Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublisher.com/sjams/

OPEN ACCESS

Medicine

Renal Changes in Burns, Poisoning and Trauma Death Cases – A Prospective Study

Dr. Shaik Shavukath Ali[1], Dr. Krishnam Raju Sagina[2*], Dr. P. Rama Krishna[2], Dr. V. Chandra Sekhar[1], Dr. P. Vijay Kumar[3]

[1]Associate Professor, Department of Forensic Medicine & Toxicology, Andhra Medical College/King George Hospital, Visakhapatnam, Andhra Pradesh, India
[2]Assistant Professor, Department of Forensic Medicine & Toxicology, Andhra Medical College/King George Hospital, Visakhapatnam, Andhra Pradesh, India
[3]Professor & Head, Department of Forensic Medicine & Toxicology, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences, Gannavaram, Andhra Pradesh, India

DOI: 10.36347/sjams.2019.v07i12.67 | **Received:** 23.11.2019 | **Accepted:** 17.12.2019 |**Published:** 30.12.2019

***Corresponding author:** Dr. Krishnam Raju Sagina

Abstract **Original Research Article**

Background: The renal system consists of the kidney, ureters, and the urethra. The overall function of the system filters approximately 200 liters of fluid a day from renal blood flow which allows for toxins, metabolic waste products, and excess ion to be excreted while keeping essential substances in the blood. Kidney is the one of the vital organs affected in cases burns, poisoning and trauma. ***Objective:*** Gross and microscopic changes in kidney of burns, poisoning and trauma case deaths; relation of renal changes with survival period and renal damage influencing fatal outcome. ***Materials and Methods:*** A prospective descriptive study at Government General Hospital Mortuary, Kakinada, Andhra Pradesh from September 2009 to October 2011 (2 year period). Cases of Burns, Poisoning And Trauma death autopsies during the study period i.e. fifty (50) cases of which burns cases – 20, poisoning – 15 and trauma cases - 15. All cases of burns, poisoning and trauma deaths where histopathology samples are compatible were included in this study. ***Observations*:** Burns victims were predominantly women (85%). Age of burn victims ranged from 17-80 years. Age of trauma victims ranged from 10-78 years. Age of poison victims ranged from 20-50 years. The frequency of major histological changes of kidney in burns, poisoning and trauma cases are recorded. Medical Intervention Lag Period also analyzed. An attempt is made to note the progression of kidney damage with increasing survival period. Relation between survival period and kidney change in burns, poisoning and trauma studied. Acute Renal Failure is observed in Burns, Poisoning and Trauma cases. Acute tubular necrosis is found in all three types of cases. Renomegaly was found predominantly in burns cases. ***Conclusion:*** Acute Renal Failure (ARF) is observed in burns cases, poisoning cases and trauma cases. Acute Tubular Necrosis (ATN) is found to be the cause of acute renal failure. Most of the kidney damage is occurring during the first 24 hours after injury whether it is burns, poisoning or trauma.

Keywords: Renal changes; Burns; Poisoning; Trauma; Histopathology; ARF; ATN.

Copyright @ 2019: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

INTRODUCTION

Acute renal failure (ARF) occurs in cases of burns, severe trauma and poisoning. Underhill (1921) demonstrated on 20 burn patients that burn shock was primarily due to fluid loss, secondary to fluid and electrolyte shifts [1]. The cause of death was Acute Renal Failure in 42% of cases studied [2]. Acute renal failure (ARF) is a well-known complication of severe burn and is an important factor that can increase mortality [3].

Crush injuries are often associated with severe rhabdomyolysis and myoglobinuric renal failure [4, 5]. This is a common sequel to extensive muscle damage or to burns that affect considerable areas of skin as well as from certain poisons [6].

The toxic alcohols methanol, ethylene glycol and isopropyl alcohol are widely available in household and commercial products that are intentionally abused as ethanol substitutes [7]. Accidental ingestion of Methanol and Ethanol causes toxic effects after several hours or days. If a person survives to initial toxicity, ARF may occur several days later [8].

The objectives of study are gross and microscopic changes in kidney of burns, poisoning and trauma case deaths; relation of renal changes with survival period and renal damage influencing fatal outcome.

MATERIALS AND METHODS

Study Design: A prospective descriptive study.

Study Setting: Government General Hospital Mortuary, Kakinada, Andhra Pradesh.

