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The Effect of Hypovolemic Shock on the Number of War Deaths

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Abstract

This paper aims to detect of the Effect of Hypovolemic Shock on the Numbers of War Deaths. The researchers use the qualitative approach. They relied on previous studies, scientific papers and existing statistics on this topic as a tool to collect the necessary information. The results of the research indicate that the majority of war deaths are due to hemorrhagic shock, which is one of the case of Hypovolemic Shock.

Keyword: hemorrhage, hypovolemic shock, hemorrhagic shock, War deaths.

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الملخص:

تهدف هذه الورقة إلى الكشف عن تأثير صدمة نقص حجم الدم على أعداد وفيات الحروب. يستخدم الباحثون المنهج الوصفي كمنهجية بحثية، حيث تم الرجوع الى عدد من الدراسات السابقة والأوراق العلمية والإحصاءات المتعلقة بموضوع البحث لجمع المعلومات اللازمة. تشير نتائج البحث إلى أن معظم وفيات الحروب ناجمة عن صدمة نزيفية ، وهي إحدى أشكال صدمة نقص حجم الدم.

الكلمة المفتاحية: نزيف ، صدمة نقص حجم الدم ، صدمة نزفية ، وفيات حرب

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Introduction

The war injuries differ from those happened in the civilian setting in terms of mechanism of injury, the speed of onset of symptoms, complications, and outcome. Except for a few prominent case (Champion, et al., 2003, p. S13).

The study of (Buehner, et al., 2017, p. e1927) indicated that the largest number of war deaths is due to hemorrhagic shock that leads to a decrease in the volume of blood in the body, which affects the heart rate and a sudden hypotensive.

Hemorrhage is the acute loss of blood due to damage to a blood vessel. Bleeding can be superficial (not deep) and most often occur when superficial vessels are damaged. On the other hand, it can be deep and penetrate the tissues of the skin and internal organs of the body, which leads to a set of symptoms and complications, and the instability of vital signs (heartbeat and blood pressure). There are two types of Hemorrhage; external and internal. External bleeding occurs from a body manhole, or a traumatic injury. while, Internal bleeding requires a high level of clinical examination laboratory tests, Mayo Clinic, and close observation of vital signs (Johnson & Burns, 2020, p. 1). Hemorrhage is a major cause of death, it is the leading reason of potentially preventable trauma deaths especially when hypovolemic shock happened (Chang & Holcomb, 2017, p. 15).

Hypovolemic shock is a sudden decrease in blood volume resulting from the loss of large amounts of liquid.

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This condition occurs for several reasons, including internal or external bleeding, severe diarrhea, excessive urination, and excessive sweating. The body tries to compensate the decrease in blood volume by increasing the heart rate, blood vessel disorder and a large drop in blood pressure (Hobson & Chima, 2013, p. 10). Hemorrhage that accompanies war injuries is a major cause of hypovolemic shock. The idea of this research focuses on recognition the effect of hypovolemic shock on the number of war deaths.

Problem Statement

Understanding the causes of post-injury death on the battlefield is effective in combating improved performance of casualty care and providing all Wilderness and clinical treatments to them. Hemorrhage that accompanies war injuries is a major cause of hypovolemic shock witch led to death in the most cases (Eastridge, et al., 2011). The problem of this research represented in study the effect of hypovolemic shock on the number of war deaths. So, the main question of this study:

What is the effect of Hypovolemic Shock on the numbers of war deaths?

literature review

Hypovolemic shock

Doctor Samuel D. Gross defined Shock as “the rude unhinging of the machinery of life”.

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Shock leads to the emergence of many complications as a result of a lack of energy feeding the cells, (Mitchell & Schoster, 2019, p. 1) in another way unbalance between oxygen supply and needs (Piras, 2017, p. 240) which leads to failure in vital functions, increased absorption of endotoxin and bacteria and systemic inflammatory response syndrome and if uncontrolled, ultimately death (Mitchell & Schoster, 2019, p. 1).

