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Case Fatality Rate, Determination and Causes of Death in Al Nassiriay Burn Center at 2015 and 2016

Dr. Ali Kadhim Hasson Alhaider **Assist. Prof. Dr. Alaa Jamel Hassan**

Dr. Lamees Majid Hameed

Abstract

A cross sectional study had been extended through 2 years to envolve 611 burn patients from whom 103has been diedfrom they were admitted in AL-Hussain teaching hospital burn center through 2 years February 2015-January 2017which representcase fatality of (16.85%), in different age group between less than one year to more than 67 years old with different percentage of total body surface area burn,we were found that increase rate of death with increasing total body surface area regardless the age of the patients. about 63% of patients were die who had burn of more than 60%of total body surface area in all different ages.while only 3.4% were died with burn of 10—15% and about 30.3% were die who had between 46—59% of burn. about 23% if patients were died who had 36 to 45% of TBSA burn while 7% died who had 26 to 35 % of burn of TBSA .there were increase rate of death in ALNassiryia burn center in young age group between less than 1 year to 5 years were have the same percentage of burn compare with older age group between 40—45 years old in percentage of 22.6% vs 10.2 % respectively , while 20.2% of cases were die in age between less than 1 and 2 years. And 19.04% patients died who have age more 60 years old. The main cause of death was septicemia in AL-Hussen burn center in 61.1% then electrolyte disturbance26.2% and renal failure in 12.62%.the main organism that cause septicemia is mixed bacteria in 35.92% then pseudomonas in 28.15% then proteus 22.33%.researcher were found that the main type of electrolyte disturbance were companied electrolyte in 42.71% then hyponateremia in 28.15%.researcher found that in this study that the most common death patients occur in 2rd degree burn in 47.57% while in 4th degree about 18.4% that is because most of cases with 4th degree burn reach dead or at end stage to the burn unit .and death occur even with first degree burn if there were large percentage of burn with bad managements

Key word ; Burn, Death rate, Age, TBSA

Introduction ;

A burn is injury to the skin, or other tissues, caused by different way as heat, cold, chemicalselectricity,or radiation.[1] Most common cause of burns are heat from hot liquids, solids, or fire. Females in many areas of the world have a higher risk related to the more frequent use of open cooking fires. smoking and Alcoholism are other risk factors. Burns can also occur due to suicidal attempt..[2]

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first-degree burns is affect only the superficial skin layers and appear red without blisters and pain lasts for three days.[3][4] .second-degree burn, (partial-thickness) When burn extends into some of the underlying skin layer it characterize by Blisters are frequently present and they are very painful. Healing can require up to ten weeks and scarring may occur. third-degree burn (full-thickness) the burn extends to all layers of the skin. Itspainless and the burn area is stiff. Healing typically does not occur on its own. A fourth-degree burn involves injury to deeper tissues, such astendonsbone or muscle, .[3] The burn is often black and may leads to loss of the burned part.[3][5]

Burns are preventable.[2] managements and Treatments of burn depends on the severity of the burn , types of burn and any associated injury so we start as ABCD managements . Superficial burns may be managed with simple pain medication, while major burns usually require treatment in specialized burn centers.[3]uses of Cooling with tap water may help pain and decrease damage; but prolonged cooling may result in low body temperature.[3][4] second degree burns may require cleaning with soap and water, followed by dressings. Management of blisters, is probably reasonable to leave them intact if small and drain them if large. Third degree burns usually require surgical treatments, such as skin grafting.[3] large surface area burns require large amounts of intravenous fluid, due to capillary fluid leakage and tissue swelling.[4]infection and electrolyte disturbace are The most common complications of burns.[6] Tetanus toxoid should be given if not up to date.[5]

In 2013, fire and heat resulted in 35 million injuries.[7] This resulted in about 2.9 million hospitalizations and 238,000 deaths.[8]Most deaths due to burns occur in the developing world, particularly in Southeast Asia.[2] While large burns can be fatal, treatments developed since 1960 have improved outcomes, especially in children and young adults.[9] In the United States, approximately 96% of those admitted to a burn center survive their injuries.[10] Burns occur at similar frequencies in men and women.[2] The long-term outcome is related to the size of burn and the age of the person affected.[3]