Period of Study: September 2009 to October 2011 (2 year period).

Sample Size: Cases of Burns, Poisoning and Trauma death autopsies during the study period i.e. Fifty (50) cases of which burns cases – 20, poisoning – 15 and trauma cases - 15.

Inclusion criteria: All cases of burns, poisoning and trauma deaths where histopathology samples are compatible.

Exclusion Criteria: Cases where the histopathology samples are unfit, decomposed cases.

Sources of information included clinical records, survival period of patient, autopsy registers of department, personal data from inquest forms, forensic science laboratory reports and autopsy findings from postmortem reports.

OBSERVATIONS

Table-1: Sex Distribution

	Burns	Poisoning	Trauma	Total
Male	**3**	**13**	**10**	**26**
Female	**17**	**2**	**5**	**24**

Burns victims were predominantly women (85%). Whereas, poisoning victims (87%) and trauma victims (67%) were predominantly men (Table-1).

Table-2: Age Distribution

Age Group	Burns	Poisoning	Trauma
<20	**5**	**1**	**1**
21-30	**8**	**6**	**2**
31-40	**3**	**2**	**3**
41-50	**2**	**6**	**5**
>50	**2**	**-**	**4**
Total	**20**	**15**	**15**

Age of burn victims ranged from 17-80 years. The victims under 40 years were 14 and all were women. They accounted for 70% of total burn victims and 82% of women burns mortalities. Age of trauma victims ranged from 10-78 years. The victims under 50 years were 11 and two cases (19%) were female and 9 cases (81%) were male. Age of poison victims ranged from 20-50 years. The victims under 40 years were 9 and one case (11%) was female and 8cases (89%) were male (Table-2).

Table 3: Kidney Change and No. Of Cases

S. No	KIDNEY CHANGE	BURNS	POISONING	TRAUMA
1.	Renomegaly	13	3	0
2.	Acute Renal cortical necrosis	2	3	3
3.	Vacuolar degeneration	3	1	1
4.	Tubular epithelial sloughing	5	0	2
5.	Patchy tubular necrosis	4	4	1
6.	Diffuse tubular necrosis	2	4	9
7.	Tubular Regeneration	1	0	0
8.	Tubular Atrophy	0	1	0

The frequency of major histological changes of kidney in burns, poisoning and trauma cases are recorded in Table-3. Renomegaly is observed in majority of burns cases followed by tubular epithelial sloughing and patchy tubular necrosis (Histopathology slides 1 & 2). In poisoning cases diffuse tubular necrosis and patchy tubular necrosis are common (Histopathology slides 3 & 4). In trauma cases diffuse tubular necrosis is the commonest finding (Histopathology slides 5 & 6). Charts 1 – 3 represent pictorially the percentage wise data given in Table-3.

