics Committee were present in the meeting held on **03.04.2018** conducted at Madras Medical College, Chennai 3

1. Prof.P.V.Jayashankar :Chairperson
2. Prof.R.Jayanthi,MD.,FRCP(Glasg) Dean,MMC,Ch-3 : Deputy Chairperson
3. Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3 : Member Secretary
4. Prof.N.Gopalakrishnan,MD,Director,Inst.of Nephrology,MMC,Ch : Member
5. Prof.S.Mayilvahanan,MD,Director,Inst. of Int.Med,MMC, Ch-3 : Member
6. Prof.A.Pandiya Raj,Director, Inst. of Gen.Surgery,MMC : Member
7. Prof.Shanthy Gunasingh, Director, Inst.of Social Obstetrics,KGH : Member
8. Prof.Rema Chandramohan,Prof.of Paediatrics,ICH,Chennai : Member
9. Prof. Susila, Director, Inst. of Pharmacology,MMC,Ch-3 : Member
10. Prof.K.Ramadevi,MD., Director, Inst. of Bio-Chemistry,MMC,Ch-3 : Member
11. Prof.Bharathi Vidya Jayanthi,Director, Inst. of Pathology,MMC,Ch-3: Member
12. Thiru S.Govindasamy, BA.,BL,High Court,Chennai : Lawyer
13. Tmt.Arnold Saulina, MA.,MSW., :Social Scientist
14. Thiru K.Ranjith, Ch- 91 : Lay Person

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary - Ethics Committee

Urkund Analysis Result

Analysed Document:	THE CLINICAL PROFILE AND ELECTROCARDIOGRAPHIC CHANGES IN SCORPION ENVENOMATION.docx (D58279436)
Submitted:	11/5/2019 8:28:00 AM
Submitted By:	drntraja@gmail.com
Significance:	22 %

Sources included in the report:

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https://www.slideshare.net/ikramdr01/scorpion-sting-173277069

Instances where selected sources appear:

59

CERTIFICATE – II

This is to certify that this dissertation work titled **"THE CLINICAL PROFILE AND ELECTROCARDIOGRAPHIC CHANGES IN SCORPION ENVENOMATION"** of the candidate **Dr. N. THIRUPPATHIRAJA** with registration number **201711023** for the award of **M.D. Degree** in the **BRANCH I – GENERAL MEDICINE**. I personally verified the urkung.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **22 percentage** of plagiarism in the dissertation.

GUIDE AND SUPERVISOR SIGN WITH SEAL

Prof. Dr. S. USHALAKSHMI, MD.,FMMC

INFORMATION SHEET

We are conducting A study on **"THE CLINICAL PROFILE AND ELECTROCARDIOGRAPHIC CHANGES IN SCORPION ENVENOMATION"** among patients attending Rajiv Gandhi Government Genera Hospital, Chennai.

- Your participation in this study may be valuable to us.

- This study will not affect your treatment The purpose of this study is to assess the clinical profile and elctrocardiographic changes in scorpion envenomation.

- In this study history of patient will be taken, examination will be done and blood test will be taken without disclosing the identity of patients, sample from patientwill be processed and examined . Specific treatment will be given based on diagnosis.

- The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

- Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

In the end of the study period or during the study if anything is found abnormal which may aid in the management or treatmentI will responsible.

Signature of Investigator Signature of the Participant

ஆய்வு தகவல் தாள்

ஆய்வு தலைப்பு : தேள் கடியின் மருத்துவ விவரக் குறிப்புகள் மற்றும் அதனால் இதய துடிப்பலை அளவியில் ஏற்படும் மாற்றங்களை பற்றிய ஆய்வு

ஆய்வாளர் பெயர் : **மரு. ந. திருப்பதிராஜா**

ஆய்வு நிலையம் : பொது மருத்துவப் பிரிவு,
சென்னை மருத்துவக் கல்லூரி, சென்னை-3.

