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EVALUATION AND ASSORTMENT OF HEPATIC FAILURE RISK IN VARIOUS POISONING CASES IN TERTIARY CARE TEACHING HOSPITAL

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Abstract

Poisons are compounds that when ingested, absorbed, injected or inhaled cause disruption of normal body functions usually through chemical reactions or activities on the molecular scale. Over the exposure time, the concentration of poison in the body can build up, it can redistribute, or it can overwhelm repair and removal mechanisms. The purpose of this study was to assess the affect of poison on the hepatic functioning. The psychiatric counselling and diet changes are essential as a part of the treatment. The main aim of the study is to evaluate and assort the hepatic failure risk among the various poisoned cases. Evaluation and Assortment of Hepatic Failure Risk among various Poisoning Cases in the Department of General Medicine in Tertiary Care Teaching Hospital for a period of 6 months(October 2021 – March 2022). The study was conducted after obtaining ethical clearance from the Institutional Ethical Committee. All the data under the inclusion criteria are included and assessed. The data was collected in the designed data collection form (including lab profile before counselling and after counselling) using CHILD-PUGH Score. A total of 250 subjects met the inclusion criteria of the study. Based on the CHILD-PUGH Score, the percent of 1-year survival rate staging was done. Before counselling(on day-3), 158(63.20%) of cases were under Class-A(100% Of 1-year survival rate) followed by 91(36.40%) of cases under Class-B(80% of 1-year survival rate) and 1(0.4%) of cases under Class-C(45% of 1-year survival rate). Two months after counselling, 194(77.60%) of cases were under Class-A followed by 55(22.00%) of cases under Class-B and 1(0.4%) of cases under Class-C. The obtained results were analyzed using Chi-Square test and ‘p value’ of $p = .0011$ was obtained in view of developing hepatic failure, our data showed that there is a good statistical significance between poisoning and hepatic failure risk. The results also revealed that there is a reduction in the risk after providing counselling(followup: 2 months), “p value” of $p = .001875$ was obtained.

Keywords: Poison, Hepatic Failure, CHILD-PUGH Score, 1-year Survival Rate.

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1. INTRODUCTION

Liver failure occur when liver is not working well enough to perform its functions such as manufacturing bile and ridding the body from harmful substances. Causes include autoimmune hepatitis, acetaminophen overdose, intake of herbal supplements for long time, exposure to toxins and poisonous substances, diseases of the veins in the liver, metabolic diseases, cancer, shock and heat stroke. Some cases of liver failure have no obvious cause. Jaundice, upper right abdomen pain, ascites, vomiting, malaise, confusion, sleepiness, tremors are some of the symptoms of liver failure. Alanine transaminase, aspartate transaminase, alkaline phosphatase, gamma glutamyl transferase, Prothrombin time, serum bilirubin, albumin levels are used for diagnosis. Increased bilirubin and prothrombin time, decreased albumin levels and presence of ascites indicates the risk of developing hepatic failure. Organophosphate induced hepatotoxicity is due to disturbances in antioxidant defence system, oxidative stress. Yellow phosphorous is a protoplasmic poison that affects hepatic functioning. It disrupts the ribosomal activity, protein synthesis, glucose homeostasis, lipoprotein and triglyceride metabolism results in fatty liver. Ingestion of small to medium amounts of paraquat may lead to development of liver failure within several days to several weeks. Elapid snake bite can cause the disseminated intravascular coagulation due to improper liver functioning. Benzodiazepines do not cause significant serum enzyme elevations and have been linked to only very rare instances of acute, symptomatic liver disease. Because of diethyl glycol present in hand sanitizer can cause the hepatitis while ingested. Acetaminophen overdose is the most common cause of developing acute liver failure in Western countries. Boric acid is commonly used as a pesticide, disinfectant and wood preservative ingestion can cause the serious organ damages including liver and resulting in death. Amanita punctata can also cause the elevation of liver and pancreatic enzymes. Accidental poisoning with the mushroom is contributing to the leading cause of developing acute liver failure in children. Accidental or suicidal poisoning with yellow phosphorus and metal phosphides such as aluminium and zinc phosphides causes the acute liver failure. Paracetamol overdose in adults is a risk factor in developing hepatotoxicity.