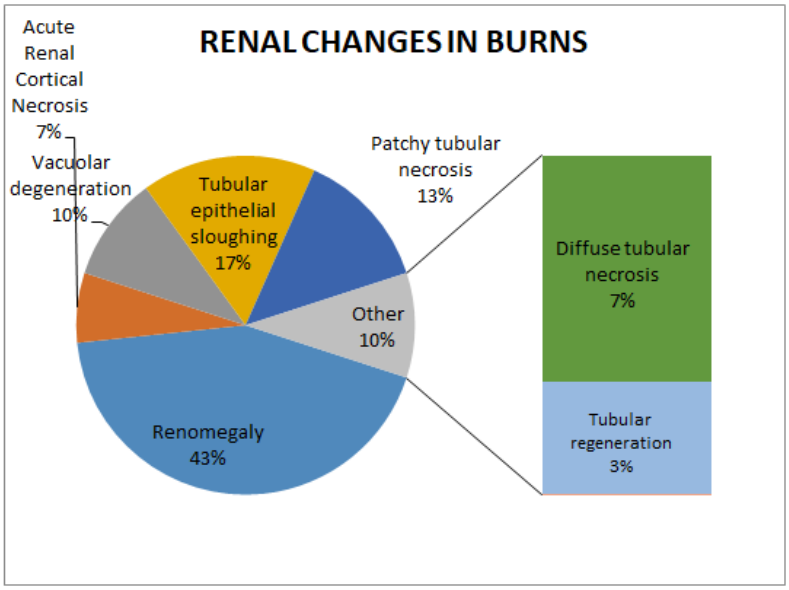


Chart –1

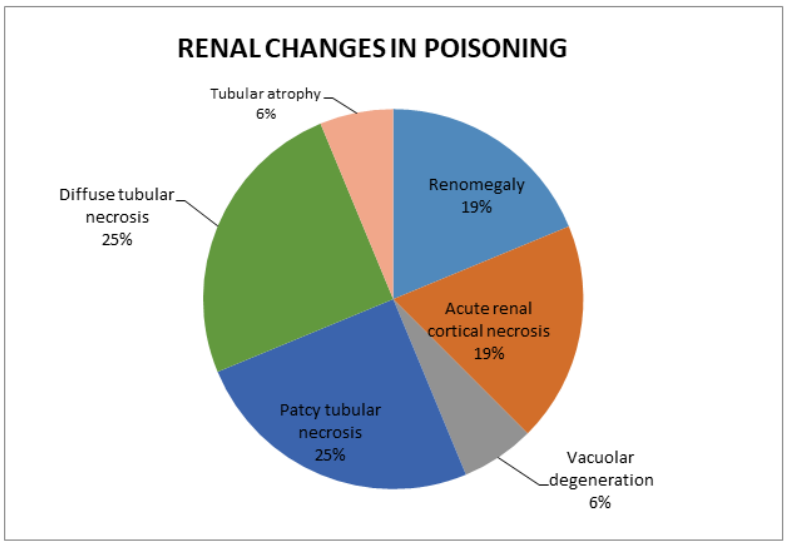


Chart - 2

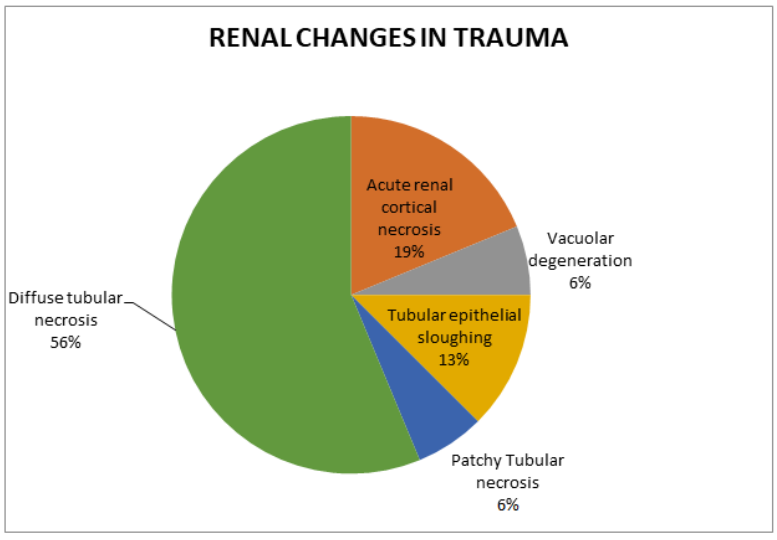


Chart - 3

Table 4: Survival Period

S. No	Survival Period	Burns	Poisoning	Trauma
1.	≤1day	6	8	6
2.	2-7days	8	3	4
3.	>7days	6	4	5

Table 5: Onset of Kidney Change & Survival Period

S. No	ONSET OF KIDNEY CHANGE	SURVIVAL PERIOD
1.	Acute cortical necrosis	<6hours
2.	Vacuolar degeneration	1 day
3.	Tubular epithelial sloughing	1-3days
4.	Patchy tubular necrosis	2-3days
5.	Diffuse tubular necrosis	3-5days
6.	Renomegaly	>1week
7.	Tubular Atrophy	>10days

Table 6: Relation between Survival Period and Kidney Changes in Burns

S. No	SURVIVAL PERIOD	KIDNEY CHANGE
1.	1 day	Vacuolar degeneration
2.	2 days	Focal tubular sloughing
3.	5 days	Diffuse tubular necrosis
4.	> 7 days	Renomegaly
5.	> 10 days	Tubular atrophy

