Review

Comparative Study of Anesthetic and Post Operative Complications in Trauma Patients: (Intoxicated vs Non-Intoxicated with Alcohol)

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Comparative Study of Anesthetic and Post Operative Complications in Trauma Patients: (Intoxicated vs Non-Intoxicated with Alcohol)

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Abstract: Alcohol is a substantial risk factor for trauma, accounting for 30-50% of cases with alcohol intoxication. Alcohol usage impairs wound healing in traumatic injuries by lowering immune function and leukocyte production. This review compares the outcomes and complications of trauma patients who have consumed alcohol to those who have not. Systematic and independent searches were carried out on PubMed, Google Scholar, Scopus, and Web of Science databases. PRISMA guidelines were strictly followed. Data was gathered on the type of trauma, the type of operation, whether or not alcohol was used, the outcomes, and the complications. The study included 12 publications, all of which came to the same conclusion: trauma patients with alcohol intoxication spent more time on mechanical ventilators, had longer ICU LOS, and had longer hospital stays.

Keywords: alcohol; trauma; outcomes; surgical complications; anaesthetic complications hospital length of stay; mechanical ventilation; ICU stay

Introduction

Alcohol is the most often abused drug worldwide, causing substantial harm to individuals, families, and society. [9] Alcohol intoxication has a substantial impact on the outcomes of traumatic injuries, altering patient management, surgical treatments, and postoperative care. Several research have investigated the link between alcohol intoxication and various traumatic injuries, offering light on the challenges of treating individuals who have a history of alcohol use. Trauma includes both purposeful and unintentional injuries from car accidents, piercing or blunt violence, falls, firearms, poisons, and burns. [13] Epidemiology studies show that intoxication is becoming more common during trauma injuries, which can impair coordination and reaction times and has been linked to an increased risk of complications after surgery. [3]

Crutcher et al. (2014) investigated the effects of alcohol intoxication on traumatic spinal cord injury outcomes, focusing on the potential role of alcohol intake in the severity and recovery of such injuries. Similarly, Vartan et al. (2020) conducted a statewide examination of rib fractures in patients with alcohol use disorder, emphasizing the relationship between alcohol usage and specific injury patterns. These findings emphasize the need of managing alcohol intoxication as a contributing factor in trauma patients. [1,2] Klifto et al. (2020) conducted a systematic review and meta-analysis of the effects of nicotine/smoking, alcohol, and illegal substance use on burn patient outcomes and complications, emphasizing the multifaceted nature of substance abuse on burn injury management. [3] Hsieh et al. (2013) examined the intriguing question of whether alcohol intoxication could

Protect trauma patients from major harm and lower hospital mortality, demonstrating the intricate relationship between alcohol use, injury severity, and patient survival. [4] Furthermore, Puyana et al. (2021) investigated the effect of elevated blood alcohol levels on burn patient outcomes,

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providing insight into the difficulty of managing burn injuries in patients with alcohol-related comorbidities. [5] Jung et al. (2023) evaluated the effect of alcohol consumption prior to damage on functional and survival outcomes after catastrophic brain damage, emphasizing the need of considering pre-accident alcohol usage while treating traumatic brain injuries. [6]

This systematic evaluation of 12 studies compared the outcomes and repercussions of trauma patients referred to hospitals with and without alcohol intoxication. According to the data analysed, trauma patients who are drunk with alcohol, before hospitalization have worse outcomes and complications than those who are not.

Objectives

The primary objective of the review is to comparatively evaluate the use of mechanical ventilator post operatively and length of the hospital stay in alcohol intoxicated trauma patients to that of non-intoxicated patients. Secondary objective is to evaluate any anaesthetic complications such as intubation and coagulation in both the groups.

Material and Methods

Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines was followed in the literature search to create a framework for the review. Multiple search strings which included keywords like “alcohol”, “complications”, “trauma”, “outcomes”, “ICU stay” were built to rigorously search through different data bases (PubMed, Scopus, web of science, google scholar) to extract the required articles. 17300 articles were initially pulled out after the initial search. Both male and female patients of any age with any kind of trauma with alcohol intoxication before the trauma or with a habit of alcohol consumption admitted to the hospital were included in the study. Papers published in the last ten years were considered to narrow down the articles. After applying required filters, the articles were narrowed down to 539.Further specific papers were extracted using search string that included required outcomes like “length of hospital stay” and “use of mechanical ventilator”. Full article papers including review articles, observation prospective studies, retrospective studies, case studies from various parts of the world were extracted. The papers narrowed down to 22 out of which 12 relevant articles which had the expected outcomes were selected for the review.

