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Clinico-Bacteriological Profiles of Burn Patients- an Interesting Study from Tertiary Care Hospital of Central India

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INTRODUCTION

With the evaluation of man he created fire, which was a source of energy for cooking the food, which also kept him warm but with this advantage the injuries caused by fire also come as an evil. The injuries caused by fire remain more or less challenge to their successful management till today. Thermal injury is one of the major causes of mortality and morbidity in surgical patients.

Burn is the tissue injury resulting from excessive exposure to thermal, chemical, electrical or radioactive agent, Burn injury is a multifaceted, multidimensional injury, which deranges almost all the function of body in one way or other depending on the extent of the injury. The wound ranges from microscopic destruction of cellular label in first-degree burn to complete coagulation of all the layer of skin, Burn wound is catastrophic its physiological aspect and catastrophic in cost and suffering to family involved. **[1]**

The burn wound has been rightly simulated to a parasite because at imbibes and throws out the vital and essential ingredients of water, protein and electrolytes from plasma, circulating through its depth. Only malignancy view with burn injury is causing pain, mental agony and anxiety is leaving everlasting disabilities and disfigurement. **[2, 3]**

In burn involving large area of skin the patient is exposed to death first from shock and secondly from toxaemia due to absorption of toxins from injured surface, thirdly from loss of function of the absent skin covering and fourthly from exhaustion due to the long continuous fight for recovery. **[4]**

Burn is a leading killer in the world and causes significant morbidity and mortality. In India, based on conservative estimate, out of 20 million burn cases at least 10 millions are minor case, more than 2.5 millions are serious, 7 lak people require hospitalization and more than 13 lak die per annum. **[5]**

Burn occur due to causes like stove burst, clothes catching fire while cooking, fall of chimney, dowry harassment, fire accidents, industrial explosion, bomb blast, fire crackers etc. In our country, burn is mostly due to clothes catching fire in kitchen. Burn injuries are seen mostly in children less than 15 year and young female between 15-30 year of age group preferentially low socio-economic, rural and illiterate and electrical system, crowded living conditions and inflammable oils are responsible for many burn injuries. **[6]**

Over last two decades there has been significant decline in mortality and morbidity rates. This is due to continuously expending knowledge and path-physiology of thermal injury and rapid development of better topical agents and systemic antibiotics.

Burn injury causes major bulk of the surgical emergencies. Burn infection makes the burn wound complicated causes considerable mortality and morbidity. **[7, 8]** With the above back ground the present study was conducted to review the clinic-bacteriological profile of burn patients admitted in surgical wards of a tertiary care hospital of Rewa city (M.P.), India.

MATERIAL AND METHOD

"The present study "Clinico-bacteriological study of burn with special reference to use of various topical ointments in wound healing" was carried out in 160 burns and scald admitted in surgical wards in Department of General Surgery, SGMH and S.S. Medical College, Rewa (M.P.) during period of one year from May 2002 to April 2003. Ethical considerations were met through institutional ethical committee.

The cases are fully recorded and thoroughly studied with the aim of establishing the incidence, mode of burn and causes of burn, source of burn, clothing at timed incidence, time and place of incidence and detail clinical assessment. Patients who died during initial resuscitation or left against medical advice/ absconded were excluded from the study.

A detailed relevant history was taken. A special attention was paid to the type of fire or heat producing burn. The detailed history of acquiring burn, exact time, place of accident and the type of treatment received from the time of accident till arrival in hospital.

a. History of past illness such as epilepsy, diabetes, cardiovascular pulmonary, renal disease. Status of immunization.
b. Detailed personal history, material status, issues.

Complete general examination was conducted with a particular emphasis upon the state of shock, nutrition, the level of consciousness, toxaemia, and anaemia. Further the rate of pulse; respiration, blood pressure and weight were recorded.

A through clinical examination of cardiovascular system, respiratory system, gastro-intestinal tract, central nervous system was carried out.