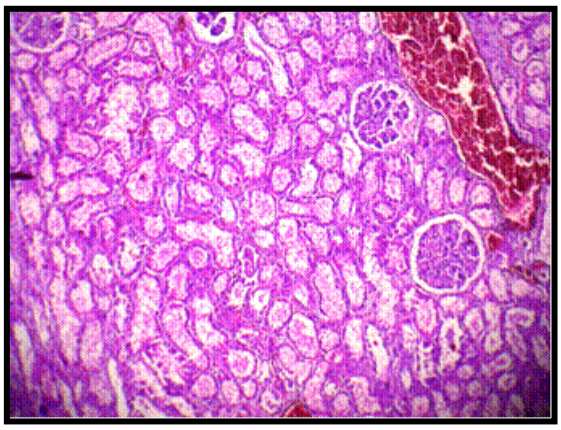
Table-7: Relation between Survival Period and Kidney Changes in Poisoning

S. No	SURVIVAL PERIOD	KIDNEY CHANGE
1.	<6 hours	Acute Renal cortical necrosis
2.	1 day	Vacuolar degeneration
3	3 days	Focal Tubular sloughing
4	5 days	Diffuse tubular necrosis
5	>30 days	Glomerular sclerosis

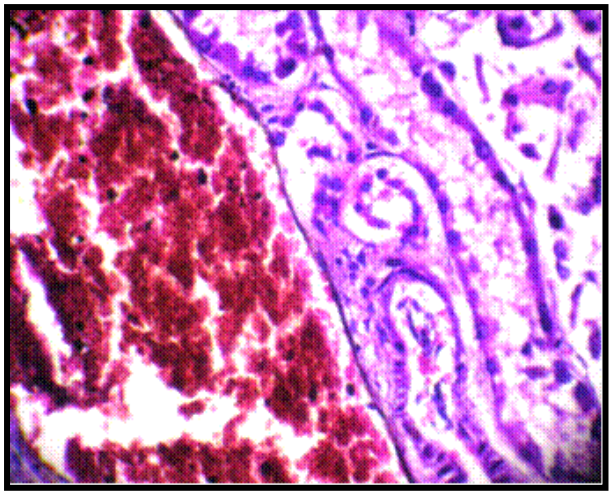
Table 8: Relation between Survival Period and Kidney Changes in Trauma

S. No	SURVIVAL PERIOD	KIDNEY CHANGE
1.	< 1 hour	Coarse granular cytoplasm of PCT
2.	1-6 hours	Acute Renal cortical necrosis
3.	2 days	Hyaline, granular and cellular casts in Distal tubules and collecting ducts
4.	>5 days	Diffuse tubular necrosis

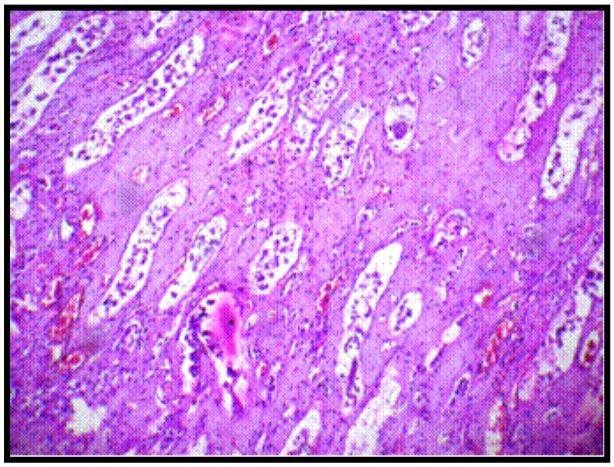
An attempt is made to note the progression of kidney damage with increasing survival period that is recorded in table no.5. This shows acute cortical necrosis in less than 6 hours survival (Histopathology slide 5) , patchy and diffuse tubular necrosis in 2 to 5 days (Histopathology slides 1, 3 & 4) and renomegaly in persons survived more than 1 week. Table 6 to 8 show the relation between survival period and renal change in burns, poisoning and trauma respectively.



