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Epidemiological Study of Paediatric Burns in a Tertiary Burn Care Center

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ABSTRACT:

Burn injuries in children continue to be a major epidemiological problem in our country. It is a major cause of morbidity and mortality in children. Nearly one third of burn injury occurs in children under the age of 12 years. Majority of the paediatric burns are under the age of 5 years[(1-5)]. There are certain unique features to be kept in mind while managing paediatric burns. The differences in physiology of fluid and electrolyte balance, the uniqueness of the energy requirement and the differences in the body proportions in children dictate the paediatric burn management. If special care is taken during the initial management of burn injuries in children, they children can be effectively treated and integrated into the society as useful and productive members.

Introduction:

Most of the burn injuries in children are minor. Causes of burn injuries vary in different age groups. In the paediatric age group, most of the burns are due to

scalds. Flame injuries occur in children of more than 5 years of age. Child abuse has to be kept in mind when burns occur in suspicious circumstances.

Major burn injuries not only result in local tissue damage, but also cause multisystem damage. Care for these particularly vulnerable patients requires sound understanding of multisystemic pathophysiological effects of burn injuries, as virtually all systems are affected .

The most important factors that lead to improvement in prognosis are the prompt identification of wound status, debridment and effective wound cover. Besides, strides have been made in resuscitation, intensive care, antimicrobials, vascular access and nutritional support[6].

Aim:

In this analysis, we have studied the incidence of paediatric burns,age and sex preponderance, admission criteria, management protocols and outcome of paediatric burn wound management in our centre.

Admission Criteria

The protocol for admission of children to the Burns ward, is as follows.

1. Burns greater than 5 % TBSA
2. Burns involving face,hands, feet, genitalia, perineum and major joints
3. Full thickness burns
4. Electrical burns
5. Chemical burns
6. Circumferential burns
7. Burn injury in patients with pre existing medical disorders
8. Burns with associated trauma
9. Any burn referred from/by other institution / general practice / clinic /health worker requiring expert management
10. Burn injury that has ocurred in suspicious circumstances

Management Protocols

Management of children with burns is challenging for any personnel of the specialburn unit. Appreciating the major differences in burns management in children and adults is important. Children have nearly three times the body surface area to body mass ratio of adults. Fluid losses are proportionately higher in children than in adults. The large BSA to body mass ratio of the child also predisposes to hypothermia.

Children younger than two years have thinner skin and insulating subcutaneous tissue ,than older children and adults. They lose more heat and water than adults. Management of paediatric burn is a major challenge and a team approach is always required [7]

Initial Treatment Considerations in Paediatric Burns

1. Fluid Resuscitation

Should be prompt and aggressive.Thermal injury in children produces major fluid loss within first 24 – 36 hours.A child with less than 10% BSA superficial burns does not need parenteral fluids[8]. In our burn unit,we use the PARKLAND FORMULA.

Total requirement for first 24 hours = 4ml/kg/%TBSA

Infants are at risk of developing hypoglycemia because of limited glycogen stores.Hence we use Ringer's Lactate solution with 5% dextrose for maintenance.

2. Avoidance of Hypothermia:

Children are maintained in a room with 25^0 C temperature. Warm blankets are used and warm pads can be kept under the sheets to maintain optimum temperature. Warm intravenous infusions also help in preventing hypothermia.