In Local Examination Extent of burn, Depth of burn, Presence of Infection and Presence of Gangrene were also recorded diagrammatically. Outcome of the study was also recorded. Data was compiled in MS excel and checked for its completeness, correctness and then it was analyzed**.**

Results-

Table-1. Age and Sex distribution of Burn Patient

Age in year	Male		Female	
	No	%	No	%
<=5	6	3.8%	9	5.6%
6 – 20	21	13.1%	32	20.0%
21 – 30	11	6.9%	38	23.8%
31 – 40	16	10.0%	12	7.5%
41 – 50	2	1.3%	6	3.8%
Above50	3	1.9%	4	2.5%
Total	59	36.9%	101	63.1%

It is evident from above table that out of 160 patient, majority of the patient was female (63.1%). Out of total patient, majority of the patient belong to 21 – 40 year 48.1%. Next common group was 6 – 12 years. **[Table-1]**

Table-2. Baseline characteristics of study subjects

Baseline characteristics	No. of cases	Percentage
Residential		
Rural	145	90.6%
Urban	15	9.4%
Total	160	100.0%
Occupation		
House wife	78	48.8%
Student	38	23.8%
Labour	21	13.1%
Farmer	09	5.6%
Children	08	5.0%
Electrician	02	1.3%
Peon	01	0.6%
MPEB worker	01	0.6%
Driver	01	0.6%
Sub Engineer	01	0.6%
Burn due to		
7AM – 10AM	32	20.0%
11AM – 2PM	11	6.9%
3PM – 7PM	52	32.5%
8PM – 10PM	40	25.0%
11PM – 6AM	25	15.6%
Total	160	100.0%
Time interval in reporting		
0 - ½ hours	09	5.6%
1 – 4 hours	88	55.0%
5 – 12 hours	35	21.9%
12 – 24 hours	14	8.8%
2 – 4 days	13	8.1%
>5 days	01	0.6%
Total	160	100.0%
Burn due to		
Flame	110	68.80%
Electric	24	15.00%
Scald	22	13.80%
Lighting	03	1.90%
Acid burn	01	0.60%
Total	160	100.0%
Source of heat		
Chimney	47	29.4%
Stove	25	15.6%
Hot liquid	22	13.8%
Electric	21	13.1%
Chulha	17	10.6%
Candle	5	3.1%
Lightening	5	3.1%
Cooking Gas	4	2.5%
Gursi	4	2.5%
Lamp	5	3.1%
Cracker	3	1.9%
Acid	1	0.65
Cooker	1	0.6%
Total	160	100.0%

Majority (90.6%) of burn patient were form rural area. From the above it is evident that majority of burn patient were housewives (48.8%) and next most common were student (23.8%) and 13.1% labourers, 5.6% farmers, 5.0% children and others include Electrician (1.3%), Peon (0.6%), MPEB worker, Driver and sub Engineer (0.6%). It is evident from above table that time of burn in majority of male patient was 3PM to 7PM, where as in female most of the patients burned between 8PM to 10PM (32 cases). The overall incidence of highest percentage of burn cases (32.5%) occurred during 3PM to 7PM. It is evident from the above that most of the burn cases reported within 1 to 4 hours after burn (55.0%) and 35 (21.9%) with 5-12 hours. Only one patient reported after 5 days whereas 13 (8.1%) reported after 2 – 4 days. It is evident from above table that in majority of burn patient the cause of burn was flame (68.8%). The next common cause was found to be Electric burn (15.0%). Electric burn is more common in male than in females. It is evident from the above table that in maximum number of burn cases, the source of heat was chimney* (29.4%) out of which 39 were females and only 8 were males. The stove was the second most common cause of burn and the incidence of female is about three times that of males. Males predominated in the number of burn caused by electricity. 16 out of 21 cases were male and only 5 cases were female whereas female predominated the number of burns caused by chimney, stove & chulha.*- Chimnies were indigenously made lamps by using cotton wick used in containers like diya, tin box, glass bottles, empty bottles of medicine etc using cooking oil/kerosene oil. **[Table-2]**

Table-3. Distribution of cases according to presence of dominant Bacteria on wound

S.N.	Name of Bacteria	No. of cases on admission and day after admission					
		Admission	7th	14th	21th	Total	%
1	Pseudomonas	0	14	13	3	30	18.8%
2	Staphylococcus	5	16	4	2	27	16.9%
3	Other positive cocci	2	13	6	0	21	13.1%
4	Klebsiella	0	3	3	0	6	3.8%
5	Streptococcus	3	0	0	0	3	1.9%
6	Negative cocci	0	0	3	0	3	1.9%
7	Mixed	0	12	4	3	19	11.9%
8	Sterile	73	22	13	0	108	67.5%
Total		83	80	46	08	217	