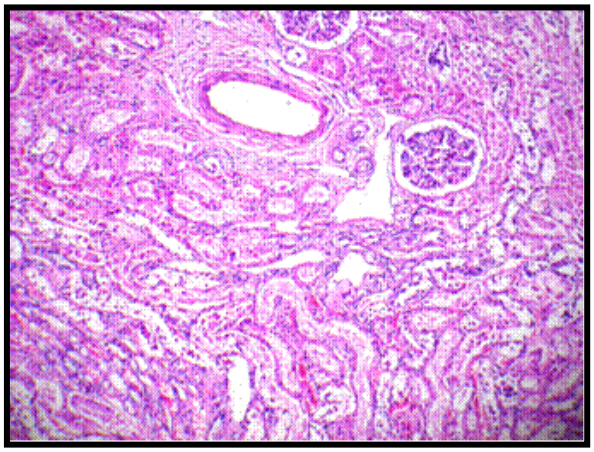
Histopathology Slide 1: A BURNS CASE WITH SURVIVAL PERIOD OF 2-3 DAYS – CORTICAL REGION WITH INTERSTITIAL EDEMA, TUBULAR NECROSIS AND HEME CASTS (H&E X 10)



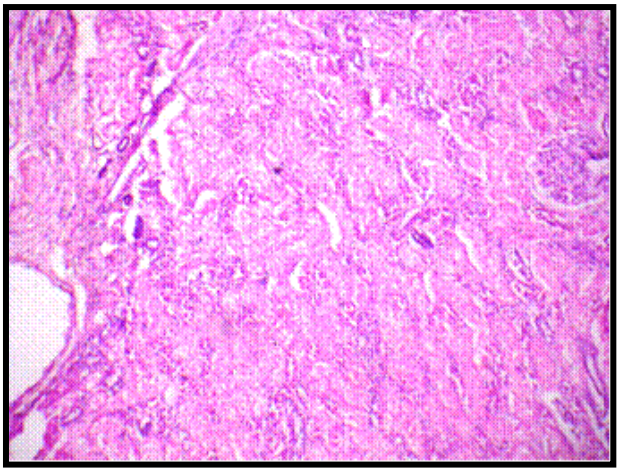
Histopathology Slide 2: A BURNS CASE OF 3 DAYS SURVIVAL PERIOD SHOWING TUBULAR NECROSIS, HEME CASTS AND EPITHELIAL SLOUGHING (H&E X40)



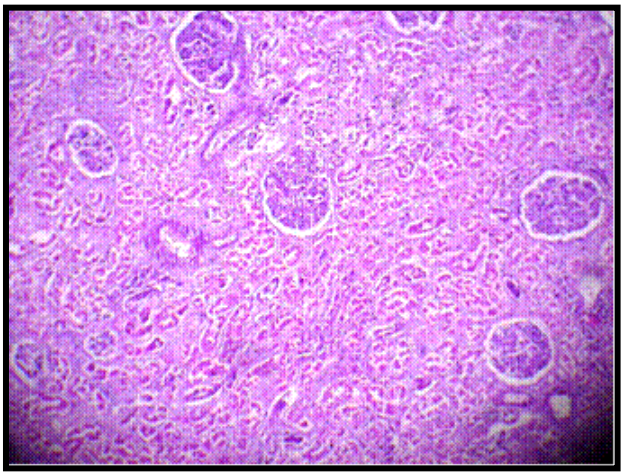
Histopathology Slide 3: A CASE OF PARAQUAT POISONING WITH SURVIVAL PERIOD OF 1 DAY- RENAL MEDULLA SHOWING TUBULAR (COLLECTING DUCTS) NECROSIS, EPITHELIAL SLOUGHING, HEME CASTS AND INTERSTITIAL EDEMA (H&E X10)



Histopathology Slide 4: A POISONING CASE WITH SURVIVAL PERIOD OF 1 DAY SHOWING DIFFUSE TUBULAR NECROSIS AND HYALINE CASTS (H&E X 10)



Histopathology Slide 5: A CASE OF HEAD INJURY WITH SURVIVAL PERIOD OF 6 HOURS SHOWING EARLIEST ATN CHANGE - VACUOLAR DEGENERATION (H&E X10)



Histopathology Slide 6: A CASE OF ELECTRICAL INJURY WITH 1 DAY SURVIVAL PERIOD – SHOWING DIFFUSE TUBULAR NECROSIS – COAGULATIVE NECROSIS (H&E X10)

DISCUSSION

Burns victims were predominantly women (85%). Whereas, poisoning victims (87%) and trauma victims (67%) were predominantly men (Table-1).

Age of burn victims ranged from 17-80 years. The victims under 40 years were 14 and all were women. They accounted for 70% of total burn victims and 82% of women burns mortalities. Age of trauma victims ranged from 10-78 years. The victims under 50 years were 11 and two cases (19%) were female and 9 cases (81%) were male. Age of poison victims ranged from 20-50 years. The victims under 40 years were 9 and one case (11%) was female and 8cases (89%) were male (Table-2).