The study of (Piras, 2017, p. 240) indicate that the shock is one of the most convoluted conditions and is closely related to increased death rates. Death may occur at an early stage of hemorrhagic hypovolemic shock, after a period of injury, which affects the state of the brain, or in a delayed event as a result of organ failure and their inability to carry out their vital functions. Shock is classified as hypovolemic shock (hemorrhagic shock), cardiogenic shock, obstructive shock, and distributive shock (Shagana, et al., 2018, p. 1102).

Hypovolemic shock is defined as the rapid loss of large amounts of body fluids or blood which leading to impaired function of vital systems and insufficient blood volume and perfusion (Shagana, et al., 2018, p. 1102).

Hypovolemic shock is associated with drop of filling pressure and heart rate to reduce tissue perfusion. Low blood pressure (BP) causes the release of adrenaline and noradrenaline into the circulation which increases the contraction of the heart and heart rate (HR) and promotes vasoconstriction. When the disease becomes more severe, there is an increase in cortisol production due to the secretion of the hormone releasing corticotrophin (the hormone supplying the

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adrenocorticotropic) and a decrease in cortisol When the blood pressure drops to insufficiency low level, there is also a decrease in coronary blood flow, which reduces the capacity of the heart muscle on systole and thus reduces the DC current, making the shock more severe. Blood stagnation in the microvessels and tissue metabolism continues to increase. As a senior amount of carbonic and lactic acid continues to be produced and spread into the local blood vessels, the acidity of the blood increases, which leads to damage to brain tissue, clumping of blood, formation of clots, and the consequent blockage of small blood vessels. (Piras, 2017, p. 240).

Hypovolemic shock can be divided into two categories; hemorrhagic and nonhemorrhagic . Non-hemorrhagic hypovolemic shock is caused by dehydration (a decrease in the water content in the body). Dehydration is usually caused by various factors such as: intake fluid, excessive gastrointestinal losses, excessive urination, excessive perspiration, or the transfer of body fluids from the intravascular compartment. (Hobson & Chima, 2013, p. 10) . One the other hand, hemorrhagic shock is caused by rapid blood loss is mostly occurs in obstetrical situations and combat injuries (Shagana, et al., 2018, p. 1102).

Hemorrhagic shock is described by decrease oxygen surrender, , related with sever blood loss. Severe hemorrhage is also related with extra "physiologic abnormalities" including coagulopathy, decrease enzyme efficiency, and energizing of the systemic inflammatory response. This pathophysiology is eminent after acute injury, and unstopped hemorrhage has been proved to be the

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main cause of preventable death after shock in both militaries and civilian populations. Death due to severe bleeding and 30 - 56% of these deaths occur Before arrived the hospital or receiving health care. As for the cases who managed to reach the hospital and receive primary care, they died due to continuous bleeding, coagulopathy, and poor resuscitation. Furthermore, hypotension may accelerate death (Buehner, et al., 2017, p. e1922).

Etiology of Hypovolemic shock

Hypovolemic shock is incurred by abrupt blood absence or Loss of large amounts of body fluids. The most prevalent clinical causes of hypovolemic shock are "hemorrhage, vomiting, diarrhea, severe burns, and excessive sweating". the reduction in blood pressure, cardiac output and systemic vascular resistance without a compensatory elevation led to systemic hypotension. In hypovolemic shock, the volume loss is from external factors or internal. The lost blood can be recovered in a simple way if necessary measures are taken before tissue damage. The outward fluid losses and the inward sequestration will lead to minimize venous return and reduced cardiac output. This cause set of reversal responses work to preserve the oxygen to ticklish organs such as brain and heart. However, these responses may border exudation of other organs such as gut as to produce necrosis. The effect of reduced tissue exudation are same in all forms of shock (Shagana, et al., 2018, p. 1102).

(0.3- 0.7) per 1000 people develop hypovolemic shock annually. The primary cause of non-hemorrhagic hypovolemic shock is dehydration that results from

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diarrhea and lack of take liquid, which are so widespread in the developing world. in the Hemorrhagic hypovolemic shock, the traumatic injury is the most common cause that occurs in wars, armed combat and military attacks, while "gastrointestinal bleed, bleed from an ectopic pregnancy, bleeding from surgical intervention, or vaginal bleeding" all of them may occur Hemorrhagic shock of varying proportions (Taghavi & Askari, 2020, p. 1).