Infection on wounds was of mixed type but dominant colony of Pseudomonas was the most commonly (18.8%) found bacteria in burn patients followed by staphylococcus aureus (16.9%).In 11.9% patients mixed pathogen were found .It was observed that infection gradually decreases with duration . The culture on admission was sterile in maximum number of patients except in those cases who admitted 2-3 days after burn whereas maximum infection was found in 1st week. **[Table-3]**

Table-4. Age & Sex wise distribution of mortality

SN.	Age in Years	Total no. of patient	Number of deaths					
			Male		Female		Total	
			No	%	No	%	No	%
1.	<=5	15	3	20.0%	2	13.3%	5	33.35
2.	6 – 20	53	4	7.5%	8	15.1%	12	22.6%
3.	21 – 30	49	4	8.2%	13	26.5%	17	34.7%

4.	31 – 40	28	2	7.12%	6	21.4%	8	28.6%
5.	41 – 50	8	0	0.0%	1	12.5%	1	12.5%
6.	Above 50	7	1	14.3%	2	28.6%	3	42.9%
	Total	160	14	808%	32	20.0%	46	28.8%

As evident from the table that overall mortality was highest (42.95%) in patient above 50 year of age followed by 34.7% among 21 – 30 year age group and <=5 year (33.3%). Male comprise of 8.8% of overall mortality whereas female comprise of 20.0%. [**Table-4**]

Table-5. Distribution of mortality with relation to total body surface area burnt

TBSA	Total Patient	Total Deaths	Percentage
Under 20%	38	01	2.6%
21 – 40%	55	04	7.3%
41 – 60%	22	08	36.45
61- 80%	20	10	50.0%
Above 80%	25	23	92.0%
Total	160	46	28.8%
X^2 test= 72.3, d.f.=4, p value <0.0001 (Highly significant)			

As it is evident from the above table that majority of the patients died when the percentage of body surface area burnt is above 80% (92.0%). Next mortality was recorded 50% in body surface area burnt was 61- 80%. Youngest patient died was 3 year old body surface area burnt 10% burn to hot liquids. Association was found highly significant. (p<0.001). Survival and Death Ratio was 2.48:1 **[Table-5]**

DISCUSSION

The burn is a serious traumatic wound, produced by excessive heat upon the protective covering of the body, damaging the underlying tissues causing circulatory disturbances. If untreated, the burn injury results in intense suffering, a protracted course of illness, and possible disfiguration with psychological trauma to the patients and his family. **[9]**

Burn is a leading killer in the world and according to the available statistic burn injury leads to nearly 2000 deaths each year in India.

In India, based on conversation estimate, out of 20, million burn cases, at least 10 million are minor cases, more than 2.5 million are serious, 7 lack people require hospitalization and more than 1.3 lak die per annum. **[10]**

In the present series 4149 patient were admitted in the surgical wards, among which 3.86% had injury.

This is similar to 4.82% found in 1982 by Bajpayee, 3.25% found by Jha in 1989 and 2.8% found by Modi in 1972 i.e. to say that there is no significant variation from the other studies when total cases are considered. **[11, 12, 13]**

The incidence of burn is higher in India than in Western countries. In India, the rural population is affected more than the urban population. This may be attributed to various reasons such as use of unguarded domestic heating appliance for cooking, use of open flame equipment, faulty heating appliances for cooking, use of open flame equipment, faulty heating and electrical system, poverty, ignorance, overcrowding and lack of responsibilities.

In our institution approximately 4% of admissions in surgical ward are burn cases which represent only those patients who are admitted in surgical wards but a large number of patients which are less than 15% burnt of total body surface area are treated as OPD patients. Going through the local newspaper it is also documented that patients with more than 80% burn area are often due to suicidal burn or major explosions, die either on the spot or during transportation to the hospital. Some patients are admitted in the nearby clinics and/or PHC's and only referred for delayed complications and therefore consideration of a high incidence of burn injuries should be taken in planning for setting up of burn units. **[14, 15]**

Burn injury affects almost all age and sex groups. Injury by the heat source in the form of burn or scald is inevitable, no sooner one comes in contact with it. However, the incidence of burn in different age groups and sex varies considerably. The factors that determine age and sex incidence of burn injuries are variable different countries depending upon the local climate and prevailing social customs.