2. MATERIALS AND METHODS

Materials used:

Subject or individual informed consent form, Data collection form, CHILD-PUGH Score

3. METHODOLOGY

Source of data: Data was collected from a tertiary care hospital

Study design: Prospective cohort study

Study duration: The study was carried out for a period of 6 months (October 2021- March 2022)

Inclusion criteria: Patients who are admitted in the hospital due to poison ingestion either deliberately or undeliberately, patients of all ages of either sex and patients with repeated poison ingestion are included in the study.

Exclusion criteria: Patients who are unable to provide information or unable to answer; pregnant women, patients with malaria, viral fever, hepatitis and other hepatic issues and who are not willing to participate in this study.

Study procedure: The study was conducted through data collection form after obtaining ethical clearance from the Institutional Ethical Committee. All the data under the inclusion criteria are included and assessed.

Design of data collection form: The data collection form was designed by the need of subject demographic details and laboratory profiles are designed by using standard textbooks, journal, and websites and by other relevant sources.

4. RESULTS AND DISCUSSION

Figure 1: Paraquat poisoning Vs Percent of 1-year survival rate

Figure 1 depicts the information regarding the distribution of Paraquat poisoned cases for percentage of 1-year survival rate. Majority of the cases were found to be 100% of 1-year survival rate(58.33%), followed by 80% of 1-year survival rate(41.67%).

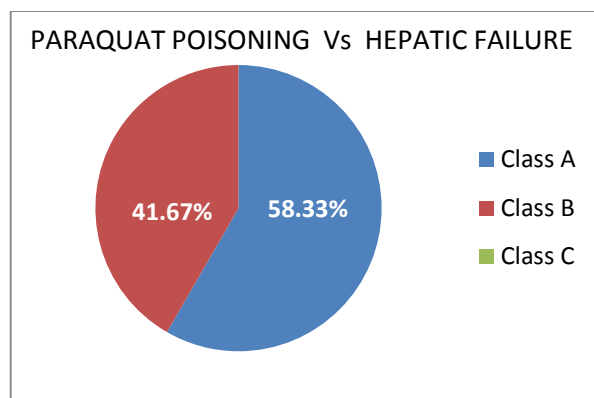


Fig.1: Paraquat Poisoning Vs Hepatic Failure

Figure 2: Rodenticide poisoning Vs Percent of 1-year survival rate

Figure 2 depicts the information regarding the distribution of Rodenticide poisoned cases for

percentage of 1-year survival rate. Majority of the cases were found to be 100% of 1-year survival rate(81.53%), followed by 80% of 1-year survival rate(17.39%), 45% of 1-year survival rate(1.08%).

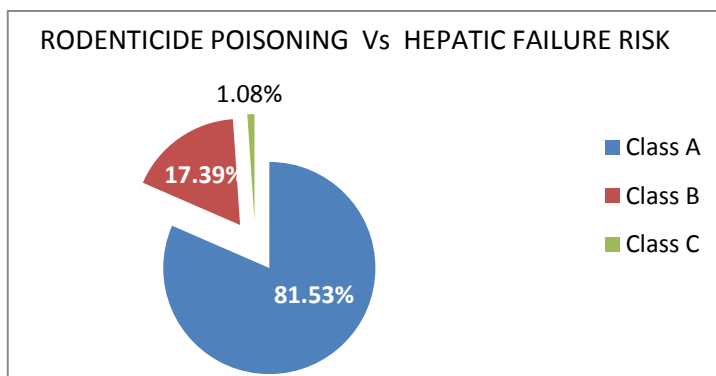


Fig.2: Rodenticide Poisoning Vs Hepatic Failure

Figure 3: Snake envenomation Vs Percent of 1-year survival rate

Figure 3 depicts the information regarding the distribution of Snake bite poisoned cases for

percentage of 1-year survival rate. Majority of the cases were found to be 100% of 1-year survival rate (64%), followed by 80% of 1-year survival rate (36%).

