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Original Research Article

Histopathological study of lungs, kidney and spleen in death due to burns

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ABSTRACT

Introduction: Burn injuries occur universally and have plagued mankind ever since antiquity till the present day. As burns continue to be a major problem, a prospective study of demographic and pathological profile in deaths due to burns was conducted at the Department of Pathology Karnataka Institute of Medical Sciences Hubballi.

Objectives: To study the demographic profile, histopathological changes in lungs, kidney and spleen and to find the cause of death in cases due to burns.

Materials and Methods: The present study was carried out in the Department of Pathology, Karnataka institute of medical sciences, Hubballi, during the period of one year from 1-11-2014 to 31-10-2015. Total of 44 cases with burn injuries were used as material for study purpose and the collection of tissues were done for histopathology examination.

Results: This study includes 44 autopsy cases of death due to burn, of which majority were females. The age of the subjects ranged from 13 years to 65 years. Maximum numbers of victims were found in the age group of 21-30 years were 22 cases (50.00%).Most of the female victims were married and housewives. Most common manner of the burn were said accidental burns in 27 cases (61.36%) and 13 cases (29.54%) were due to suicidal burns, 4 cases (9.09%) were homicidal burns.

Conclusion: Burns were more common in females most were married. Age group most commonly found was between 21-30 years of age probably related to dowry related issues, inexperience in cooking styles, house hold works, and inability to bear stress. Most common place of burns were kitchen. Most common manner of burns were said accidental. Most common cause of burns was due to said kerosene spill over or self pouring. TBSA involved more than 76%, in maximum number of cases. Maximum finding were seen in lung. Most common findings were diffuse alveolar damage, acute tubular injury and congested splenomegaly.

1. Introduction

Burn injury is one of the common medical emergencies admitted to any hospital and is an important public health problem throughout the world.[1,2]

The ultimate goal is to help the patient to return to his/her natural lifestyle and lead a normal life as early as possible, so that he /she is not a burden on his / her family.[3] Current study caters to understanding the demographic profile of burn cases, as well as histopathological changes in various organs of deaths due to burns. The major cause of death in the burn patients includes multiple organ failure and infection. Autopsy and particularly autopsy histology are still the most accurate method of determining the cause of death and auditing accuracy of clinical diagnosis, diagnosic

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tests and death certification.[4] So proceeding in the same path, this study is an effort to identify the pathological changes in various organs in burn victims.

2. Materials and Methods

The present study was carried out in the Department of Pathology, Karnataka institute of medical sciences, Hubballi, during the period of one year from 1-11-2014 to 31-10-2015. Total of 44 cases with burn injuries brought to the mortuary for autopsy were used as material for study purpose and the collection of tissues were done for histopathology examination. Thorough and complete post mortem examination was conducted on all the bodies.

2.1. Inclusion criteria

All cases of burns, brought for medico-legal postmortem examination to mortuary at Karnataka Institute of Medical Sciences, Hubballi for autopsy.

2.2. Exclusion criteria

Cases with history of sustaining other thermal injuries like scalds, electrocution and lightening were excluded from the study.

2.3. Source of data

Data for the present study was collected from mortuary, Karnataka institute of medical sciences, Hubballi.

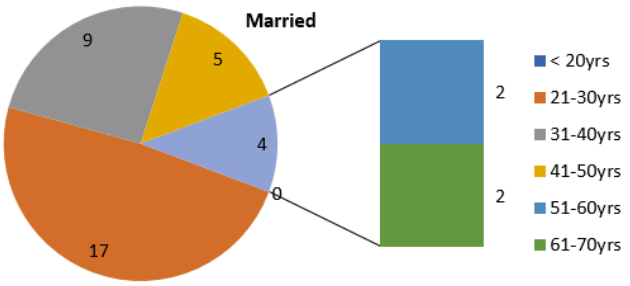
The details of the case were collected as

1. History obtained from the relative of the deceased.
2. Inquest papers furnished by police for autopsy.
3. Indoor case papers.
4. Postmortem reports of burn cases of the study period.
5. Histopathology reports of the organs sent.