Alcohol usage in the articles was indicated by a positive blood alcohol concentration (BAC), urine toxicology report, drunkenness, or patient self-report on admission. [3] Injury severity score (ISS), Glassgow coma scale, PT, were measured to assess patient’s condition on arrival.

Outcomes measured in trauma cases (intoxicated and non-intoxicated patients) included comparative complications and severity of complications in both the groups like Mortality, Length of stay, Ventilator days Neurological complications, Pulmonary complications, Pneumonia complications, Renal complications, Haematological complications ,DVT/Reinfections complications ,UTI Ulcer/skin ,Wound complications, Alcohol withdrawal syndrome ,Delirium ,Pneumonia ,Sepsis ,ARDS, Unplanned intubation, myocardial infarction; hypotension and shock, gastroparesis, total parenteral nutrition use, acute respiratory failure, sepsis, central line associated blood stream infection, surgical site infection, , persistent postoperative fistula, postoperative gastrointestinal complication, and withdrawal from either alcohol or drugs, increased LOS. Out of all the mentioned complications, ones with p-value <0.05 were considered significant variables in both the groups. [1–12]

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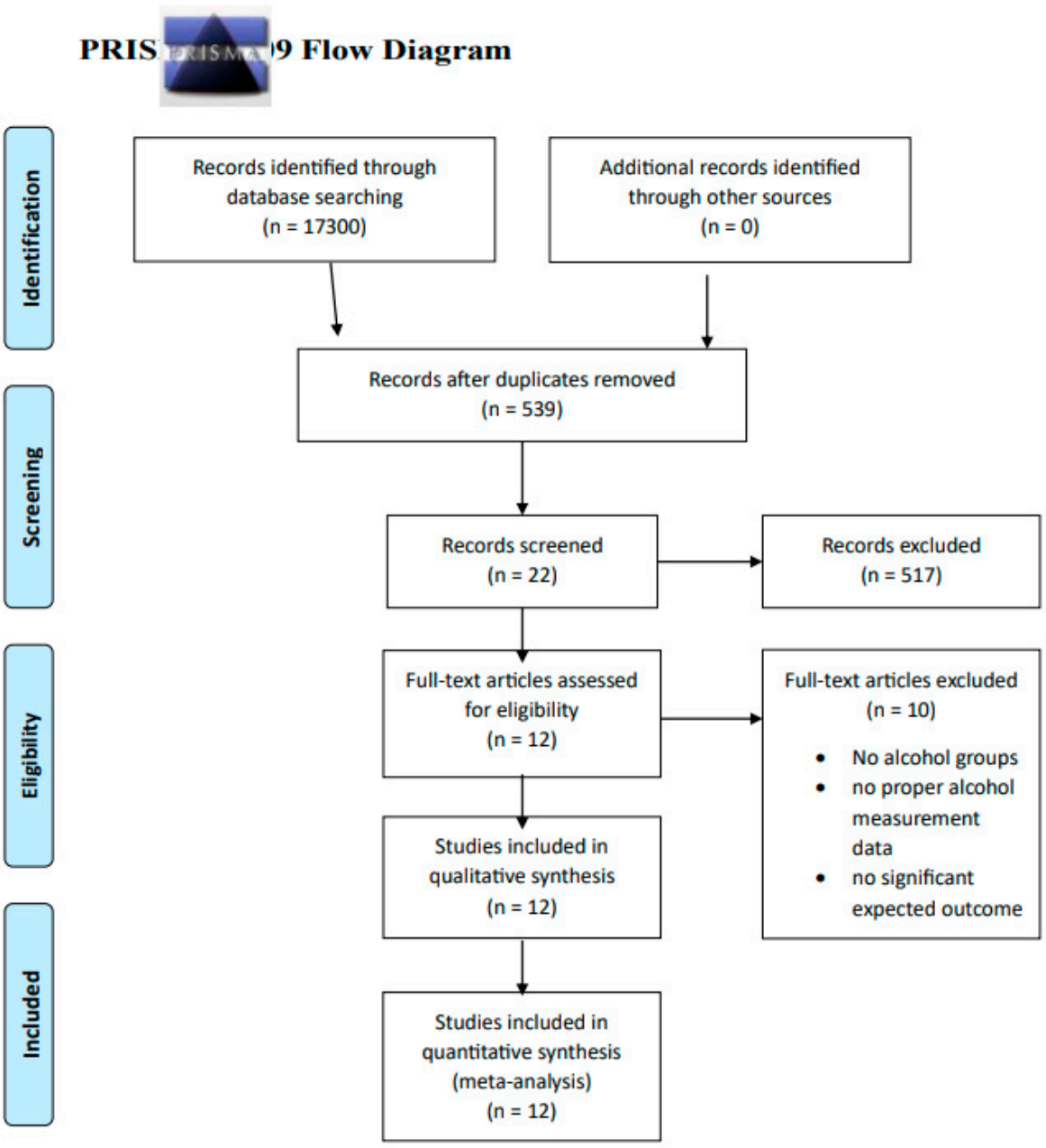