Burns are caused by different types of external sources classified as thermal (heat-related), electrical, chemical, and radiation.[11] In the United States, the most common causes of burns are: fire or flame (44%), scalds (33%), hot objects (9%), electricity (4%), and chemicals (3%).[12] Most (69%) burn injuries occur at home or at work (9%),[10] and most are accidental, with 2% due to assault by another, and 1-2% resulting from a suicide attempt.[13] These sources can cause inhalation injury to the airway and/or lungs, occurring in about 6%.[6]

In the United States, the most common causes of burns are fire and hot liquids .[6] smoking causes 25% and heating devices cause 22%.[1] Scalding is caused by hot liquids or gases and most

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commonly occurs from exposure to hot drinks, high temperature tap water in baths or showers, hot cooking oil, or steam.[14] in children under the age of five, Scald injuries are most common [3] in children, Contact with hot objects is the cause of about 20-30% of burns [6] .

from 2 to 11% of all burns due to Chemicals cause and contribute about 30% of burn-related deaths.[15] Chemical burns can be caused by over 25,000 substances,[3] most of which are either a strong base (55%) or a strong acid (26%).[15] Most chemical burn deaths are secondary to ingestion.[3]

Electrical burns are classified as low voltage (less than 1000 volts),or high voltage (greater than or equal to 1000 volts), or as flash burns secondary to an electric arc.[3]The most common causes of electrical burns in children are electrical cords (60%) followed by electrical outlets (14%).[6]

,in electrical burn the most damage may occur internally and thus the extent of the injury cannot be judged by examination of the skin alone.[16] cardiac arrhythmias or cardiac arrest. May occue due to Contact with either low voltage or high voltage[16]

Radiation burns may be caused due to exposure to ionizing radiation (such as radiation therapy, X-rays or radioactive fallout) or ultraviolet light (such as from the sun,).[17] Sun exposure is the most common cause of radiation burns and the most common cause of superficial burns overall.[18] There is significant variation in how easily people sunburn based on their skin type.[19] Skin effects from ionizing radiation depend on the amount of exposure to the area, with hair loss seen after 3 Gy, redness seen after 10 Gy, wet skin peeling after 20 Gy, and necrosis after 30 Gy.[20] Redness, if it occurs, may not appear until some time after exposure.[31]Radiation burns are treated the same as other burns.[20] .

Pathophysiology;

proteins begin losing their three-dimensional shape and start breaking down At temperatures greater than 44 °C (111 °F).[21] This results in cell and tissue damage.[3] Many of the direct health effects of a burn are secondary to disruption in the normal functioning of the skin.[3]They include disruption of the skin's sensation, ability to prevent water loss through evaporation, and ability to control body temperature.[3] Disruption of cell membranes causes cells to lose potassium to the spaces outside the cell and to take up water and sodium.[3]

there is a significant inflammatory response In large burns (over 30% of the total body surface area).[22] This results in increased leakage of fluid from the capillaries,[12] and subsequent tissue edema.[3] This causes overall blood volume loss, with the remaining blood suffering significant plasma loss, making the blood more concentrated.[3] Poor blood flow to organs such as the kidneys and gastrointestinal tract may result in renal failure and stomach ulcers.[23]

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Increased levels of catecholamines and cortisol can cause a hypermetabolic state that can last for years.[22] This is associated with increased cardiac output, metabolism, a fast heart rate, and poor immune function.[22].

Estimation of burn according to total body surface area.

First-degree burns that are only red in color and are not blistering

are not included in this estimation.[3]only burn affected by partial thickness or full thickness burns.[3]

There are a number of methods to determine the TBSA, including the Wallace rule of nines, Lund and Browder chart, and estimations based on a person's palm size.[4] The rule of nines is easy to remember but only accurate in people over 16 years of age.[4] More accurate estimates can be made using Lund and Browder charts, which take into account the different proportions of body parts in adults and children.[4] The size of a person's handprint (including the palm and fingers) is approximately 1% of their TBSA.[4]

American Burn Association severity classification[24]		
Minor	**Moderate**	**Major**
Adult <10% TBSA	Adult 10–20% TBSA	Adult >20% TBSA
Young or old < 5% TBSA	Young or old 5–10% TBSA	Young or old >10% TBSA
<2% full thickness burn	2–5% full thickness burn	>5% full thickness burn
	High voltage injury	High voltage burn
	Possible inhalation injury	Known inhalation injury
	Circumferential burn	Significant burn to face, joints, hands or feet
	Other health problems	Associated injuries