During autopsy, samples of lungs, kidneys, spleen were collected and preserved in 10% formalin solution. These were taken to Department of pathology for histopathology examination. After proper fixation of organs in 10% formalin, grossing was done and sections from representative areas had been taken and processed for microscopic histopathology examination using H&E stain in all cases.

3. Results

The present study comprises the profile of 44 cases of deaths due to burns that were subjected to autopsy, at mortuary in Karnataka Institute of Medical Sciences, Hubballi, during the period of one year from Nov 2014 to Oct 2015. Current study caters to understanding the demographic profile of burn cases, as well as histopathology changes in lungs, kidney and spleen of the deaths due to burns. Out of 44 cases, 33 (75.00%) were females and 11 were males (25.00%). Chi-Square value = 6.09, P = 0.29 Not Significant.Maximum numbers of victims were found in the age group of 21-30 years which were 22 cases (50.00%). Out of which 16 cases (48.72%) were females, 6 cases (54.54%) were males. Next common age group involved were 31-40yrs, 11 cases (25%), out of which 8 cases (24.06%) were females, 3 cases (27.28%) were males got affected by burns.



Graph 1: Distribution of cases according to marital status and age.

Above Graph 1 shows distribution of cases according to marital status In the present study most of the married victims, 17cases (45.96%) were in the age group of 21-30 years. Most of unmarried victims 5 cases (71.40%) were in the age group of 21-30 years. The next common age group involved was 31-40 years were 11 cases (29.72%).

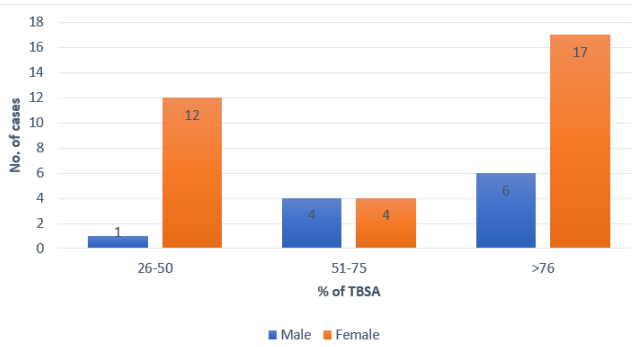
In India below 7 years married female burn deaths are linked with dowry death, Government of India made guidelines for unnatural death of female within seven years of marriage or if she is below the age of thirty years, an autopsy is compulsory in an attempt to establish the cause of death and circumstances leading to death.

In the present study 15 cases (34.09%) of married female belonged to 21 -30 years of age group who might be probably prone for harassment from the family members. some of them were burnt to death were 4 cases and others choose to end life by litting themselves with fire with help of kerosene. were 4 cases. Others 7 cases met with stove burst with spill of kerosene accidentally as taken history from records.

Depicts distribution of cases according to causes of burns. In the present study self inflicted burns with kerosene was most common cause of burns., out of which 7 cases (63.64%) were in males, 17 cases (41.46%) were in females. Next common cause was spill of kerosene 10 cases (22.72%) either while pouring kerosene to stove, pumping the stove or litting wood for fire to cook, out of which 1 case was male(9.09%),9cases (27.28%) cases were females.

The Graph 2 depicts most of victims in both males and females suffered superficial to deep burns of more than 76% with 6 cases (54.54%) and 15 cases (50.00%) cases in males

and females respectively in the present study.



Graph 2: Distribution of cases according to total body surface area of burns and sex.

The above Table 1 shows Most of the victims; 19 cases (43.18%) who survived for 2-7 days had more than 76% of TBSA burns and least 4 cases (12.19%) had 26-50% of TBSA burns. Burn victims 9 cases (20.45%) who survived for less than one day had more than 76% of TBSA burns. Majority of victims 4 cases (44.45%) who survived for 8-14 days had 26-50% of TBSA burns .Most of victims 5 cases (71.42%)who survived for more than 14 days had 26-50% of TBSA burns. Co-relation between TBSA burns and survival period was found to be statistically significant with P value of 0.001. In the present study.