Figure 1. PRISMA FLOW CHART SUMMARIZING THE SCREENING PROCESS AND FINAL ARTICLES SELECTION [5].

Findings and Results

Upon reviewing the literature from different areas of the world made by various doctors, students and research professionals, a findings table (Table 1) was made which included the article being reviewed, year of publication, population studied, complications mentioned, significant variable complications and the conclusions given by each article.

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Table 1.

S.NO	REFERENCE	YEAR	POPULATION STUDIED	TYPE OF OPERATION	COMPLICATIONS	SIGNIFICANT VARIABLE (p value< 0.05)	CONCLUSION
1	Alcohol Intoxication and Its Effects on Traumatic Spinal Cord Injury Outcomes Clifford L. Crutcher II,1 Beatrice Ugiliweneza,2 Jonathan E. Hodes,3 Maiying Kong,4 and Maxwell Boakye2,5,6,**2014**	2014	n=10611, patients with alcohol intoxication and traumatic spinal cord injuries	orthopedic and neurological	Mortality Length of stay Ventilator days All-type complications Neurological complications 3 Pulmonary complications Pneumonia complications Renal complications Hematological complications DVT/PE Infection complications UTI Ulcer/skin Wound complications	length of hospital stay, ventilator days, ICU stay	Intoxicated patients, on average, **spent an extra 3 days in the hospital, 2 days in the ICU, and 2 days on a ventilator**. Alcohol intoxication was associated with an increased risk for all complications
2	Alcohol Use Disorder Is Bad for Broken Ribs: A Nationwide Analysis of 19,638 Patients With Rib Fractures Phillip Vartan, MS, Samer Asmar, MD, Letitia Bible, MD, Mohamad Chehab, MD, Muhammad Khurram, MD, Lourdes Castanon, MD, Michael Dirlikv, DO, and Bellal Joseph, MD*, **2020**	2020	n =19638 ,patients with alcohol use disorder, rib fracture cases	orthopedic surgery	Alcohol withdrawal syndrome Delirium Pneumonia Sepsis ARDS Unplanned intubation Ventilator days, ICU LOS, Hospital LOS, Mortality	pneumonia,sepsis,ARDS,unplanned intubation, icu LOS, hospital LOS	patients with AUD with rib fractures had higher rates of pneumonia, unplanned intubation, sepsis, ARDS, and mortality. They spent **more days in the hospital** and **in the ICU** than non-AUD patients.
3	Impact of nicotine/smoking, alcohol, and illicit substance use on outcomes and complications of burn patients requiring hospital admission: systematic review and meta-analysis Kevin M. Klifto a, Pragna N. Shetty a, Benjamin R. Slavin a, Caresse F. Gurno b, Stella M. Seal c, Mohammed Asif a, C. Scott Hultman,**2019**	2019	n= 28,512,burn patients under influence of nicotine/ smoking, alcohol, substance use	N/A	LOS Ventilator days Intubation Inhalation injury ICU LOS Mortality Infection Wound/ local infection Sepsis DVT/ PE	Ventilator days Intubation Inhalation injury ICU LOS	Alcohol was associated with more days on a **ventilator, higher rates of intubation, higher rates of inhalation injury, longer ICU LOS**, and increased mortality.
4	Does Alcohol Intoxication Protect Patients from Severe Injury and Reduce Hospital Mortality? The Association of Alcohol Consumption with the Severity of Injury and Survival in Trauma Patients CHI-HSUN HSIEH, M.D.,*† LI-TING SU, M.SC.,* YU-CHUN WANG, M.D.,*‡ CHIH-YUAN FU, M.D.,*† HUNG-CHIEH LO, M.D.,* CHIU-HSIU LIN, M.SC.*	2013	n=5738, trauma and accident cases without alcohol and under influence of alcohol	N/A	severe injuries with prolonged intensive care unit and hospital stays	prolonged intensive care unit & hospital stays	Patients who consumed alcohol tended to have more severe injuries with **prolonged intensive care unit and hospital stays** compared with those who did not.
5	Effects of Elevated Blood Alcohol Levels on Burn Patient Outcomes Salomon Poyntas, MD, MSa,c, Samuel Ruiz, MDa, Francisco Amador, MDd, Elizabeth Young, MSNb, Shaikh Hai, MDa, Mark McKenney, MD, MBAa,c, Rizal Lim, MDa,b, Haaris Mir, MDa,b	2021	n=11286 , burn patients with an without alcohol influence	N/A	Hospital LOS ICU- LOS Average Ventilator Days In-Hospital Mortality	Hospital LOS ICU- LOS Average Ventilator Days In-Hospital Mortality	Burn patients who tested above the legal limit for alcohol on admission were associated with increased inpatient mortality, as well as increased ICU LOS and days on a ventilator. A positive admission blood alcohol level may be an independent predictor of worse outcomes, leading to an increase in resource needs and health care costs.
6	Alcohol intake before injury and functional and survival outcomes after traumatic brain injury Pan-Asian trauma outcomes study (PATOS) Enjene Jung, MD, PhDa,b, Young Sun Ro, MD, DrPHb,c,d,* , Joo Jeong, MDb,e, Hyun Ho Ryu, MD, PhDa,b, Sang Do Shin, MD, PhDb,c	2023	n=71,383, trauma patients (TBI)	N/A	poor functional recovery at hospital discharge, in hospital mortality	———	**alcohol intake before TBI** was associated with **better functional and survival outcomes,low in hospital mortality** especially in male patients