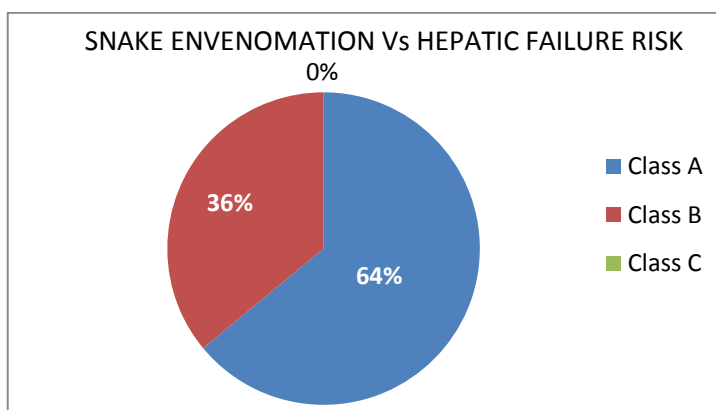


Fig.3: Snake envenomation Vs Hepatic Failure

Figure 4: Insecticide Poisoning Vs Percent of 1-year survival rate

Figure 4 depicts the information regarding the distribution of Insecticide poisoned cases for

percentage of 1-year survival rate. All the cases were found to be 100% of 1-year survival rate (100%).

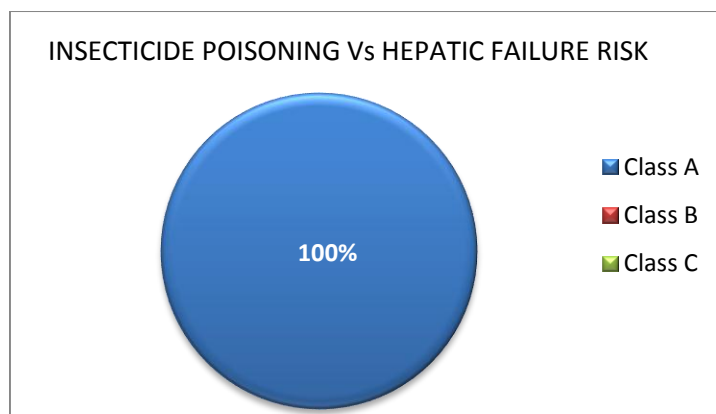


Fig.4: Insecticide Poisoning Vs Hepatic Failure

Figure 5: Organophosphate Poisoning Vs Percent of 1-year survival rate

Figure 5 depicts the information regarding the distribution of Organophosphate poisoned cases for

percentage of 1-year survival rate. Majority of the cases were found to be 100% of 1-year survival rate (80.95%), followed by 80% of 1-year survival rate (19.05%).

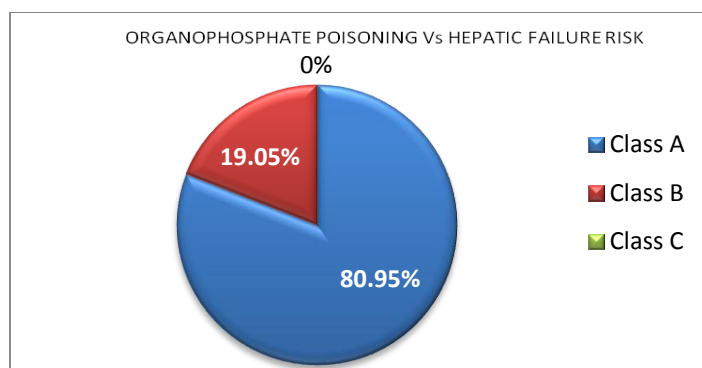


Fig.5: Organophosphate Poisoning Vs Hepatic Failure

Figure 6: Alprazolam overdose Vs Percent of 1-year survival rate

Figure 6 depicts the information regarding the distribution of Alprazolam poisoned cases for

percentage of 1-year survival rate. All of the cases were found to be 100% of 1-year survival rate (100%).

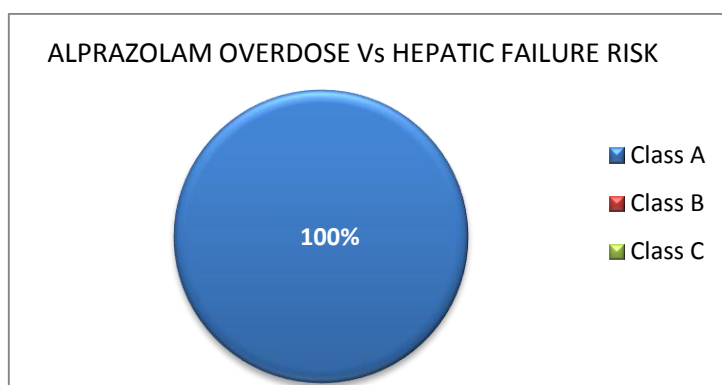


Fig.6: Alprazolam overdose Vs Hepatic Failure

Figure 7 : Sanitizer poisoning Vs Percent of 1-year survival rate

Figure 7 depicts the information regarding the distribution of Sanitizer poisoned cases for

percentage of 1 year survival rate. All of the cases were found to be 100% of 1-year survival rate (100%).