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To determine the need for referral to a specialized burn unit, the American Burn Association devised a classification system. Under this system, burns can be classified as major, moderate and minor. This is assessed based on a number of factors, including total body surface area affected, the involvement of specific anatomical zones, the age of the person, and associated injuries.[24] Minor burns can typically be managed at home, moderate burns are often managed in hospital, and major burns are managed by a burn center.[24]

Managements;

Resuscitation begins with the assessment and stabilization of the person's airway, breathing and circulation.[4] If inhalation injury is suspected, early intubation may be required.[12] This is followed by care of the burn wound itself. People with extensive burns may be wrapped in clean sheets until they arrive at a hospital.[12] As burn wounds are prone to infection, a tetanus booster shot should be given if an individual has not been immunized within the last five years.[25] In the United States, 95% of burns that present to the emergency department are treated and discharged; 5% require hospital admission.[15] With major burns, early feeding is important.[22] Hyperbaric oxygenation may be useful in addition to traditional treatments.[26]then Intravenous fluids In children with more than 10-20% TBSA burns, and adults with more than 15% TBSA burns, formal fluid resuscitation and monitoring should follow.[4][27][28] This should be begun pre-hospital if possible in those with burns greater than 25% TBSA.[27] The Parkland formula can help determine the volume of intravenous fluids required over the first 24 hours. The formula is based on the affected individual's TBSA and weight. Half of the fluid is administered over the first 8 hours, and the remainder over the following 16 hours. The time is calculated from when the burn occurred, and not from the time that fluid resuscitation began. Children require additional maintenance fluid that includes glucose.[12] . Additionally, those with inhalation injuries require more fluid.[29] The formulas are only a guide, with infusions ideally tailored to a urinary output of >30 mL/h in adults or >1mL/kg in children and mean arterial pressure greater than 60 mmHg .[12] While lactated Ringer's solution is often used, there is no evidence that it is superior to normal saline.[4] Crystalloid fluids appear just as good as colloid fluids, and as colloids are more expensive they are not recommended.[30][31] Intravenous catheters may be placed through burned skin if needed or intraosseous infusions may be used.[12]

Wound care;

Early cooling (within 30 minutes of the burn) reduces burn depth and pain, but care must be taken as over-cooling can result in hypothermia.[3][4] It should be

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performed with cool water 10–25 °C (50.0–77.0 °F) and not ice water as the latter can cause further injury.[4][21] Chemical burns may require extensive irrigation.[3] Cleaning with soap and water, removal of dead tissue, and application of dressings are important aspects of wound care.

Surgical therapy;

Wounds requiring surgical closure with skin grafts or flaps (typically anything more than a small full thickness burn) should be dealt with as early as possible.[32] Circumferential burns of the limbs or chest may need urgent surgical release of the skin, known as an escharotomy.[33] This is done to treat or prevent problems with distal circulation, or ventilation.[33] It is uncertain if it is useful for neck or digit burns(33). Fasciotomies may be required for electrical burns.[33].

Prognosis;

Prognosis in the USA[34]	
TBSA	**Mortality**
<10%	0.6%
10–20%	2.9%
20–30%	8.6%
30–40%	16%
40–50%	25%
50–60%	37%
60–70%	43%
70–80%	57%
80–90%	73%
>90%	85%

The prognosis is worse in those with larger burns, those who are older, and those who are females.[3] The presence of a smoke inhalation injury, other significant injuries such as long bone fractures, and serious co-morbidities (e.g. heart disease, diabetes, psychiatric illness, and suicidal intent) also influence prognosis.[3] On average, of those admitted to United States burn centers, 4% die,[6] with the outcome for individuals dependent on the extent of the burn injury. For example, admittees with burn areas less than 10% TBSA had a mortality rate of less than 1%, while admittees with over 90% TBSA had a mortality rate of 85%.[34] In Afghanistan, people with more than 60% TBSA burns rarely survive.[6] The Baux score has historically been used to determine prognosis of major burns. However, with improved care, it is no longer very accurate.[12] The score is determined by adding the size of the burn (% TBSA) to the age of the person, and taking that to be more or less equal to the risk of death.[12] Burns in 2013 resulted in 1.2 million years lived with disability and 12.3 million disability adjusted life years.[8]

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Aim of study

1- to detect case fatality rate of burn patientsin AL-Nassiryia burn center
2-to detect the main causes of death in burn patients.
3- to know the relation between the rate of death with the age and percentage of burn to the total body surface area.