3. Pain Relief

Appropriate management of pain in the child with burn injury can be challenging. It is very important tominimize pain to maximize the outcome of burn management. Small doses of intravenous narcotics (0.1 mg/kg of morphine) can initially be administered during the resuscitation period to decrease pain. Intravenous paracetamol is a good adjuvant, along with opioids like morphine in the acute pain management. The intravenous route allows rapid passage of paracetamol into the systemic circulation, leading to a rapid onset and faster distribution of the drug, resulting in higher plasma concentration as compared with oral and rectal route. In case of minor burns less than 15%, adequate analgesia may be achieved with oral analgesics like Ibuprofen 10mg/kg/dose 6-8 hourly and Tramadol in the dosage of 1-2 mg/kg 6 hourly

4. Wound Care

The ultimate aim of wound management in burns is to prevent wound infection and thereby facilitate closure of wounds, either spontaneously as in superficial burns, or provide coverage to the raw areas by autogenous skin grafts. Devitalized skin and ruptured blisters should be debrided. Topical antibiotic therapy is used to delay bacterial colonization. Silver sulphadiazine is the commonly used broad spectrum topical antimicrobial cream.It is applied as a thin layer with gauze dressings, twice a day. It is not used after 5days since it is known to interfere with granulation and wound healing.The concept of early excision of the burn wound and immediate wound coverage is in vogue, which requires good post-operative monitoring. It is generally undertaken around the 5th-7th post burn day, and 5 – 15% BSA is excised at a time.

Out of 284 patients-

1. Collagen was applied for 101 patients.
2. Wound debridement and SSG was done for 45 patients.
3. Abdominal flaps were done for 2 patients .
4. Fasciotomy was done for 2 patients .

5. Shoulder disarticulation was done for 1 patient with gangrene due to electrical burn gangrene.

6.Rest were managed conservatively.

Types of Surgical wound management

a. Collagen Application

Figure1: Wound healing after Collagen application

Collagen application is the mainstay of management (Fig.1) in case of paediatric burns[9]. Collagen is applied after 24 hours and within 72 hours. No dressing is done over the collagen. Collagen is allowed to peel offon its own. If the collagen does not separate in 2 weeks time, debridement and skin grafting is done.

b. Fasciotomy

Fasciotomies are performed without delay over muscle compartments by an incision going through the skin, subcutaneous tissue, deep fascia over the muscles.Fasciotomy on the flexor surface of forearm and wrist is extended into thehand with release of transverse carpal ligament. These post fasciotomy wounds must be covered early (Fig.2) with skin grafts before infection can set in.

Figure 2: Fasciotomy and subsequent skin grafting

c. Split Skin Grafting: Skin graft was commonly done for deeper wounds (Fig.3).It is avoided for wounds over the joints and flexural surfaces .Medium thickness skin grafts are preferred for resurfacing raw areas in children for avoiding deformity ,contractures and also for aesthetic appearance .It is also important to prevent hypertrophic scarring by post operative management of these grafts with adequate compression and massage.

Figure 3: Skin grafting for raw areas and subsequent healing

d. Flap Cover: Flaps are an essential part of reconstruction of burn raw areas in children as the growth of the children may result in contracture if resurfaced with skin grafts only .Flaps are also indicated in raw areas exposing underlying vital structures .The commonest indication for flaps in children are electrical burns (Fig.4), where later reconstruction of tendons and nerves will be required. The commonest flaps done in children are groin flap and abdominal flaps.

Figure 4: Multiple flaps for cover of complicated defects on the hand in a case of electrical burns in a child

e. Disarticulation at The Shoulder

Figure 5: Shoulder disarticulation in a child with gangrene of right upper limb following electrical burns

5. Infection Control

Prophylactic systemic antibiotics are not used in the treatment of burn patients, because it increases the risk of resistant organisms. Instead, the use of systemic

antibiotics is reserved for the treatment of specific infections,depending on the culture and sensitivity results.

6. Nutritional Support

Children with burn injury need increased calories because of the hyperdynamic response after burn injury.Thishypermetabolic state is caused byburns which releasescatecholamines due to injury, pain and anxiety. Children with burns need high protein and high caloric diet. Early enteral nutrition can reduce the hyper metabolic response, preserve gut mucosal integrity and improve intestinal blood flow and motility[10].