In the present study, most common pathology findings were in lungs followed by kidney and spleen. In lungs most common findings were CVC lungs 14 cases (34.14%), followed by diffuse alveolar damage 11 cases (26.82%), pulmonary edema 9 cases (21.95%), bronchopneumonia 7 cases (17.07%), lobar pneumonia 2 cases (4.87%). Next common organ involved is kidney. Most common finding in kidney were acute tubular necrosis 24 cases (58.53%).next cause chronic pyelonephritis 4 cases (9.75%), acute pyelonephritis 1 case (2.43%). Next common organ cause for burns was spleen showing CVC spleen in 30 cases (73.17%), followed by congested spleenomegaly in 20 cases (48.78%). Most of the histopathology findings were overlapping in two organs. Next common cause were multi organ failure 14 cases (34.14%) as shown in the table no 2.

Above Table 3 and Table 4 depicts distribution of cases according to pathological findings in lungs in the present study. Most common findings were CVC lungs, 16 cases (36.36%),followed by diffuse alveolar damage 11 cases(25.02%), pulmonary edema 9cases(20.45%), bronchopneumonia 6 cases (13.63%), lobar pneumonia 2 cases(4.54%).

In the present study, most of the cases externally were unremarkable in 22 cases (50%) ,congestion with petechial hemorrhages in 10 cases(22.72%), and cut surface common findings were congestion, pale cortex 12 cases (27.27%).

Figure 1: Specimen of Lung on cut surface shows congestion

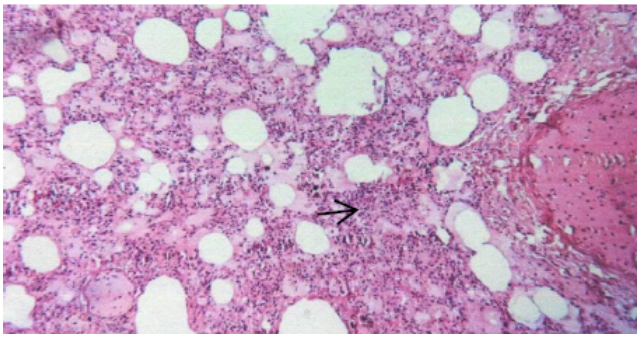


Figure 2: Microscopy of Lung showing intraalveolar and interstial edema and inflammatory cells (H&E 10X)

Table 6 shows distribution of cases according to pathological findings in kidney. Acute tubular necrosis was observed in 26 cases (59.09%), 11 cases (25%) showed normal histopathology appearances, 5 cases (11.36%) showed chronic pyelonephritis and 2 cases (4.54%) showed acute pyelonephritis in the present study.

Figure 3: Cut surface of Kidney showing pale cortex and congested medulla

In present study, in most of the cases externally were unremarkable about 24 cases (54.54%), 17 cases (38.63%) of spleen were enlarged, petechial hemorrhages in 12

Table 1: Distribution of cases according to total body surface area of burns and survival period in days.

Survival period &	< 1		2-7		8-14		>14	
% TBSA	No	%	No	%	No	%	No	%
26-50	0	0.00	4	21.06	4	44.45	5	71.42
51-75	0	0.00	6	31.58	3	33.33	1	14.29
>76	9	100.00	9	47.36	2	22.22	1	14.29
Total	9	100.00	19	100.00	9	100.00	7	100.00

Table 2: Distribution of cases according to histopathology diagnosis.

Histopathology diagnosis	No	%
Bronchial edema	9	20.45
Bronchopneumonia	7	15.90
Lobar pneumonia	2	4.54
CVC Lung	14	31.81
Diffuse alveolar damage	11	25
Congested splenomegaly	20	45.45
Acute tubular injury	9	20.45
Acute tubular necrosis	15	34.09
Acute pyelonephritis	1	2.27
Chronic pyelonephritis	4	9
Multiorgan dysfunction syndrome	14	31.81

Table 3: Distribution of cases according to gross findings in lungs.