Patients and Methods;

This study a cross sectional study , was done in burn unit of AL-Hussain teaching hospital in AL-Nassiryia city since January 2015-till January 2017.this center receive all burn cases in ALNassiryia ,after we receive the patients we were start with them as first line managements ofair way, breathing, circulation, disability(A,B,C,D) as a routine management of traumatized patients in ATLS and if any associated injury then second survey by estimating the percentage of burn according to the role of ninewith estimation the degree of burn ,start with them fluid replacement according to the parkland formula (body weight multiply with percentage of burn and multiply by 4) half amount give in first 8 hours from the time of accident and 2nd half amount give next 16 hours[6]after we gave the patients a strong analgesia as pethedin or morphin . withmonitoringof urine output ,blood pressure, pulse rate ,then give the toxoid tetanus.usually we were not start antibiotic till patients got a fever or other sign of inflammation.then we took data about age, residence , type of burn, from the patients himself or from close relative. , then start with our managements according to the patients condition with fallow up of patients , those patients who began to deteriorate we start with them routinely blood culture with broad spectrum antibiotic till the culture result appear , renal function test in alternative day , blood urea and serumcreatinine with daily serum electrolyte NA, K, CL .we were continue to fallow up the patients till die .we fallow the dead patients to the postmortem and read the final report of the cause of death .

Result; After collection of these data that analyzed manually to estimate the frequency and percentage , so From our study we found in AL-nassiryia unite center death rate increase with increasing percentage of burn regardless the age of the patients so about 63% of cases were died with total body surface area of equal or more than 60 %.(table NO.1) While about 33.3% of cases were died with percentage of burn between 45—59%.(table NO. 1) .about3.4% of cases were died with 10---15% of T.B.S.A burn(table NO. 1). There was a high percentage of death in our study occur at age 1—2 years regardless the burn percentage area about **20.21%** of cases were died at that age group(this is because of high number of patients at this age group) while only **16%**were died at age between 11---35 years (table NO.2). in other hand there were high death rate at age between 1—5 years with the same

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percentage area of burn at age 40---45 year ,22.6% vs 10.2% respectively(table NO.3).

We found that the most common cause of death in burn patients was septicemia in about 61.1% then electrolyte disturbance about26.2% and finally renal failure in 12.62%(figure NO. 4), About septicemia according to the blood culture the commonest microorganism isolated in burn patients who were died was mixed microorganisms in 35.92% then pseudomonas in about 28.15% the proteus infection in22.33% lastly klebseilla in 13.95% (figure NO.5).the most common type of electrolyte disturbance was combined in about 42.7% then hyponaitremia in 28.15 % then hyperkalemia in 17.7% and finally was hypochloredemia in 11.65% (fiqureNO.6). most common death occur with 2rd degree burn about 47.57% this due to large number of burn patients come with this degree,then third degree burn carry mortality about 32.03%,then 4th degree burn 18,4% ,and even with first degree burn also there were some percentage of death occur about 1.94% this due to large area of burn and bad managements.(Table NO.7)

Table NO.1 Distribution of Burn Cases According to TBSA

TSBA	10---15%	16---25%	26---35%	36---45%	46---59%	60---and more
NO. of burn pt	88	144	157	78	79	**65**
No. of death	3	6	11	18	24	**41**
Percentage	3.4%	4.1%	7%	23%	30.3%	**%63**

Table NO. 2 Distribution of Burn Cases According to the Age

AGE	>1—2 y	3---10 y	11---34y	35---45y	46---60y	>60y
NO. of pt	**183**	**159**	**131**	**73**	**44**	21
NO. of death	**37**	**22**	**21**	**14**	**5**	4
Percentage	**20.21%**	**13.83%**	**16%**	**19.1%**	**11.36%**	19.04%

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Table NO.3 Death Rate according to the Age with Same Percentage of TBSA

age	Percentage of burn	NO. of patients	NO. of death patients	Percentage
>1---5 years	**25---30**	**45**	**11**	24.4%
40----45 years	**25---30**	**38**	**4.85%**	10.2%