In the present series, the incidence of burn was more in females than males i.e. 101 cases were female and 59 were males out of total 160 patients. Majority of this i.e. 53 out of 160 were in age group of 6-20 year and only 7 cases were above 50 year of age. The youngest patient was 6 months old female and eldest was 75 year female.

The higher incidence of 23.8% burn in female was recorded in 21-30 years of age group. It is understandable, as this is the age group, which is commonly responsible for cooking food in family and secondly this is the commonest marriageable age group in this region. Most of the burns were accidental due to faulty heating appliances used for cooking use of synthetic sarees, which catches fire easily and unsafe fireplaces. In this age group, burns are common due to family dispute and dowry reasons.

Fowler (1958) found higher incidence of burn in children owing to the fact as Indian women do all cooking on the floor, it is easy for child to crawl into danger. Scalds were more common in this age group because of accidental spillage of hot water, milk and tea. **[16]**

Incidences were declined to only 4.4% above 50 year of the age group i.e. to say the incidence of burn decrease in age. The reason for low incidence of burn patient after the age of 30 year could be due to less involvement in kitchen work, maturity.

As far as incidence is concerned Sundarson (1971) from Singapore reported a higher incidence of male, probably due to large number of individual burns. Sridhar Rao (1966) in his series of 91 cases reported male: female ratio to be 2:1 but Bajpayee et al (1982) in retrospective study of 1218 cases found ratio to be 1:3:4 (if the children are excluded). Gulliani and Tyagi (1988) reported male: female ratio 2:3. **[11, 17]**

In the present series, the female patient accounted for 63.1% total burn whereas male patient counted for 36.9% only and female ratio was calculated to be 1:7.

Burn are more common in young age group with females more commonly affected than the males for the reason explained above and the incidence of burn decrease with in age.

In the present study, most of the patients were from rural area (90.6%) whereas only 9.4% were from the urban areas. This vast difference in the occurrence of burn cases between rural and urban areas is understandable as India is predominantly an agriculture country and nearly population resides in rural area whereas only 20% is urban population. Some of the urban people may have treatment in private sector hospitals also.

The second important factor in rural area is that there is no electricity in most of the rural area and people use chimney or Deepak as a source of light and stove or chulha for cooking food. Lastly but not the least is that most of people residing in rural area are illiterate and ignorant and they use faulty heating and electrical appliance for their daily needs.

Occupation is very closely related to the incidence of burn patients. In the present series , majority of patients 48.8% were housewives .The second most common affected were students accounting for 23.89% of total case followed by la-

bourer (13.01%),farmers (5.6%) , children (5.6%), electricians (1.3%) and the others 4% including MPEB workers ,electricians, peon etc.

Johnson (1959) found greater incidence of burns in the family of labourers than skilled workers. **[18]**

The high incidence of housewives can be explained owing to the fact that they are most exposed to fire while cooking , they spend most of their time in the unsafe kitchen wearing loose garments ,carelessness, illiteracy ,ignorance and social stigma of dowry .

The pre-school children were burnt due to scalds caused by falling of boiling water or hot liquids over them .The high incidence of burn in pre –school children was due to factors like overcrowding, lack of proper care of children, illiteracy in rural areas. Whereas in urban areas working mother was common cause of burn in dependents.

In students, the cause of higher incidence was due to chimney either felt over them accidently or clothes catching fire during the study.

Labourers comprised 13.3% burn patients in this series and majority of them got burned while warming their body during winter while sitting around the fire places .Other factors responsible for burn injuries were extremes of age, tiredness and alcoholic intoxication.

Time is an important factor in the present series, out of 160, maximum numbers of cases (32.5%) were burnt during 3PM to 7PM and second most common time was 8PM – 10 PM, during which 32 females and 8 males were burnt. The percentage of female patient was higher during this time as it is the time when most of the female cook dinner for the family and spend their time in the kitchen. Between 3.00-7.00pm maximum numbers of males (31) were reported to be burnt while in the fields.

Time occurrence of the injury and sex was found to be significantly associated.

According to D. singh and P.K.Jash (1997) majority of the female sustained burn during day contrast to male who sustained burns during night. **[19]**

In the present series, major number of patients got burnt by chimney which is used as a source of light for reading and working and is often kept at the door to illuminate two rooms or kept on the shelf which accidently fall while working or crossing the door and may not be related to sex or the time but has a more bearing on accidental burns.

In the present series that 91.3% reported within 24 hours of burn.