Gross findings in lungs	No.	%
(A) **External surface**		
unremarkable	29	65.9
Congested	8	18.18
Petechial hemorrhage	7	15.9
Total cases	44	100
(B) **Cut surface**		
Spongy	9	20.45
Congested	19	43.18
Consolidated	16	36.36
Total cases	44	100

Table 4: Distribution of cases according to microscopic findings in lungs.

Microscopic findings	No.	%
C V C Lung	16	36.36
Pulmonary edema	9	20.45
Bronchopeumonia	6	13.63
Lobar pneumonia	2	4.54
Diffuse alveolar damage	11	25.02
Total cases	44	100

Table 5: Distribution of cases according to gross findings in kidney.

Gross findings	No.	%
Unremarkable	22	50
Congestion with Petechial Hemorrhage	10	22.72
Pale cortex	12	27.27
Total cases	44	100

Table 6: Distributionof cases according to microscopic findings

M icroscopic findings	No.	%
Unremarkable	11	25
Acute tubular necrosis	26	59.09
Acute pyelonephritis	2	4.54
Chronic pyelonephritis	5	11.36
Total cases	44	100

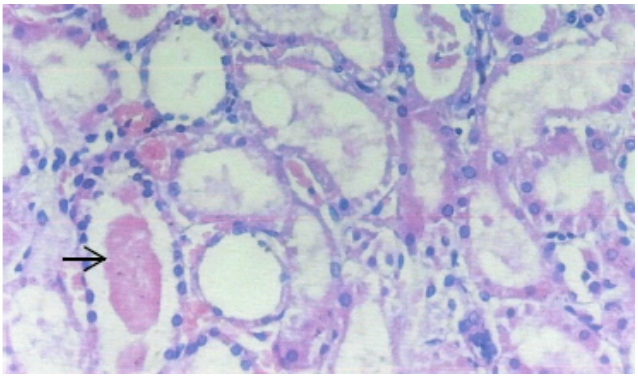


Figure 4: Microscopy of kidney showing acute tubular injury with tubular cast formation (H&E-40X)

Figure 5: Cut surface of spleen showing congestion

cases(27.27%), cut surface most common findings were congestion of about 30 cases (68.18%).

Table 7: Distribution of cases according to microscopic findings in spleen.

Microscopic findings in spleen.	No of cases	Percentage
Congestion	32	72.72%
Haemorrhage	12	27.27%
Necrosis	8	18.18%
Enlarged lymphoid follicles	18	40.90%
Hyalinised blood vessels	16	22.72%

Out of 44 cases Congestion was observed in 32 cases (72.72%), 12 cases (27.27%) showed hemorrhage and 8 cases (18.18%) showed necrosis, 18 cases (40.90%) showed diffuse enlarged lymphoid follicles, and 16 cases (22.72%) showed hyalinised blood vessels. Table 7

In the present study, 24 cases (54.54%) died due to septicemia shock. Neurogenic shock was main cause of death who survived less than 24 hours observed in 10 cases (22.73%). The other cause was hypovolemic shock 5 cases (11.36%), toxemia with 5 cases (11.36%).