7	Recent alcohol use prolongs hospital length of stay following lung transplant Erin M Lowery1,2, Meagan Youg1, Arsis Colum1, Cara Joyce3, and Elizabeth J Kovacs4Alcohol Research Program, Burn Shock	2018	n=139, lung transplant cases with or without alcohol concentration in patients	Lung transplantation	increase in hospital length of stay (LOS) following lung transplant. patients spent 3 times as long on mechanical ventilation after transplant intensive care unit stay almost 3 times atrial arrhythmia, acute kidney injury, and acute cellular rejection	LOS, Prolonged ICU stay, prolonged mechanical ventilation	Lung transplant recipients with evidence of **recent alcohol** use at transplant had a **prolonged duration on mechanical ventilation, longer ICU and hospital LOS** compared to those without evidence of recent alcohol use.
8	Effect of acute alcohol intoxication on mortality, coagulation, and fibrinolysis in trauma patients Ik-Jae WangID 1,2, Byung-Kwan Bae1, Young Mo ChoID 1, Suck Ju Cho1,3, Seok-Ran YeomID 1,3, Sung-Bong Lee4, Mose Chun5, Hyerim Kim2,6, Hyung-Hoi Kim2,6, Sun Min Lee7, Up Huhh, Soo Young MoonID 2,6*	2021	n=686, trauma cases which recorded alcohol intoxication	rotational thromboelastometry	higher mortality rate, higher clotting time, and lower maximum lysis, more fibrinolysis shutdown, and hyperfibrinolysis	higher mortality rate, higher clotting time,fibrinolysis shutdown	alcohol impairs initial clot generation, inhibits fibrinolysis, and is an independent risk factor for fibrinolysis shutdown in trauma patients. Further, in patients with fibrinolysis shutdown, alcohol is an independent risk factor for mortality
9	The impact of alcohol-related admissions on resource use in critically ill patients from 2009 to 2015: an observational study P. J. Secombe*, P. C. Stewart†	2018	n=3,768, critically ill patients including alcohol abusive patients(Cardiovascular,Trauma,Renal / Genitourinary,Gynaecologic,UGI bleed/ Pancreatitis)	N/A	ICU LOS, resulting is increased resource utilisation, need for mechanical ventilation.	ICU LOS,MV	Admissions associated with alcohol were significantly more likely to require **mechanical ventilation** , and had a significantly **longer ICU length of stay**
10	Unhealthy Alcohol and Drug Use is Associated with an Increased Length of Stay and Hospital Cost in Patients Undergoing Major Upper Gastrointestinal and Pancreatic Oncologic Resections Sujay Kulshrestha, MD1,2, Corinne Bunn, MD1,2, Richard Gonzalez, MD1,2, Majid Afshar, MD, MSCR2,3,4, Fred A. Luchette, MD, MSc1,5, Marshall S. Baker, MD, MBA1,5	2020	n=59,490,gastrectomy, esophagectomy, total pancreatectomy, and pancreaticoduodenectomy	gastrectomy, esophagectomy, total pancreatectomy, and pancreaticoduodenectomy	myocardial infarction; hypotension and shock, pneumonia and respiratory failure, gastroparesis, total parenteral nutrition use, acute respiratory failure, sepsis, central line associated blood stream infection, urinary tract infection, surgical site infection, deep vein thrombosis or pulmonary embolism (DVT/PE), persistent postoperative fistula, postoperative gastrointestinal complication, and withdrawal from either alcohol or drugs, increased LOS	prolonged hospitalizations	patients with unhealthy substance use have an increased risk of a complication but also require **prolonged hospitalizations** for their recoveries independent of any postoperative complications they suffer.
11	Influence of alcohol use on mortality and expenditure during hospital admission: a cross-sectional study Shu-Hui Peng,1,2 Shiuh-Yuan Hsu,3 Pao-Jen Kuo,2 Cheng-Shyuan Rau,4 Yu-Ai Cheng,1 Ching-Hua Hsieh3	2016	n=20 106, trauma patients	N/A	higher injury severity, longer hospital stay, higher proportion of admission to the ICU	longer hospital stay, higher proportion of admission to the ICU	patients with alcohol intoxication incurred significantly **higher expenditure** than patients without alcohol intoxication.Patients with alcohol intoxication had significantly higher, cost of operation, cost of examination and cost of pharmaceuticals than the total patient population,
12	The influence of substance misuse on clinical outcomes following burn† Sarah Rehoux, Stephanie Mosoun,b, Jessie MacDonaldc, Runandra Pintod, Marc G. Jeschkea,e,f,*	2017	n=1199, burn cases (alcohol, illicit drug, or both)	N/A	increased ventilator days, fluid resuscitation volumes, and rates of complications such as graft loss, cellulitis, and pneumonia , fluid retention and impairment of the gut-liver axis; graft loss, compartment syndrome, pulmonary complications, and worsen end-organ ischemia	greater LOS,increased rates of bacteremia and sepsis	A history of substance misuse is associated with an increased risk of inpatient complications and longer hospital stay.