The child's caloric requirements can be calculated by CURRERI FORMULA

0-1 YEAR - BMR + 15 KCAL / % BURN

1-3 YEAR - BMR + 25 KCAL / % BURN

4-15 YEAR - BMR + 40 KCAL / % BURN

In our burn unit, we give food like milk, banana, eggs, ice creams, groundnut candy, dates, multigrain kanji and a special mixture of buttermilk, banana and jaggery. In general, a child with a burn greater than 20 – 30 % will require placement of a naso-duodenal feeding tube to provide needed calories.Muscle protein catabolism persists for 6 – 9 months.Sometimes it takes one and half to two years for the negative balance to become normal.

7. Ventilatory Support

Neededin case of facial burns (Fig. 6) /respiratory burns/inhalational injury

Clinical features of inhalational injury [12]

Head and neck burns

Facial oedema

Increased respiratory rate

Singed nasal hair

Inflamed oral mucosa

Hoarseness of voice

Carbonaceous sputum

Facial burns

Figure 6: Facial burns in a child and healing

Indications for Intubation

When there is increased respiratory rate, compromised upper airway patency, compromised mental status and three successive recording of (SpO_2) < 85% over the period of 3 hours, intubation is indicated.

Out of 284 patients, ventilatory support was required for 18 patients (6.3%). Out of the 18 patients, 9 patients survived. Survival rate was 50% in inhalational burns withventilatory support.

8. Physiotherapy and Rehabilitation

To minimize the development of contracture and joint deformities,early mobilization, proper positioning and splintage (Fig 7) is advocated[11].The child is motivated to wear the pressure garments for 2 years.The advantage is that children start playing and using their limbs very early which helps in reduction of development of contracture.Children are encouragedtocolour, paint, and play video games. The caregiver, usually the mother, is the best motivator.

Figure 7: Rehabilitation with compression garments, splints and re-education

Materials and Methods:

It is a retrospective analysis of burn patients admitted in paediatric age group (0-12 years) from Jan 2015 to Dec 2015 in the Department of Burns, Plastic and Reconstructive Surgery, Government Kilpauk Medical College and Hospital, Chennai.

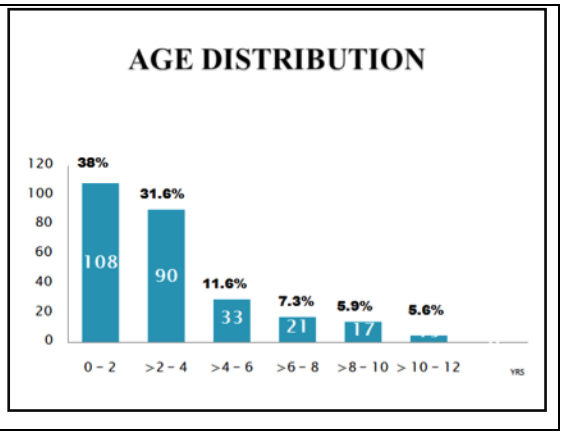
Incidence of Paediatric Burns:

Total number of admissions in the unit from Jan 2015 to Dec 2015 were 1742, out of which, 284 were children. Paediatric burn constituted 16.3% of total admissions.

Age and Sex Preponderance

Age group analysis

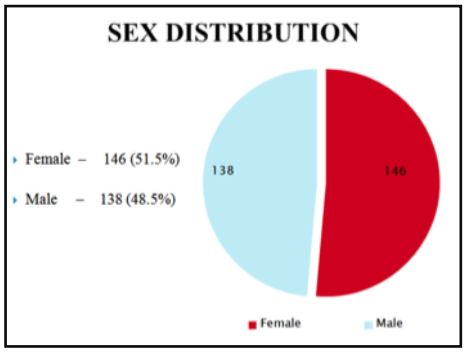
Years	No
0-2	108
2-4	90
4-6	33
6-8	21
8-10	17
10-12	15



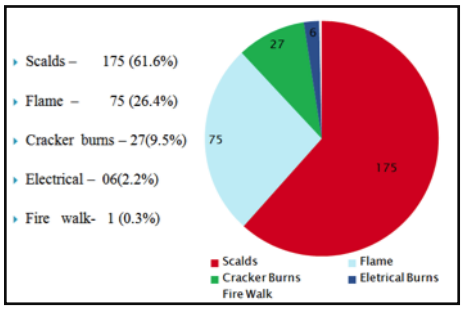
Majority of admissions were under the age of 5 years[1-5].