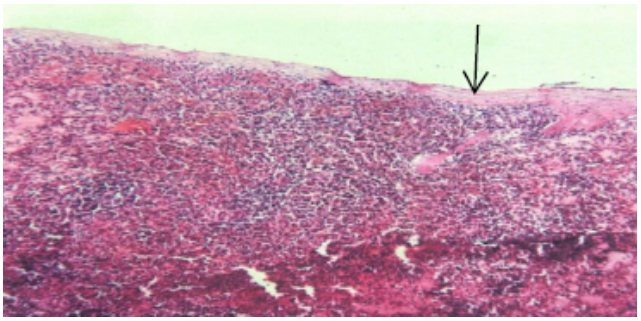
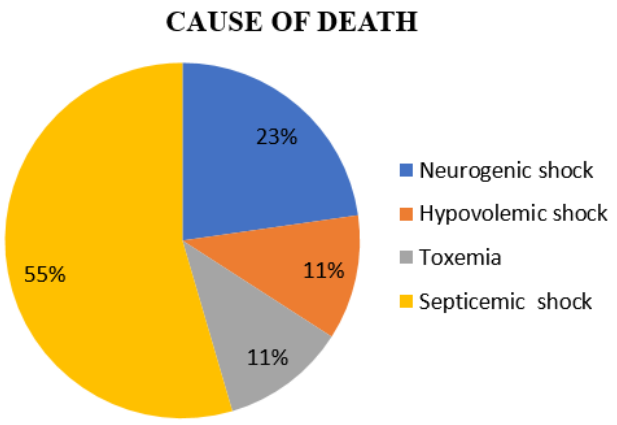


Figure 6: Microscopy of spleen showing congested sinusoids with thick capsule



Graph 3: Distribution of cases according to clinical final cause of death.

4. Discussion

Burn cases are among the most emergent and priority situations for treating doctor and a medico legal person. The observations of the present study and their correlation with other studies are discussed in following paragraphs

In the present study the age of the cases ranged from 13 years to 65 years with the mean age of 31.08 years, with 33 female cases (75.00%) and 11 male cases (25.00%). Maximum number of cases were found in the age group of 21-30 years with 22 cases (50.00%), out of which 16 cases (48.72%) were females and 6 cases (54.54%) were males. Chawla et al[1] in 2005 in his study had 36% of male and 64% of female, out of which majority were in age group 21-30 years. Shinde et al[5] in 2008 in their study had 14.55% male and 85.45% female, majority were in 21-30 years. Sarashwati et al[6] in 2013 had 11.98% males and 88.09 females and majority (47.07%) were in 21-30 years age group

Kerosene tops the list of the main causative agent of burns with 38 cases (86.36%) (either due to stove burst or due to fall of kerosene container or pouring of kerosene on victim) and flame burns without involvement of kerosene in 6 cases (13.65%)

This finding is similar to the studies conducted by Ambade VN. et al,[7] Singh D. et al,[8] and Zanjad NP et al.[9] As kerosene is easily available and highly inflammable and also more the use of kerosene, more is the risk involved.

It is observed the relationship between the percentage of TBSA and survival period of burn victims was highly significant. Majority of cases had more than 50% of TBSA burns indicating the incompatibility with life. Among the five cases (11.36%) with < 40% burn all survived for more than two weeks. Cases with more than 50% TBSA burns, 6 cases (13.65%) survived for a week and 3 cases (6.83%) for more than a week one case (1.90%) after two case weeks. This is in accordance with Afify. M et al[10] study. From these observations it can be deduced that if percentage of burns is more, survival period is less and vice ersa cases with more % TBSA had tendency to survive for lesser duration. Koulapur V V.et al[11](2005 - 2009) in his study conducted on 119 cases of deaths due to burns at Sri B M Patil Medical College Bijapur, states that there were 89 (74.78%) females and 30 (35.22%) males. Majority of deaths occurred in the age group of 21-30 years with 41 cases (34.45%) followed by age group 31-40 with 28 cases (23.53%) and 24 cases (20.16%) were seen in the age group of 11-20 years. The majority of the burn incidents were accidental with 93 cases (78.2%) followed by suicidal 21 cases (17.5%) and homicidal 5 cases (4.3%). The most common place of burn incidence was home. Majority of the victims survived for more than 72 hours to one week with 38 cases (31.93%), more than one week 22 cases (18.48%) and 24 to 48 hours, 11 cases (9.24%). The total body surface area (TBSA) in majority of the cases was 81-90%, with 37 cases (31.1%) and 50% or less in 15 cases (12.6%). Septicemia was the most common cause of death in 70 cases (58.9%), followed by hypovolemic shock with 22 cases (18.5%) and in 15 cases (12.6%) it was neurogenic shock.