இந்த ஆய்வில் தங்களை பங்கேற்க அழைக்கிறோம். இந்த தகவல் அறிக்கையில் கூறப்பட்டிருக்கும் தகவல்கள் தாங்கள் இந்த ஆராய்ச்சியில் பங்கேற்கலாமா வேண்டாமா என்பதை முடிவு செய்ய உதவியாக இருக்கும். இந்த படிவத்தில் உள்ள தகவல்கள் பற்றி உள்ள சந்தேகங்களை நீங்கள் தயங்காமல் கேட்கலாம்.

இந்த ஆய்வில் தேள் கடியின் மருத்துவ விவரக் குறிப்புகள் மற்றும் அதனால் இதய துடிப்பலை அளவியில் ஏற்படும் மாற்றங்களை கண்டறிகிறோம் மற்றும் அதற்கு இரத்த பரிசோதனை அவசியம், அதற்கு தங்கள் ஒத்துழைப்பு தேவை.

நீங்கள் இந்த ஆராய்ச்சியில் பங்கேற்க நாங்கள் விரும்புகிறோம். முடிவுகளை அல்லது கருத்துகளை வெளியிடும் போதோ அல்லது ஆராய்ச்சியின் போதோ தங்களது பெயரையோ அல்லது அடையாளங்களையோ வெளியிடமாட்டோம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இந்த ஆராய்ச்சியில் பங்கேற்பது தங்களுடைய விருப்பத்தின் பேரில்தான் இருக்கிறது. மேலும் நீங்கள் எந்த நேரமும் இந்த ஆராய்ச்சியில் இருந்து பின் வாங்கலாம் என்பதையும் தெரிவித்துக்கொள்கிறோம்.

இந்த சிறப்புப் பரிசோதனையின் முடிவுகளை ஆராய்ச்சியின் போது அல்லது ஆராய்ச்சியின் முடிவில் தங்களுக்கு அறிவிப்போம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

ஆராய்ச்சியாளர் கையொப்பம்

பங்கேற்பாளர் கையொப்பம் /
இடது கட்டைவிரல் ரேகை

PATIENT CONSENT FORM

Title of the study:

"THE CLINICAL PROFILE AND ELECTROCARDIOGRAPHIC CHANGES IN SCORPION ENVENOMATION"

Name of the Participant :

Patient's age/sex :

Name of the Principal investigator : Dr. N.THIRUPPATHIRAJA

Name of the Institution : Rajiv Gandhi Government General Hospital, Chennai

Documentation of the informed consent

1. I_____have read the information in this form (or it has been read for me). I was free to ask any questions and they have been answered. I am over 18 years of age and exercising my free power of choice, hereby give my consent to be included as a participant in the study.

2. I have read and understood this consent form and the information provided to me.

3. I have had the consent document explained to me.

4. I have been explained about the nature of the study.

5. I have been explained about my rights and responsibilities by the Investigator.

6. I am aware of the fact that I can opt out of the study at any time

without having to give any reason and this will not affect my future treatment in this hospital

7. I hereby give permission to the investigators to release the information obtained from me as result of participation in this study to the sponsors, regulatory authorities, govt. agencies and IEC.I understand that they are publicly published

8. I have understood that my identity will be kept confidential if my data are publicly presented.

9. I have had my questions answered to my satisfaction.

10. I have decided to be in the research study

11. I am aware that if I have any question during this study, I should contact at one of the addresses listed above. By signing this consent form I attest that the information given in this document has been clearly explained to me and apparently understood by me. I will be given a copy of this consent document.

Name and signature/thumb impression of the participant (or legal representative if participant incompetent)

_____ _____ _____

Name Signature Date

ஆய்வு ஒப்புதல் படிவம்

ஆய்வு தலைப்பு : தேள் கடியின் மருத்துவ விவரக் குறிப்புகள் மற்றும் அதனால் இதய துடிப்பலை அளவியில் ஏற்படும் மாற்றங்களை பற்றிய ஆய்வு

பெயர் :
வயது :
பால் :

தேதி :
உள்நோயாளி எண் :
ஆராய்ச்சி சேர்க்கை எண் :

இந்த ஆராய்ச்சியின் விவரங்களும் அதன் நோக்கங்களும் முழுமையாக எனக்கு தெளிவாக விளக்கப்பட்டது. எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்துகொண்டு நான் எனது சம்மதத்தை தெரிவிக்கிறேன்.