Sex Distribution

Out of 284 paediatric admissions 138 [48.5 %] were male patients and 146 [51.5 %] were female patients. A very slight female preponderance was observed.



Aetiological Analysis



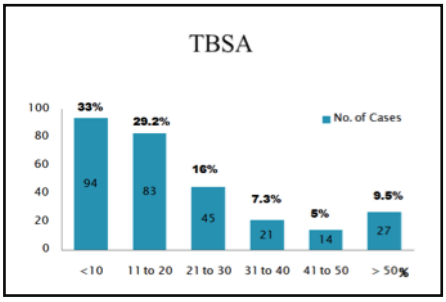
Our study shows that scalds is the most common cause of burn injury in paediatric age group.In less than 5 years age group, most of the burns were scalds.In more than 5 years,mostly flame burns was noted. Child abuse is always kept in mind in case of suspicious burns, inconsistent history,clear line of demarcation in the wound,associated with other injuries and delay in seeking medical attention.

SCALDS	ELECTRICAL BURNS	FLAME BURNS
		
CRACKER BURNS (FIRE WORKS)	**CRACKER BLAST INJURIES**	

Figure 8: Types of burns in children

Burns Surface Area Analysis (BSA)

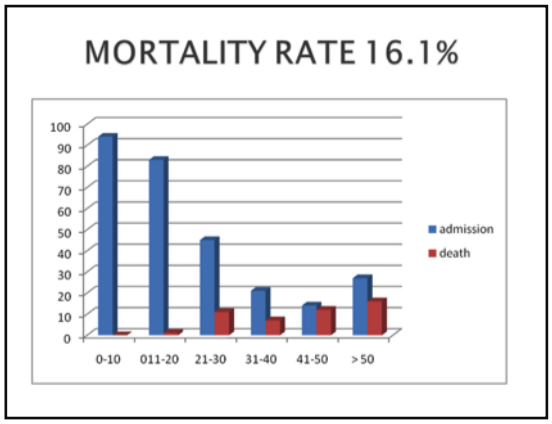
Most of the burn injuries were less percentage. However, the majority of these burn injuries was serious and met the criteria for admission.



Outcome and Prognosis

Out of 286 children 46 children expired. Mortality rate was 16.1 %

% Burns	No of Deaths
1 – 20%	1
21 – 40%	17
41 – 60%	19
61 – 80%	3
81 – 100%	6
Total	46



12 patients in the 40 – 100 % burns range died due to hypovolaemic shock.34 patients died due to septicemia.

Post Burn Day	No. of Deaths	Cause of Death
Within 48 hours	12	Hypovolaemic Shock
> D3	34	Septicaemia

Prevention

Counseling is given to mothers and care takers regarding safety and preventive norms.They are also advicedabout kitchen safety and safety norms while shifting hot liquids from one place to another.Kitchen to be child free zone.School programmes during festivals like Diwali ,are also conducted to create awareness about fire work related burns.Welfare and fire safety awareness programmesare conducted regularly in low socio economic areas (Fig. 9).

Figure 9: Outreach programmes for school children and the community

Discussion

Our study shows 16.3 % paediatric admissions with 16.1 % mortality rate. Scalds was the commonest cause of injury in the peadiatric age group.

Conclusion

Paediatric burns needs special care in the management in terms of early appropriate and adequate fluid resuscitation,proper nutrition, wound care and rehabilitation.Multi modal team approach is mandatory in the management of paediatric burns what are mostly accidental and preventable.

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