Lungs are major and early organ involved in burns. In the present study, wide varieties of histopathology features were observed. Most common findings were CVC lungs, 14 cases (34.14%), followed by diffuse alveolar damage 11 cases (26.82%), pulmonary edema 9 cases (21.95%), bronchopneumonia 7 cases (12.19%), lobar pneumonia 2 cases (4.87%). Similarly study were done by Shashwati et al[6] in his study had 73.63%of CVC Lung, 55.45% of pulmonary edema and 20% of pneumonia cases. Hasleton PS.et al[12](1983) conducted study on 68 fatal burn cases, noted congestion of alveolar walls, capillary proliferation, interstitial and intra alveolar edema and intra alveolar hemorrhage in first 48 hours. Pneumonia and septicemia were common findings after 48 hours. Intravascular micro thrombi denoting disseminated intravascular coagulation along with above changes were also noted after 48 hours. Hyaline membranes were uncommon, being found in only four cases (5.8%).

Toor AH et al[13] (1990) conducted study on 33 fatal burn cases and observed diffuse alveolar damage (DAD) in 16 cases (48.48%). Acute bronchopneumonia and necrotizing inflammation were seen in 7 cases (21.21%) each.

In the present study it was observed that of 18 cases (37.50%), gross findings in kidneys were unremarkable, it was observed that majority, 60.98% of cases showed acute tubular necrosis, followed by 46.34% cases showed cloudy degeneration. Pyelonephritis was seen in 12.19% and 43.9% cases showed tubular cast. Similarly studies were done by Mithal R et al[14] showed 15.45% of cloudy degeration 31.81% of tubular cast, 16.36% of Acute tubular necrosis and pyelonephritis of 9.09% cases, Shinde et al[5] also showed similar results in their studies. Cerenca D.et al[15] (2000-2003) conducted study on 39 cases of fatal burns of which 9 cases (23.07%) the renal lesions were minor but critical, presented with symptoms of acute renal failure (ARF). In 25 cases (64.1%) renal lesions complex with tubular necrosis, lymphocyte infiltration and micro-abscesses. In 3 cases (7.6%) he found tubular necrosis fibrous micro-thrombi and infract areas and in the remaining 2 cases (5.1%) dissemination intravascular coagulation was seen.

In the present study, CVC Spleen as observed in 14 cases (34.15%), 12 cases (29.26%) showed hemorrhage and 8 cases (19.51%) showed necrosis, 17 cases (41.46%) showed diffuse enlarged lymphoid follicles, and 16 cases (39.02%) showed hyalinised blood vessels., Shinde A B et al[5] in 2008 in his study showed CVC Spleen in 50.9% cases 30.90% of hemorrhage 30% of necrosis, 24.54% of enlarged lymphoid follicles. Mittal R et al[14] in his study showed 75% of CVC Spleen, 36% of enlarged lymphoid follicles, 25% of hyalinised blood vessel.

In the present study majority, 24 (54.54%) died due septicemia. Second major cause was neurogenic shock with 10 cases (22.72%). The least constituting cause was

toxaemia and hypovolemic shock with 5 cases (11.36%) each. Similarly study done by Gupta R et al [16] showed 50% cases of septicemia, 17% of hypovolemic shock and 33% of neurogenic shock.

5. Conclusion

Current study caters to understand the demographic profile of burn cases, as well as histopathology changes in various organs in deaths due to burn. Following conclusions were derived from a prospective study of burn cases. Burns were more common in female. Majority were married. Most of the female death occurred within 7 years of married life possibly related to dowry issues. Most common cause of burns was due to said kerosene spill over or self-pouring. TBSA involved more than 76%, in maximum number of cases. Maximum finding were seen in lung. Most common findings were diffuse alveolar damage. Next common organ was kidney with acute tubular injury spleen congested splenomegaly was most common. The most cause of death was due to septicemia followed neurogenic shock.

6. Source of Funding

None.

7. Conflict of Interest

None.

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