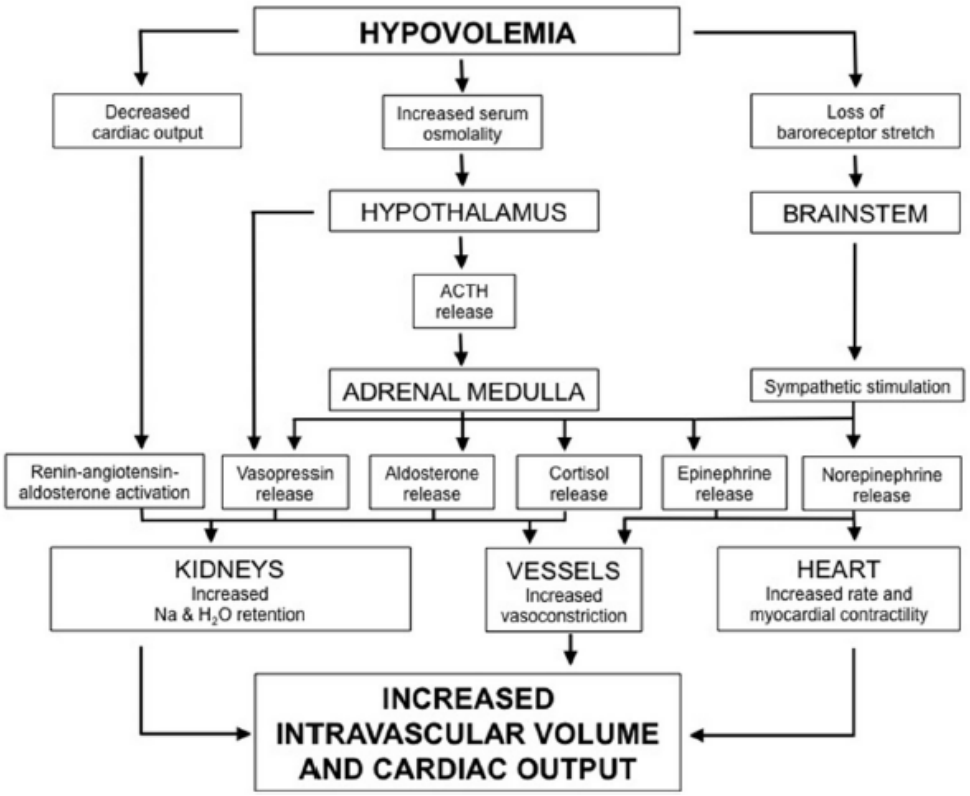

Figure (1): Physiologic compensatory responses to hypovolemic shock, source: (Mitchell & Schoster, 2019, p. 3)

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Symptoms of Hypovolemic Shock

Symptoms associated with hypovolemic shock differ depending on a range of factors, including: the past level of organ function, compensatory technique, intensity of organ dysfunctions, and the source of shock syndrome. A patient with hypovolemic shock may appear a combination of symptoms as pallor, tachycardia, hypotension, dyspnea, diaphoresis, tachypnea, cyanosis, faint heart sounds, agitation, mental status changes, pinpoint pupils, cool and clammy skin, lactic acidosis, and poor urine output" (Shagana, et al., 2018, p. 1102-1103).

There are many diagnostic methods for hypovolemic shock that reveal low blood pressure, hypothermia and acceleration of the heart rate, and they are shown by (Taghavi & Askari, 2020, p. 1) as following:

- Kidney function test (KFT)
- Complete blood count (CBC)
- computed tomography-CT
- Echocardiography
- Femoral shaft fractures in emergency medicine
- Gastrointestinal bleeding
- Hemorrhagic shock in emergency medicine
- Iron toxicity
- Pelvic fracture in emergency medicine
- Pregnancy trauma
- Peptic ulcer disease

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- Placenta previa imaging
- Thoracic aneurysm

Management of Hypovolemic Shock

Hemorrhagic shock is treated through stop blood flow and replacement of blood volume with another blood and its derivatives or fluids, like crystalloids or colloids. The crystalloid solutions is the most used ingredient in volume replacement , that use to return cardiac output and tissue perfusion. Using this method can lead to a host of complications include "inflammation, hemodilution, edema, abdominal compartment syndrome, renal failure and coagulation disorder". Complications can be avoided through mechanical monitoring of fluid replacement, which helps monitor vital signs and compare them with borderline ratios (Piras, 2017, p. 241).