The 12 articles included in the review were published from 2013 through 2023.Out of the 12 articles 11 papers had similar significant variables. A total of 2,30,556 patients were studied in the articles out of which 28,682 patients were intoxicated with alcohol before injury or at the time of arrival at the hospital. BAC>0.08% TO 0.15% is considered a risky level of blood alcohol, therefore all the intoxicated patients were checked for BAC levels and also U-TOX level, ISS score, GCS score. The trauma patients in the papers included traumatic brain injury cases, burn cases, fracture cases, traumatic spinal cord injury cases, transplantation cases, critically ill patient cases post trauma. Out of all the complications recorded significant variables having a p-value <0.05 were taken into consideration. The significant variables in intoxicated patients included prolonged hospital LOS, longer ventilator days, elongated ICU LOS, higher clotting time which means more bleeding complications, sepsis or surgical site infections, unplanned intubation, inhalational injuries. [1–12]

Burn patients with alcohol intoxication had significantly higher in-hospital mortality rates (4.86% vs 3.91%) [4]. They also had increased ICU length of stay and total days on a ventilator [4]. Alcohol use was associated with increased morbidity and mortality in thermal injuries [4]. More than half (52.3%) of acute burn patients in one study were under the influence of alcohol at the time of injury. Out of all the trauma patients burn patients were severely impacted by alcohol consumption. [3,5,12]

Others trauma patients when compared to control group of non-intoxicated patients they had increased hospital length of stay, prolonged days on ventilator, higher morbidity rate, longer ICU LOS, higher sepsis rate. [1,2,4,6–11]

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Discussion and Conclusion

The articles mentioned proper comparison between patients who were under the influence of alcohol versus patients who were not .Clear results were obtained stating the complexity and severity of trauma patients who were intoxicated .11 out of 12 papers indicated prominent post operative complications in intoxicated patients like high percentage of hospital length of stay , increased mortality rates, , prolonged stay on mechanical ventilator , longer ICU LOS , sepsis and anesthetic complications observed were unplanned intubation , higher clotting time, inhalational injury .

In conclusion, this review suggests that trauma patients with alcohol intoxication had higher rate of post operative complications and anesthetic complications when compared to non-intoxicated trauma patients.

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