Table NO.4 Distribution of Death cases According to the Causes

Cause of death	Septicemia	renal failure	electrolyte disturbances
NO. of patients	**63**	**13**	27
percentage	**61.1%**	**12.62%**	26.21%

Table NO. 5 Distribution according to the Types of Microorganism

microrganism	psedomonus	Proteus	klebseilla	mixed
NO. of patients	29	23	14	**37**
percentage	28.15	22.33	13.59	**35.92**

Table NO. 6 Types of Electrolyte Disturbance in Dead Patients

Types of electrolyte dist.	hyponitremia	Hyper kalemia	hypocloredemia	Companied
NO. of patients	**29**	**18**	**12**	44
Percentage	**28,15%**	**17.47%**	**11.65%**	42.71%

Table NO. 7 Distribution of Death Cases Related to the Degree of Burn

Degree of burn	1st degree	2nd degree	3rd degree	4th degree
NO. of dead patients	**2**	**49**	**33**	19
percentage	**1.94**	**47.57**	**32.03**	18.4

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Discussion;

There is a highincidence rate of death occur in AL-Hussainburn unite 16.85% through 2 years of 2015—2016 ,the death were increase with the increasing total body surface area burn so about

63% of death occur in burn unite when the total body surface area burn equal or more than 60% and this is similar to many study occur over the word as in Egypt and Malaysia(9). but in our unit there were ahigh percentage of death occur when the TBSA burn between 36-45% in which about 23% of cases where die which different from other study in many developed countries as in U.K and USA. Why this different ?this because an optimal burn center present with isolation of patients and disinfected and a an optimal sterilization in these unit. For that bad and non isolated our burn unite with bad hyogen and sterilization with poor staff experience in burn managements there were a lot of patients die even with low TBSA burn about 3.4% of cases were die with 10—15% of burn .for the same reasons which mention it above the we see the most common cause of death were septicemia about 61.1% of cases were die with mixed bacteria and main otherbacteria was pseudomonas 28.15% this result carry on with other studies in different countries but the percentage of death was lower than our result. There were high rate of death occur with 2th degree burn in percentage of 47.57% while in 4th degree only 18.04% and this due to a large number of burn cases come with the 2nddegree burn and less cases reach to our unite with 4th degree with small percentage of total body surface area burn . while about 1.94% of 1st degree burn were died this because high percentage of TBSA burn with the all disadvantage of our burn center which we mention it above.. electrolyte disturbance represent 26.2% causes of death with companied electrolyte disturbance represent 42.7% which represent high percentage then hyponitremia and hyper kalemia in percentage of 28.15 and 17.47% respectively. That means were difficult to control on the serum electrolyte after burn because of fluid loss from intravascular to interstitial tissue with in appropriate replacement and bad fallow up of patients in burn unit.

There were a high rate of death occur in small age group between less than one year till 5 years who have had the same percentage of total body surface area of burn(24.4% death) with those who have 40—45 years ,(10.2% death only).in other hand there were high death rate at age between 1—5 years with the same percentage area of burn at age 40---45 year ,22.6% vs 10.2% respectively.,that means there were increase rate of death with increasing percentage of total body surface area while decreasing with the increasing age of patients in children with the same percentage area of burn which is not corresponding with the Baux score(mortality rate

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equal to the age plus total body surface area).this result is differ from other result in U.K in which there were increase death with increase the age of children [22].

Conclusion;

There were ahigh percentage of death rate occur in AL-Nassiryia burn center associated with increaseof total body surface area burn in number higher than other countries even in developing countries.increasing death rate in young age group due to septicemia and electrolyte disturbance and degree of burn also higher than other study in neighboring countries.there were a percentage of death occur with low burn area according to TBSA due to septicemia , electrolyte disturbance and even renal failure . why all this happened ? why this ahigh number of death occur?. For these tow questions we need;

a- appropriatebuildingfor burn center. b-perfect sterilization and disinfection of the burn center rooms and there instruments. c-prevention of any outside visiting to the patients. d- well trained staff who work in the burn centre.E-prepare agood management appropriate dressing and topical antibiotic to prevent or decreasing rate of septicemia which represent the main cause of death with proper fluid replacement and daily serum electrolyte assessment. We need to complete the newbuilding of burn center in AL-Hussen teaching hospital.