A group of disorders that may occur in cases of severe bleeding and transfusion of large quantities of blood must be taken into consideration include" loss of blood viscosity, coagulation changes due to hemodilution and fibrinolysis". To prevent these disorders, Balanced transfusion can be used, with the ratio between plasma to platelets to red blood cells to be (1: 1: 1 or 1: 1: 2) (Taghavi & Askari, 2020, p. 1). Management of hemorrhagic shock, especially in the event of severe bleeding, may not be effective, and the patient may lose his life, especially in cases of war and combat injuries.

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In cases of Non-hemorrhagic hypovolemic shock the accurate fluid volume deficit cannot be decided. Therefore, it can began with 2 liters of isotonic crystalloid solution infiltrate, to achieve restore tissue perfusion quickly. Fluid plenum can be observing by " blood pressure, urine output, mental status, and peripheral edema". The response of the patient's condition to the fluid fed with it can be ascertained by "ultrasound, central venous pressure monitoring, and pulse pressure fluctuation" (Taghavi & Askari, 2020, p. 1).

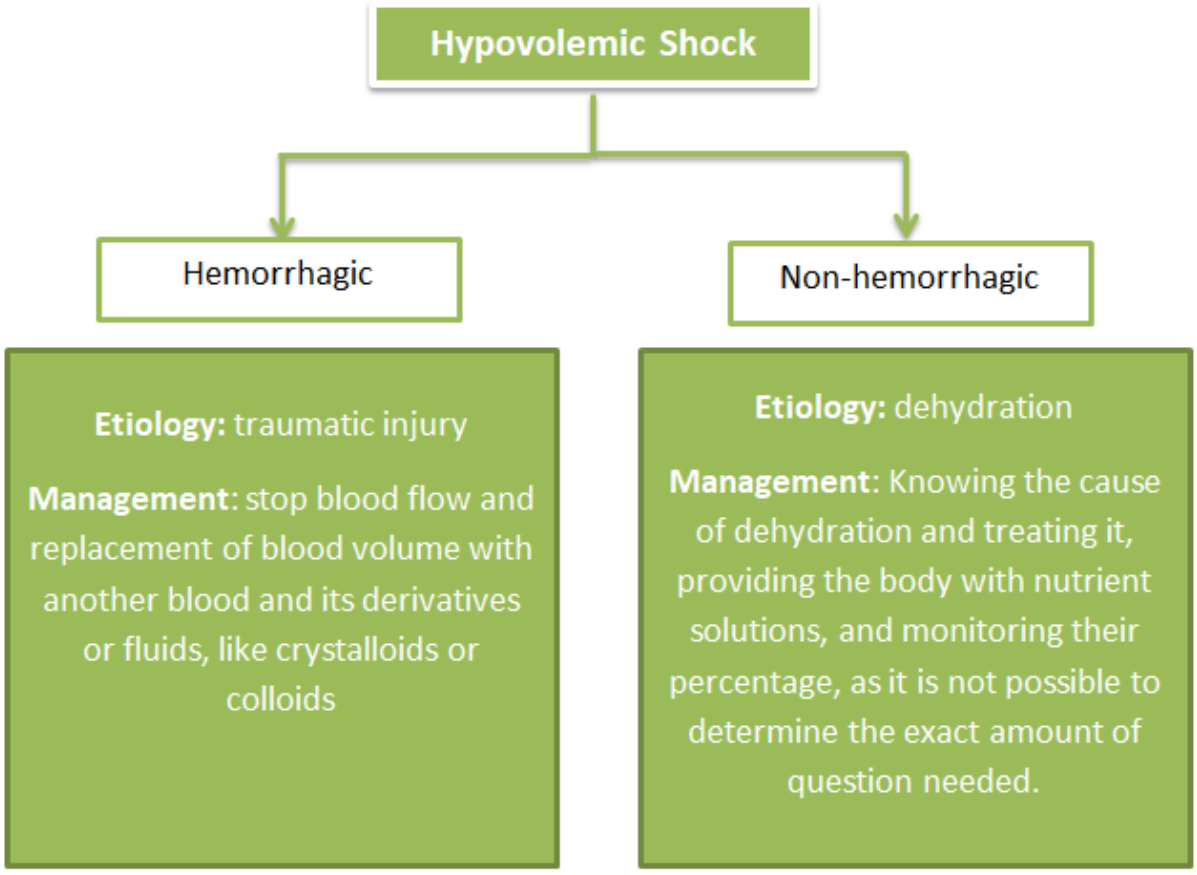

Figure (2): hypovolemic shock, source: done by researchers.

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The most number of potentially preventable deaths after injury are associated to Hemorrhagic shock and occur early after injury before hospital arrival. quarter of traumatic injury deaths may be Survivable cases through early medical and surgical interference (Eastridge, Holcomb, & Shackelford, 2019, p. 1423). In 2000, the World Health Organization (WHO) evaluated that injury led to 9%. In 2015, the National Trauma Institute predestined that in the civilian arena, sever hemorrhage cause for greater than 35% before hospitalization and nearly 40% of deaths during the first 24 hours of injury. Complications in the form of Coagulopathy occur in approximately 25% of patients who receive care, resulting in death (Donley & Loyd, 2020, p. 1).

In the battlefields , Several studies have attempted to understand the causes of death in wars. The study of (Holcomb, et al., 2007, p. 986)) which was conducted to determine the “Causes of Death in U.S. Special Operations Forces in the Global War on Terrorism 2001–2004” indicate that 82 casualties had died in one of Special Operations. the bodies of five of soldiers were lost ; autopsies had been performed on all other 77 of them. Seventy of 82 deaths (85%) were classified as non-survivable; 12 deaths (15%) were classified as potentially survivable. Of those with potentially survivable injuries, 16 causes of death were identified: Causes of death were identified: (50%) truncal hemorrhage, (19%) compressible hemorrhage, (13%) hemorrhage amenable to tourniquet, and (6%) each from tension pneumothorax, airway obstruction, and sepsis.