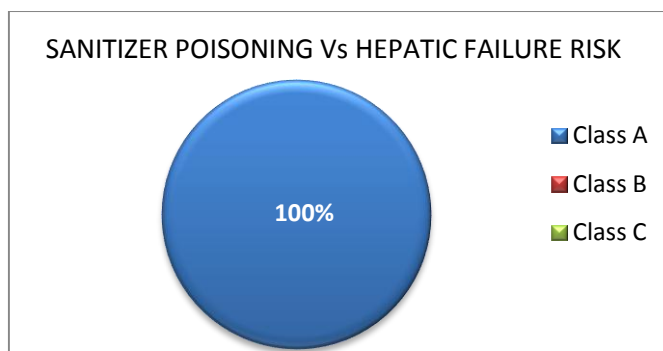


Fig.7: Sanitizer Poisoning Vs Hepatic Failure

Figure 8: Chi-Square test – All Poisonings Vs Hepatic Failure Risk

Figure 8 depicts the information regarding the distribution of all cases for all stages of hepatic failure risk.

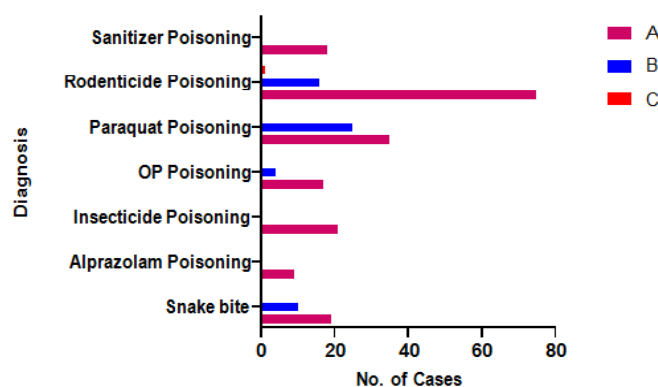


Fig.8: All Poisonings Vs Hepatic Failure
**Statistically significant; p = .0011

Figure 9: Chi-Square test – Before Counselling Vs After Counselling

Figure 9 depicts the information regarding the distribution of all cases before and after providing counselling.

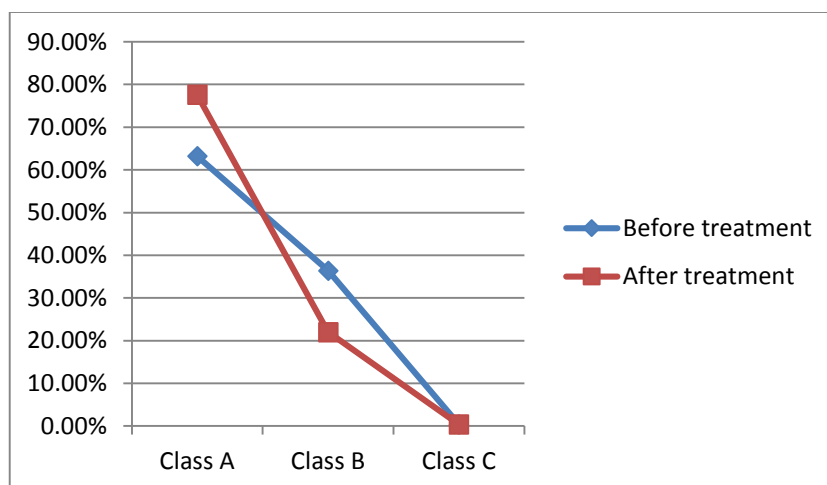


Fig.9: Before Counselling Vs After Counselling
**Statistically significant, $\chi^2(2, N=250) = 12.5585, p = .001875$