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نسبة ومحددات الوفيات واسبابها للمرضى الراقدين في ردهة الحروق لمستشفى الحسين التعليمي لعامي ٢٠١٥ & ٢٠١٦

الدكتورعلي كاظم حسون الاستاذ المساعد الدكتور علاء جميل حسن
الدكتورة لميس ماجد الجنابي

الخلاصه : دراسه مقطعيه اجريت في ردهه الحروق لمستشفى الامام الحسين التعليمي في محافضه الناصريه خلال عامين من شباط ٢٠١٥ الى كانون الثاني ٢٠١٧ لمعرفه نسبه الوفيات للمرضى الراقدين فى هذه الفتره حيث ان ١٠٣ وفاه حصلت من اصل ٦١١ مريض دخلواالردهه في هذه الفتره أي بنسبه ١٦,٨٥ % .حيث تبين من خلال الدراسه ان نسبه الوفاه تزداد مع نسبه ازدياد مساحه الحرق للمريض حيث ان ٦٣% من المرضى اللذين توفوا لديهم نسبه حروق اكثر من ٦٠% من مساحه الجسم في كل الفئات العمريه ،بينما ٣,٤% من المرضى توفوا لديهم حروق من ١٠ –١٥% و٣٠,٣% قد ماتو لديهم نسبه الحرق ٤٦ الى ٥٩% وكذالك وجد ان نسبه الوفاه تزداد بين الاعمار ١ الى ٥ سنوات اللذين لديهم نفس نسبه الحروق للاعمار ٤٠ –٤٥ سنه بنسبه ٢٢,٦% و ١٠,٢% بالتوالي ، بينما ٢٠,٢ % من المرضى توفوا يحملون الاعمار من ١ -٢ سنه و ١٩,٠٤% من المرضى اللذين توفوا يحملون اعمار اكثر من ٦٠ سنه كما وجد من خلال البحث ان السبب الرئيسي للوفاه هو تسمم الدم الجرثومي بنسبه ٦١,١% ياتي بعده تخلخل بنسبه الاملاح بنسبه ٢٦,٢% ثم الفشل الكلوي بنسبه ١٢,٦٢% واهم البكتريا اللتي تسبب تسمم الدم الجرثومي هي البكتريا المختلطه بنسبه ٣٥,٩٢% ثم بكتريا pseudomonas بنسبه ٢٨,١٥% واهم الاملاح المتخلخله هي الاملاح المختلطه الصوديوم والبوتاسيوم والكلور والكالسيوم بنسبه ٤٢,٧١% ثم قله الصوديوم بنسبه ٢٨,١٥% ووجد ان نسبه الوفاه تزداد للمرضى المصابين بالدرجه الاولى والثانيه من الحروق بنسبه ٤٧,٥٧% بينما الدرجه الرابعه نسبه الوفاه هي ١٨,٤% وذالك بسبب زياده المرضى الراقدين المصابين بالدرجه الثانيه من الحروق .

الاستنتاجات :ان نسبه الوفاه في ردهه الحروق التابعه الى مستشفى الحسين التعليمي كبيره وذالك بسبب عده عوامل واسباب اهمها

١- زياده نسبه الحروق بالنسبه الى الجسم
٢- عدم وجود التعقيم الكامل او العزل الكامل للردهه
٣- السماح لزيارات ذوي المرضى الراقدين بالرده بدون أي وسائل عزل او تعقيم للزائرين
٤- عدم وجود كادر وسطى مدرب على كيفيه معالجه او التعامل مع الحروق

المقترحات:

١- اكمال بنايه وحده الحروق التابعه للمستشفى بالسرعه الممكنه من خلال التبرعات بعد اجراء دعايه اعلاميه في قنوات التلفاز واهميه هذه الوحده لانقاذ حالات الحروق الحرجه.
٢- تدريب كادر وسط على كيفيه التعامل والتداوي مع حالات الحروق اللتي تحتاج الى دخول الى ردهات الحروق
٣- الضغط على ذوي المرضى بعدم زياره ذويهم ودخولهم الرده هالا بعد تبديل ولبس الملابس المعقمه .
٤- معرفه اسباب الحروق اتي تصيب الاشخاص ووضع الحلول الجاده لها عن طريق الاعلام والتوعيه الصحيه.