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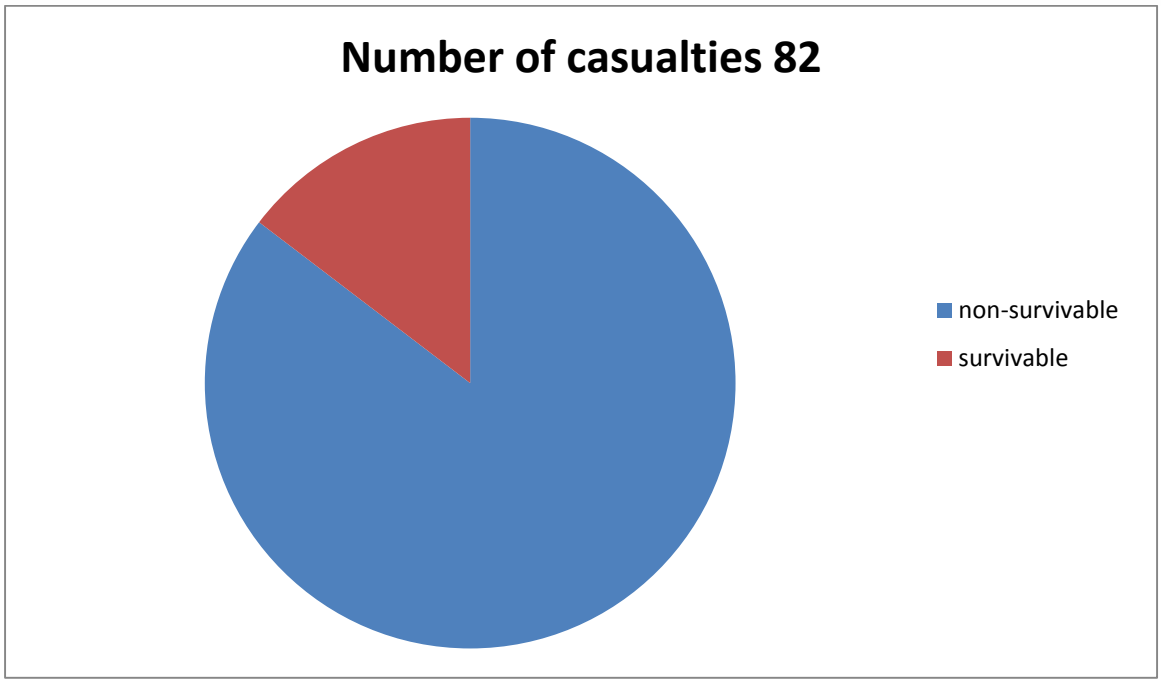
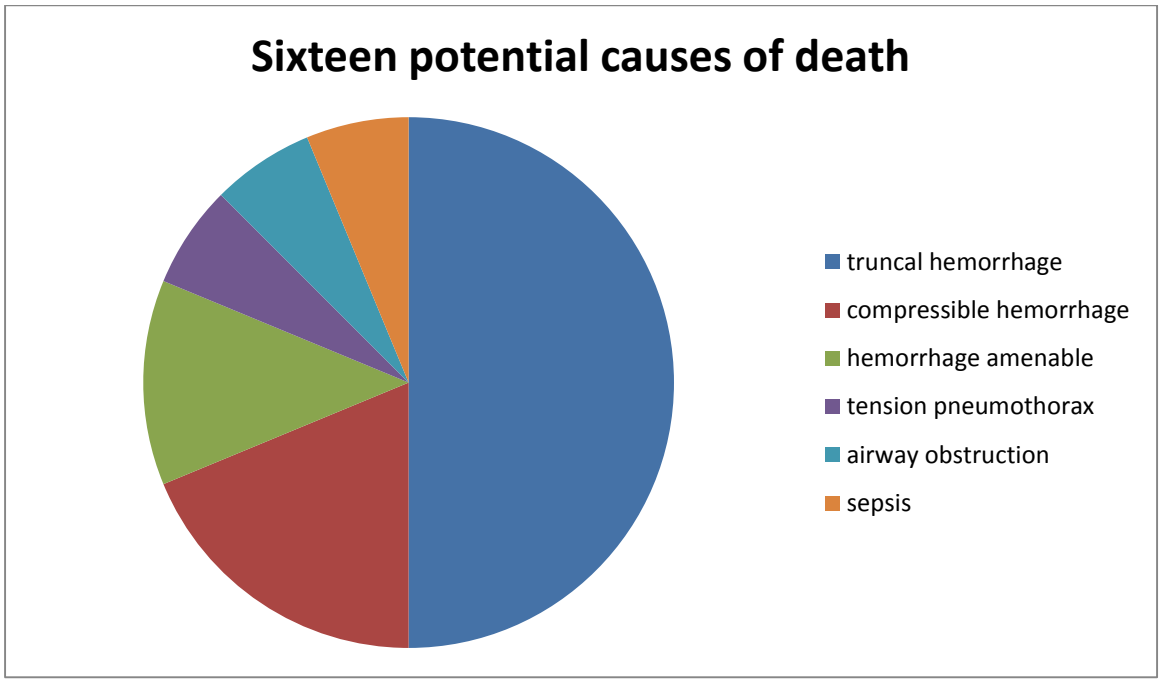


Figure(3): classification of death cause, source: done by researchers



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Figure(4): Sixteen potential causes of death in the 12 potentially survivable casualties source: done by researchers

Another study which was conducted to determine the "Causation and Implications for Improving Combat Casualty Care" The study reviewed the autopsy records to assess the death cases of victims who lost their lives after reaching medical treatment centers from October 2001 to June 2009. The number of deaths reached (558), classified into (271) (48.6%) non-survivable cases, and (287) (51.4%) Survivable cases. The study found that the death of (255) from (271) (83%) who were classified as non-survivable cases were due to a traumatic brain injury. While, it was indicated that (230) from (287) (80%) of those who were classified as Survivable cases died due to hemorrhage. Most of the bleeding was concentrated in the "torso (48%), extremity (31%), and junctional (neck, axilla, and groin) (21%)" (Eastridge, et al., 2011, p. S4). Depending on these studies, we can say that Hemorrhagic hypovolemic shock is a major mechanism of death in combat injuries