Subramanyam M.Joshi A.V reported that ninety–three per cent of the admissions occurred within the first 24 h of burn, which is almost similar to the present study. **[20]**

In the present series , the commonest source of bun was dry heat (flame) 68.8%, 15% were due to electricity ,13.8%were scald, 1.9% by lightening and one case of acid burn was also reported.

As it is evident from the above table that the dry heat was the most common cause of burn in the past and it still retain the position .Moist heat leading to scalds and acid burns were the second commonest as per other available studies.

In the present series, most of the burns were domestic burns. The most common source of burn was chimney (29.4%) followed by stove (15.6%), hot liquids (13.1 %,) chulha (10.6%) and other like candle, lightening etc accounts for 17.5%).

Chimnies are indigenously made lamps by using various containers like bottles of oil, medicine, tin boxes of ointments, panparag, tobacco and earthen diyas, which are unsafe because of open wick and uneven surface of the chimney. Most of the burns were accidental and were due to catching of fire in the free end of sari while crossing from one place to another .While cooking, ladies got burn due to crossing from one holding the hot utensils over the chulha .Children got burnt while playing around the chulha or gorsi.

Bursting of pressure stoves was also blamed as one of the cause of burn but looking into the 100% burn, some of the patients have high suspicious of suicidal burn.

Sinha and Reddy (1971) reported chulha to be the commonest cause of burn injuries but in our series chulha was in the 4th place and chimneys was the most common source of burn injuries manjhi, in1977 has reported that the most common source of burn is pressure stove (26%) followed by chimney (20%) and chulha (12%) whereas in our study Chimney was the commonest cause.

This is an important factor from the treatment and prognosis point of view, because it directly reflects on the chances of recovery. This is important in all types of burn and particularly in deep and extensive burns .In the present study, majority of patients (59.4%) poured cold water after having burn injury .Application of cold water is the cheapest, safest and most effective method, which reduces the contact of heat and lessen the tissue damage from burn injury.

A significant number of patients (14.4%) were covered by the blanket after burn injury. Most of the people believed that it increases the contact of heat there by results in deep burn.

In the rural areas people applied ghee (3.8%), Alloo, oil + Haldi (3.1% each), neem lape or mix oil (1.9%), boiled rice (1.3%) on burn wound, as it is believed that they are good soothing agents.

During our study there were 13.1% cases that did not received any first aid before hospitalization.

In the present study, Pseudomonas was the most common organism cultured 18.8%. second most common cause of infection was Staphylococcus aureus (16.9%) followed by other +ve cocci (1.9%), 11.9% patients were infected by mixed organism whereas 67.5% were found sterile.**[21]** Burn injuries remain a huge public health issue in terms of morbidity and long-term disability throughout the world. **[22, 23]** The most common pathogen isolated from burn

Wounds in another study from Turkey was Acinetobacter spec, which was contrast with the finding of the present study. **[24]**

Mortality and body surface area burnt are directly related. In the present study it was observed that as the body surface area burnt increase the mortality rate also increases. Some deviations are seen as few relatives took their patient without any information and so on follow-up was possible. 92% mortality was observed in cases with body surface area burnt above 80%.

Conclusion-

Chiminy is the main cause of burn. Educate the people to avoid the use of homemade uncovered and unguarded chimeys. In place of these promote the use of lanterns, torch or covered and guarded lamps. Stoves are another major cause of burn. Educate the people to avoid use of old and inferior quality stoves encourage them to use checked, ISI marked, good quality stoves. Educate them to use Gas chulha instead of homemade chulha. People must alert while working near the open fire. Children should not be allowed anywhere near the open fire, burning chulha and stove. They should not be allowed to hold or touch homemade chimneys. Hot liquid containers should keep beyond the reach of chil-

dren. Avoid use of defective and unchecked pressure cooker and promoting the use of ISI marked pressure cooker. Pressure cooker should not be open until the steam is present inside the cooker. People who are suffering from any type of illness draw particular attention while working near the fire or in kitchen. Encourage the standing platform in the kitchen. Women should not wear loose synthetic sari. They should wear cotton or salwar kurta carefully. Change the tradition of parda pratha because it contributes to a cause of burn in females while working near the fireplace with covered face by parda. Electrical appliances should be properly insulated and safely used. High voltage electric lines and poles should be away from residential areas. Electricians while working should wear insulated gloves.

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