இந்த ஆய்வு தேள் கடியின் மருத்துவ விவரக் குறிப்புகள் மற்றும் அதனால் இதய துடிப்பலை அளவியில் ஏற்படும் மாற்றங்களை கண்டறிதல் பற்றிய ஆய்வு என்பதை ஆராய்ச்சியாளர் கூற அறிந்து கொண்டேன் மற்றும் அதற்கு இரத்த பரிசோதனை செய்து கொள்ள சம்மதிக்கிறேன்.

மேற்கண்ட பரிசோதனையின் போது ஏற்படக்கூடிய பின்விளைவுகளையும் முழுவதும் உணர்ந்து இந்த பரிசோதனைக்கு மனமார சம்மதிக்கிறேன்.

நான் ஆராய்ச்சியாளருடன் ஒத்துழைப்பேன் என்றும், எனக்கு ஏற்படக்கூடிய அசாதாரண நிகழ்வுகள் பற்றியும் உடனடியாக ஆராய்ச்சியாளரிடம் தெரிவிப்பேன் என்று உறுதி கூறுகிறேன். இந்த ஆய்விலிருந்து எப்போது வேண்டுமானாலும் எக்காரணமும் கூறாமல் என்னை விடுவித்துக்கொள்ளலாம் என்பதை அறிவேன்.

என்னிடம் இருந்து பெறப்படும் தகவல்களை அரசு, வரைமுறை அதிகாரிகள் ஆகியோர்களுடன் பகிர்ந்துகொள்ள ஆராய்ச்சியாளருக்கு அனுமதி அளிக்கிறேன். என்னுடைய சிகிச்சைக்கட்டுகளை பார்வையிட உரிமை உண்டு. என்னுடைய தகவல்களின் அடையாளம் இரகசியமாக வைக்கப்படும் என்பதை அறிவேன்.

இந்த ஆராய்ச்சியில் பங்கேற்க தன்னிச்சையாக முழு மனதுடன் சம்மதிக்கிறேன்.

பங்கேற்பவரின் கையொப்பம் / ரேகை

பங்கேற்பவர் பெயர்

இடம் :
தேதி :

ஆய்வாளர் கையொப்பம்

ஆய்வாளர் பெயர்

இடம் :
தேதி :