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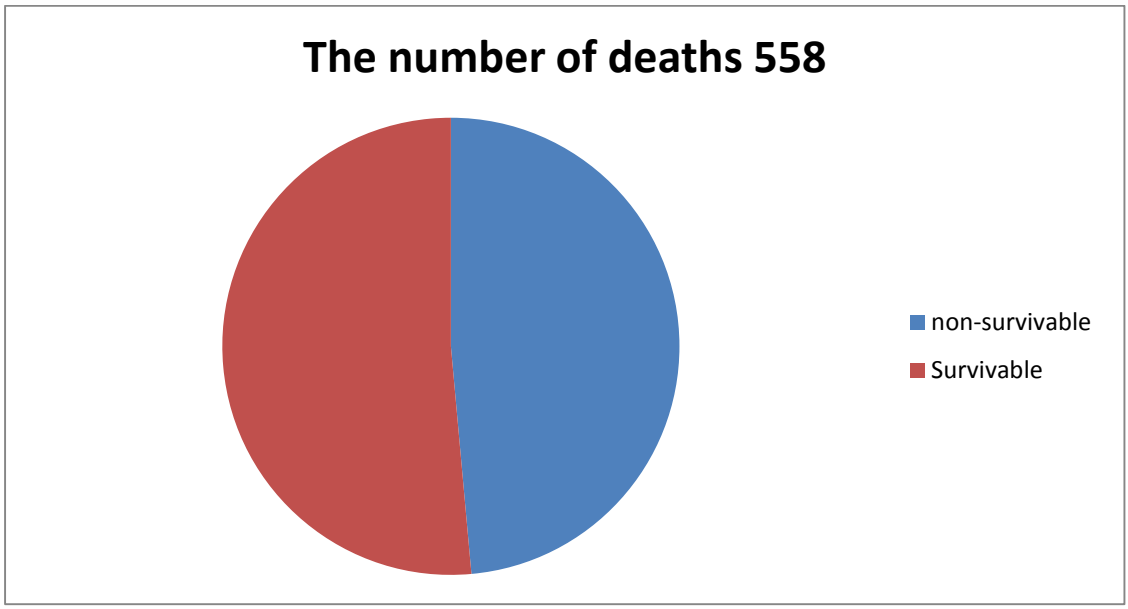
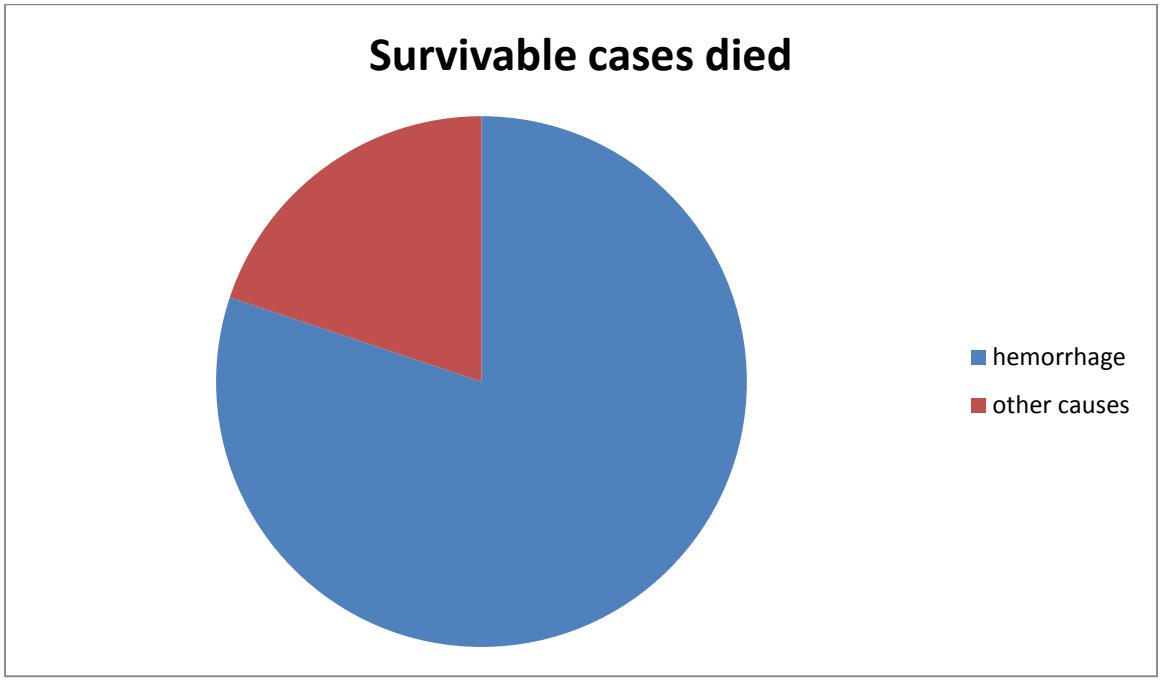