Hepatic failure risk was assessed using CHILD-PUGH Score and the extent (%) of 1-year survival rate. The scoring employs five clinical measures of liver disease like serum albumin, INR, total

bilirubin, ascites, and hepatic encephalopathy. Either the prothrombin time or INR should be used, not both. In the present study, we considered INR values. Each parameter was provided with some

points based on its value and thereby the total sum of the points indicates to which class the patient belongs to. If the total bilirubin value is <2 mg/dL (<34.2 μ mol/L); the points allotted were “+1”, the upper limit of total bilirubin for “+2” points is 3 mg/dL (50 μ mol/L) and the value of total bilirubin for “+3” points is >3 mg/dL (>50 μ mol/L). For Serum Albumin, “+1” points were given when its value is >3.5 g/dL, the lower limit for “+2” points is 2.8 g/dL and the range for “+3” points is <2.8 g/dL. In case of INR value; “+1” points were allotted when it is <1.7 , the upper limit of INR value for “+2” points is 2.3 and the value >2.3 is allotted with “+3” points. The next parameter is Ascites; in case of no ascites the points allotted were “+1”, if mild (suppressed with medication) ascites was present it is allotted with “+2” points and the presence of moderate to severe (or refractory) ascites was given “+3” points. The fifth parameter is Hepatic Encephalopathy; the absence of hepatic encephalopathy was allotted “+1” points, the presence of Grade I-II hepatic encephalopathy reflects “+2” points and Grade III-IV reflects “+3” points. After allotting points to each clinical measure, the total sum of points was calculated. If total points are 5-6, it belongs to Class ‘A’ (100% of 1-year survival rate), if total points are 7-9, it is Class ‘B’ (80% of 1-year survival rate) and if the total points are 10-15, it is Class ‘C’ (45% of the 1-year survival rate). We analyzed hepatic failure risk using Chi-square test. Based on the results out of 250 subjects, 60 were Paraquat poisoning, out of which majority of the cases were found in Class ‘A’ (n=35; 58.33%), followed by Class ‘B’ (n=25; 41.67%). 92 were Rodenticide poisoning, out of which majority of the cases were found in Class ‘A’ (n=75; 81.53%), followed by Class ‘B’ (n=16; 17.39%), Class ‘C’ (n=1; 1.08%). 26 were Snake envenomation, out of which majority of the cases were found in Class ‘A’ (n=1; 64%), followed by Class ‘B’ (n=10; 36%). 21 were Insecticide poisoning, all the cases were found in Class ‘A’ (n=21; 100%). 21 were OP poisoning, out of which majority of the cases were found in Class ‘A’ (n=17; 80.95%), followed by Class ‘B’ (n=4; 19.05%). 9 were Alprazolam overdose, all the cases were found in Class ‘A’ (n=9; 100%). 18 were Sanitizer poisoning, all the cases were found in Class ‘A’ (n=18; 100%). These findings were in concordance with study done by Robert J Fontana, MD (2008) on “Acute Liver Failure including Acetaminophen Overdose”, that reported survival of ALF patients was 3% to 18%. Later studies reported survival of 14% to 25% without liver transplantation and 41% to 49% with liver transplantation. Among transplant recipients, 1-year patient survival now varies between 60% and 80%. A followup after two months of counselling revealed that there is a significant decrease in the risk to develop hepatic failure.

Limitations:

This study included 250 subjects only. This study has to be further continued with huge amount of population and also the various factors must be considered. The amount of poison ingested is not uniform in all the cases. Follow-up is done only for two months after counselling. The time duration between poison ingestion and hospital admission is not uniform in all the cases. Convincing subjects to spend time for providing data.

5. CONCLUSION

Based on the results obtained, our study concludes that there is a significant risk to develop hepatic failure in the various poisoned subjects and found a significant decrease in the risk after providing counselling. The majority of patients exposed to poisons are dealt with general medical wards by internists and physcists. Subjects with advanced encephalopathy or an otherwise unfavourable prognosis should be promptly referred to a liver transplant centre for further evaluation. Emergency liver transplantation can be associated with favourable outcomes, but requires coordinated intensive care and constant reassessment. Most of the poisonous substances described here were both easily available and inexpensive. We believe that our results could be valuable for physicians in general and gastroenterologist in particular in managing such cases in emergency. Our study concludes that by providing leaflets and counselling patient about the diet helped the patients to reduce their risk to develop hepatic failure.

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