MASTERCHART

	Age/sex	Time of sting	Pain	Paresthesia	Swelling	Chest pain	Sweating	Palpitation	Breathlessness	Giddiness	Redness	Vomiting	Tachycardia	Hypotension
1	16/M	18:30	+		+						+			
2	33/M	19:00	+	+	+		+							
3	21/F	21:00	+	+							+			
4	41/F	7:30	+		+									
5	24/M	9:00	+	+										
6	24/F	20:45	+					+	+				+	
7	15/M	22:30	+	+							+			
8	17/F	11:00			+	+	+		+	+			+	+
9	32/F	20:00	+											
10	19/M	12:00	+		+						+			
11	14/M	13:00	+											
12	35/F	14:30	+	+				+	+		+	+	+	
13	28/M	11:00	+		+									
14	37/F	8:00	+											
15	22/M	7:30	+	+										+
16	29/M	10:30	+	+	+	+	+			+				
17	28/M	15:30									+			+
18	19/F	17:15	+											
19	45/F	17:00	+	+	+									
20	28/F	17:30	+								+			
21	38/M	20:15	+	+	+									
22	44/M	19:30	+	+	+		+	+	+					
23	21/M	22:00	+											
24	15/F	23:30	+	+							+			
25	33/M	23:00	+	+										
26	25/M	10:00			+									
27	23/F	3:30	+								+			
28	27/F	1:30	+	+	+									
29	36/F	7:00	+		+				+				+	
30	29/F	21:45											+	
31	30/M	23:00	+								+			
32	37/F	18:15	+	+										+
33	30/F	22:00	+	+	+									
34	32/F	5:00	+	+							+			
35	18/M	4:30	+											
36	22/M	4:00	+		+									
37	47/F	21:00	+	+										
38	36/F	23:30		+	+					+				
39	31/M	12:00	+								+			
40	34/F	14:00	+	+	+									
41	57/F	18:20	+											
42	39/M	19:00									+			
43	45/M	3:00	+	+	+									
44	31/M	4:45	+		+						+		+	+
45	35/F	5:30	+											
46	55/F	9:30	+	+			+	+	+		+		+	
47	58/M	8:45	+		+									
48	54/F	13:00	+	+	+									
49	27/M	22:00	+					+	+					
50	36/M	16:30	+	+							+			
51	15/M	19:00	+	+	+									
52	52/M	20:30	+					+		+				
53	26/F	14:30	+								+			
54	29/M	4:45			+							+		
55	62/M	1:00	+	+										
56	22/M	3:00	+		+				+		+			
57	17/F	18:30	+	+										
58	22/F	22:30	+	+	+						+			
59	38/M	12:30	+		+									
60	34/M	19:00	+								+			
61	36/M	23:40	+	+	+		+							
62	20/M	12:45	+											
63	34/F	20:15	+		+						+			
64	33/M	3:30	+			+					+		+	
65	24/M	15:00	+	+	+									
66	47/M	16:30	+											
67	44/M	14:00	+	+							+			+
68	29/F	12:45			+								+	
69	32/F	21:00	+					+		+		+		
70	25/M	8:45	+	+							+			
71	19/F	18:30	+	+										
72	37/M	21:40	+											
73	27/M	1:15	+	+	+	+			+				+	
74	28/F	10:45	+											
75	38/M	13:30	+								+			
76	32/M	16:00	+		+									
77	46/M	22:00	+	+										
78	65/M	20:30	+		+									
79	68/M	12:30				+			+	+				+
80	37/M	7:00	+	+	+		+							
81	39/M	19:30	+							+	+			
82	48/M	18:15	+	+					+				+	
83	52/M	15:00	+		+			+					+	+
84	38/M	23:00	+								+			
85	61/F	5:00	+											+
86	50/M	2:00	+	+	+		+					+		
87	66/F	14:00	+											

Hypertension	Profuse sweating	Cold peripheries	Tenderness	Pulmonary edema	Grade 1	Grade 2	Grade 3	Sinus tachycardia	PVC	Sinus tachycardia with ST depression	ST elevation	ST depression	T inversion	RBBB	Tall T waves	LAHB	U wave	CPK U/L
		+	+		+											+		63.45
+			+		+													34.68
						+		+										104.5
+	+			+			+								+			547
			+		+													78.62
			+	+			+				+							1257
						+				+								276
	+	+	+		+													64
					+				+									135
+			+		+													45.34
						+		+										304
					+													86.5
					+							+						38.7
			+		+													26
	+	+					+						+					1420.7
					+													57.56
			+			+		+										356.45
			+		+													36.17
					+													78
					+													68.76
			+		+													124.65
					+									+				112.78
			+			+		+										410.65
+						+							+					288.76
					+													74.31
					+													80.45
			+		+													47
					+													72.65
	+						+	+										1483.56
			+			+												183.78
					+													98.76
						+						+						138.56
					+													45.4
+			+			+				+								330.15
			+		+													36.68
				+			+	+										1570.45
					+													70.42
					+													63.86
			+		+													78.33
					+													103.12
		+				+									+			256.55
			+		+													66.9
					+													73.11
						+									+			388.68
					+													58.7
+			+			+												212.87
					+													39.67
					+													82.98
			+			+		+										172.88
					+													50.65
					+													133.65
		+	+			+							+					360.21
					+													44
						+			+									322.67
			+		+													64.56
+	+			+			+				+							990.32
			+			+		+										138.65
					+													122.14
					+													68.76
+			+			+									+			110.56
					+													83.28
					+													44.23
			+		+													70.34
						+											+	378.66
			+			+							+					174.56
					+													35.78
						+							+					169.56
	+		+			+												98.11
					+													47.89
						+										+		156.39
					+													71.8
					+													40.48
		+	+	+			+	+										854.78
					+													56.32
+						+							+					102.67
					+													60.54
					+													96.17
			+		+													55.78
	+						+							+				1120.43
					+													124.23
+			+			+							+					100.68
						+			+									195.49
							+	+										281.86
					+													44.64
		+				+				+								329.84
			+		+													68
					+													55.98