Figure(5): classification of death cause, source: done by researchers



Figure(6): death causes of survivable casualties, source: done by researchers

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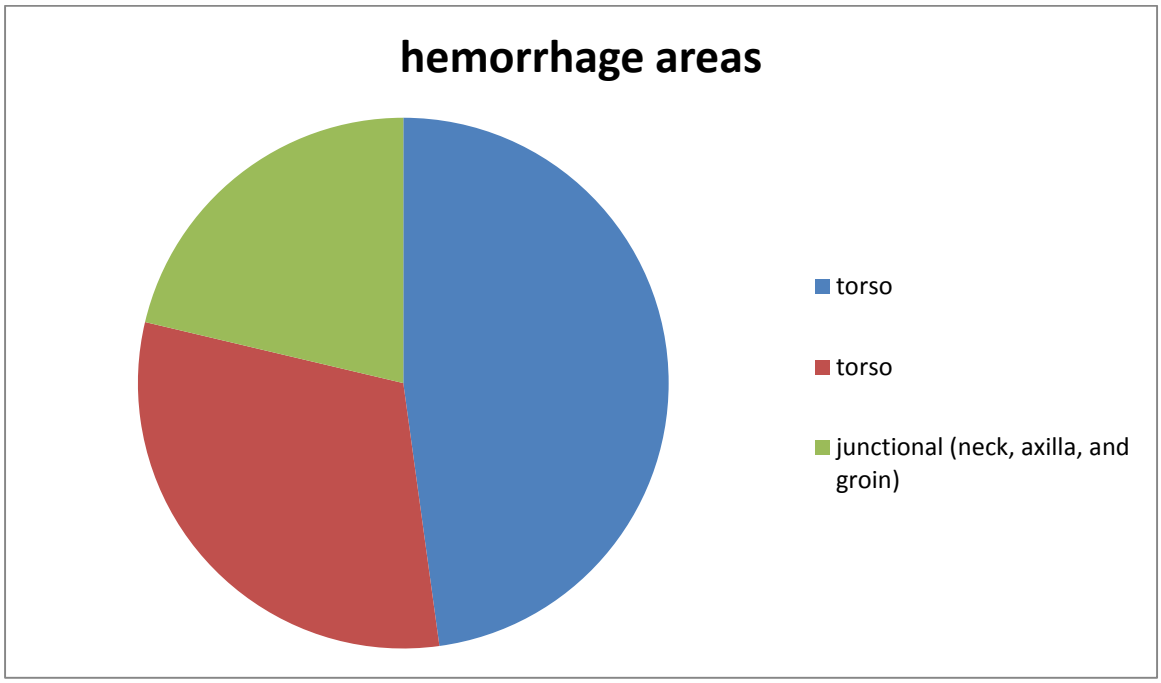

Figure(7): hemorrhage areas of the body, source: done by researchers

Summary

This research discussed the effect of hypovolemic shock and the number of war deaths. The research discussed hypovolemic shock and its types (hemorrhagic - non-hemorrhagic). On the other hand, the research mentioned the most important Etiology of this shock, the symptoms , and diagnostic mechanisms. The research also referred to a number of studies that reviewed the causes of death in wars. Accordingly, it was found that hemorrhagic shock, which is one of the cases of Hypovolemic Shock, is the first cause of death in wars.

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