The frequency of major histological changes of kidney in burns, poisoning and trauma cases are recorded in table no.3. Renomegaly is observed in majority of burns cases followed by tubular epithelial sloughing and patchy tubular necrosis (Histopathology

slides 1 & 2). In poisoning cases diffuse tubular necrosis and patchy tubular necrosis are common (Histopathology slides 3 &4). In trauma cases diffuse tubular necrosis is the commonest finding (Histopathology slides 5 & 6). Charts 1 – 3 represent pictorially the percentage wise data given in table no. 3. An attempt is made to note the progression of kidney damage with increasing survival period that is recorded in table no.5. This shows acute cortical necrosis in less than 6 hours survival (Histopathology slide 5), patchy and diffuse tubular necrosis in 2 to 5 days (Histopathology slides 1, 3 & 4) and renomegaly in persons survived more than 1 week. Table 6 to 8 show the relation between survival period and renal change in burns, poisoning and trauma respectively.

In the present study Acute Renal Failure is observed in Burns, Poisoning and Trauma cases which is consistent with other studies [2, 3, 8].

In the current study acute tubular necrosis is found in all three types of cases (i.e., burns, poisoning and trauma). Kumar *et al*., and Lamiere N *et al*., stated "Acute Tubular Necrosis is the most common cause of Acute Renal Failure [9, 10].

In the present study renomegaly was found predominantly in burns cases similar to other study [11].

CONCLUSION

- Acute Renal Failure (ARF) is observed in burns cases, poisoning cases and trauma cases.
- Acute Tubular Necrosis (ATN) is found to be the cause of acute renal failure.
- Most of the kidney damage is occurring during the first 24 hours after injury whether it is burns, poisoning or trauma.
- Progressive kidney damage is observed in all the cases that survived more than one day.
- Kidneys are worst hit in poisoning cases.

REFERENCES

1. Chawla, R., Chanana, A., Rai, H., Aggarwal, A. D., Singh, H., & Sharma, G. (2011). Clinico-pathological profile in deaths due to burns. *Journal of Indian academy of forensic medicine*, *33*(1), 14-17.
2. Sabry, A., Wafa, I., El-Din, A. B., & Hassan, M. (2009). Early markers of renal injury in predicting outcome in thermal burn patients. *Saudi Journal of Kidney Diseases and Transplantation*, *20*(4), 632-638.
3. NIMHANS BISP Fact Sheet and Surveillance on Poisoning, accessed through internet on 8thJuly 2020.
4. Kumar, V., Abbas, A. K., & Fausto, N. (2009). Robbins & Cotran Pathologic Basis Of Disease. 7th Edition. s.l.: ELSEVIER, p. 424.
5. Gururaj, G. (2005). Injuries in India: A national perspective. *Background Papers: Burden of Disease in India Equitable Development-Healthy Future. New Delhi: National Commission on Macroeconomics and Health, Ministry of Health & Family Welfare, Government of India*, 325-347.
6. Rush, C., & Thomas, J. (1999). A 42-year-old man with rhabdomyolysis from substance abuse and minor trauma. *Journal of Emergency Nursing*, *25*(1), 7-11.
7. Soloukides, A., Moutzouris, D. A., Kassimatis, T., Metaxatos, G., & Hadjiconstantinou, V. (2007). A fatal case of paraquat poisoning following minimal dermal exposure. *Renal failure*, *29*(3), 375-377.
8. Vaziri, N. D., Ness, R. L., Fairshter, R. D., Smith, W. R., & Rosen, S. M. (1979). Nephrotoxicity of paraquat in man. *Archives of internal medicine*, *139*(2), 172-174.
9. Stalker, A. C. (1978). Disseminated Intra vascular coagulation. [book auth.] Mason J.K. Pathology of violent injury.
10. Kumar, V., Abbas, A. K., & Fausto, N. (2009). Robbins & Cotran Pathologic Basis Of Disease. 7th Edition. s.l. : ELSEVIER, p. 139.
11. Heptinstall, R. H. (1974). Acute Renal Failure in Pathology Of Kidney. 2nd Edition. p. 185-187.