CK-MB U/L	WBC count cells/cumm	Blood sugar mg/dl	Time interval	Site of bite
4.25	8000	105	30m	R hand
20.2	4500	78	1h	R thumb
35.8	11000	147	1h 30m	L index finger
102	16300	178	4h	R thumb
27.7	10000	107	2h	L big toe
127.8	15000	144	3h 15m	L ring finger
25	9000	88	1h 30m	R wrist
15	8500	111	2h 10m	L leg
22.63	12000	108	1h 15m	R palm
16.2	3800	77	40m	R little finger
42.7	12400	112	3h	L little toe
26.88	7500	98	45m	R hand
14.8	6800	119	20m	L foot
9.68	4800	75	30m	L index finger
116	17000	187	3h 45m	R heel
19.87	9000	124	2h	L thumb
36.22	12000	145	3h 30m	R ring finger
8.68	5000	67	3h	R Hand
18.6	6000	148	1h 40m	L foot
28.6	12000	86	1h	L second toe
30.23	8300	104	1h 45m	R middle finger
27.98	9900	142	1h	L hand
38.6	13000	156	4h	R thumb
31.87	14000	122	3h 30m	L palm
13.67	8000	76	2h	L ankle
12.34	6800	118	2h 15m	R middle finger
5.68	4700	68	30m	R foot
23.16	8400	132	40m	R forearm
120.8	18000	220	5h	L thumb
36.9	12800	138	3h 30m	R palm
14.78	4300	65	2h 15m	R middle toe
40.72	15500	158	4h 15m	L leg
10.68	6700	83	1h 15m	R shoulder
38.9	13500	164	3h 15m	R ring finger
11.79	7000	125	40m	L little finger
116.56	18000	204	3h 45m	L big toe
17.16	9000	133	2h	L hand
16.21	6900	90	50m	R leg
12.44	8000	111	1h 45m	L forearm
21	7400	137	2h 10m	R thumb
35.78	15000	235	1h 40m	L wrist
9.88	4900	93	30m	L heel
17.34	6600	100	2h	R middle finger
40.56	12000	143	4h	L thumb
7.98	9000	114	3h	L hand
27.11	11800	231	3h 45m	R big toe
15.22	10000	88	1h	L foot
21.64	4100	90	2h 15m	R index finger
40.44	7900	122	2h 45m	R little toe
8.68	8500	110	30m	R heel
22.6	3900	81	2h 30m	L middle toe
42.11	15000	170	5h 45m	R hand
30.33	13000	122	1h 10m	R ring finger
35.88	17300	164	2h 30m	L elbow
13.44	6800	93	1h	R middle finger
93.66	18800	196	3h 45m	L big toe
36.43	13800	113	4h 30m	R hand
21.8	5600	86	20m	R thumb
19.45	10400	104	1h 45m	L hand
29.12	14500	208	2h 20m	R foot
23.66	9900	119	30m	R knee
5.44	4500	73	2h	L thumb
7.89	7200	88	1h 10m	R ring finger
38.76	12800	212	4h	L foot
31.44	14400	192	1h	R little finger
6.64	5000	110	40m	L palm
39.11	11900	129	1h 10m	L Hand
22.87	15000	158	3h 30m	R middle finger
26.34	6000	91	1h 10m	R thumb
32.83	16000	142	4h 30m	L heel
12.44	5900	65	1h	R 4th toe
4.87	7300	82	2h 15m	L ring finger
42.21	18000	236	4h 30m	R thumb
20.65	6700	74	30m	L palm
38.33	10800	122	1h 40m	R second toe
26.61	12000	131	20m	L hand
20.16	5400	102	2h	R middle finger
22.86	4000	89	45m	L thumb
38.57	16000	173	4h 45m	L ankle
18.98	8300	118	2h 30m	R hand
25.19	6900	88	1h	L elbow
36.81	10700	124	6h	R heel
46.23	16000	165	5h	R index finger
5.69	5000	96	2h	L little finger
43.78	13000	144	4h 30m	R thumb
16.82	8000	78	1h 45m	R palm
26.92	10200	90	2h 15m	L hand