

Relationship between the development of Sepsis, Systemic Inflammatory Response Syndrome and Body Mass Index among Adult Trauma Patients at University Hospital in Cairo

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Abstract

Background: Sepsis is a major cause of mortality and morbidity in trauma patients. Body mass index as an indicator of nutritional status was reported as a predictor of injury pattern and complications among critically ill injured patients. **Aim:** The aim of this study is to investigate the relationship between body mass index and the development of sepsis, systemic inflammatory response syndrome among adult trauma patients at emergency hospital - Cairo University. **Research design:** Descriptive correlational research design was utilized in the current study. **Research questions:** Q1. What is the body mass index profile of adult trauma patients admitted to the emergency hospital at Cairo University over a period of 6 months?, Q2. What is the frequency of systemic inflammatory response syndrome and sepsis among adult trauma patients admitted to the emergency hospital at Cairo University over a period of 6 months?, and Q3. What is the relationship between the development of sepsis, systemic inflammatory response syndrome and body mass index among adult trauma patients admitted to the emergency hospital at Cairo University over a period of 6 months?. **Sample:** A purposive sample of 52 adult male and female trauma patients with revised trauma score 10 to 12. **Setting:** The Emergency Hospital affiliated to Cairo University. **Tools:** Four tools were utilized to collect data pertinent to the study: Socio demographic and medical data tool, Systemic inflammatory response syndrome assessment tool, Revised Trauma Score tool, and Sequential organ failure assessment tool. **Results:** The current study revealed that, (61.5 %) of the studied subjects had normal body mass index, (25 %) were overweight, and (13.5 %) were underweight. 84.6% of the studied subjects had systemic inflammatory response syndrome and 92.3% were suffering from mild sepsis. No significant statistical relationship was found between body mass index and occurrence of Systemic inflammatory response syndrome ($\chi^2=2.89$ & $P = 0.23$). However, Sequential organ failure assessment scores were affected significantly by body mass index was found mean of initial and last Sequential organ failure assessment score for underweight, normal and obese where $t= 7.24$ at $p = 0.000$, $t= 16.49$ at $p = 0.000$ and $t= 9.80$ at $p = 0.000$ respectively. **Conclusion:** Underweight trauma patients showed significantly higher rate of developing sepsis as compared to patients with normal body weight and obese. **Recommendations:** based on finding of this study the following are recommended: replication of the study on a larger probability sample from different geographical locations in Egypt. Carrying out of further studies in order to assess the other risk factors influencing trauma outcome and incidence of its complications. Establishment of standardized guidelines for managing underweight traumatized patients with sepsis.

Key wards: Body Mass Index, Sepsis, Systemic Inflammatory Response Syndrome, Adult Trauma.

1. Introduction:

Nurses have long been challenged by the complexity of the health care needs of seriously injured patients and their family. Nurses play an essential role in the care of the trauma patient, from prevention to resuscitation through rehabilitation. The incidence of trauma is predicted to increase worldwide in the twenty –first century (**Mcquillan, Makic, & Whalen, 2009**). The national safety council reported that unintentional injury or trauma continues to be the fifth leading cause of death for all ages. Trauma is frequently referred to as the disease of the young because the majority of injured person's age ranged from 16 to 24 years. Major complications of trauma include sepsis, hypovolemia, pneumonia, acute respiratory distress syndrome and pulmonary embolism, neurogenic shock, and renal failure. SIRS is a systemic response to a clinical insult such as trauma (**Sole, Klein & Moseley, 2012**). SIRS is the presence of two or more of the following clinical manifestations: 1- Fever of more than 38°C (100.4°F) or less than 36°C (96.8°F) 2- Heart rate of more than 90 beats per minute, 3-Respiratory rate of more than 20 breaths per minute or arterial carbon dioxide tension (PaCO₂) of less than 32mm Hg, 4- Abnormal white blood cell count (>12,000/μL or < 4,000/μL or >10% immature [band] forms) (**Chulay & Burns, 2010**).

Sepsis is a complex condition that is often life threatening. It is characterized by hematological derangements and a profound inflammatory response to an infection or injury. Sepsis is a major cause of mortality and morbidity in the trauma patient. Sepsis following traumatic injury is related to the type of injury, together with the extent of injury and the anatomical location. There are many factors influencing trauma outcome and incidence of its complications such as age, mechanism of injury, associated patient factors (e.g. medical conditions), severity of injury, nutritional status of the patient, involvement of body parts, prehospital care and gender of the patients (Nair, 2009). One of the risk factors for the development of sepsis is malnutrition (**Picard, O'Donoghue, Young-Kershaw & Russell, 2006**).

The negative consequences of malnutrition have been known for centuries and there is substantial evidence that malnourished hospitalized patients have increased morbidity, compromised outcomes and increased mortality rates (**Chulay & Burns, 2010**). WHO (2005) define malnutrition as generally refers both to undernutrition and overnutrition. To monitor nutritional status many parameters are useful to do that such as: Body Mass Index (BMI), laboratory, physical and historical data (**Stanfield, Hui, 2010**). Body Mass Index (BMI) is a person's weight in kilograms divided by the square of their height in meters. It is one of the most commonly used ways of estimating whether a person is overweight and hence more likely to experience health problems than someone with a healthy weight. Obese patients have multiple physiological changes that alter their response to injury such as increased risk of infection and increased cardiac output due to increased blood volume to the adipose tissue (**Nayduch, 2009**). On the other hand, underweight can also cause health problem which include fighting off infection, osteoporosis, decreased muscle strength, trouble regulating body temperature and even increased risk of death (**Rochester, 2005**).

Early detection of sepsis is the key element in its management and the nurse should detect it and assess the traumatic patient frequently. Critical care nurses are the health care providers most closely involved in daily care of critically ill patients and so, have opportunity to identify patients at risk for sepsis (**Beasley, 2010**). Critical care nurse is responsible for close monitoring and assessment which are essentials for detection of early signs of SIRS and early intervention to ensure good outcome in these patients (**Chulay & Burns, 2010**). Therefore, the aim of this study was to investigate the relationship between the development of sepsis, systemic inflammatory response syndrome and body mass index among adult trauma patients at Cairo university hospital.

2. Significance of the study

Recent studies reported an incidence of sepsis between 5% and 25% among trauma patients admitted to the intensive care unit (ICU) (Ilašević, et al 2008). Also it has been observed over a period of 3 years of experience as a clinical instructor in The Emergency Hospital of Cairo University that, trauma patients develop some health problems and complications, these complications are prominent to some extent among those who are either over or underweight which include sepsis, pneumonia, hypovolemia...etc. These complications increase length of ICU stay, increase mortality rate, worsen the patient outcomes, delaying patient's recovery and increase hospital costs. Therefore, this study was designed in an attempt to provide healthcare professionals with an in-depth information about the relationship between the development of sepsis, systemic inflammatory response syndrome and body mass index among adult trauma patients, which hopefully will be reflected positively on the quality of patients' care and prevent suspected complications.

Furthermore, this data could be beneficial in maintaining a cost-effective patient care especially in such critical care units as it might shorten hospital stay and safeguard patients against any of life threatening complications. Also, it provides data base that can be utilized by health care professionals in the provision of the future care for such group of patients and it is hoped that, this effort will generate an attention and motivation for further investigations into this area.

3. Aim of the study

The aim of this study was to investigate the relationship between the development of sepsis, systemic inflammatory response syndrome and body mass index among adult trauma patients at The Emergency Hospital - Cairo University.

4. Research Questions:

To fulfill the aim of this study, the following research questions were formulated:

Q1: What is the body mass index profile of adult trauma patients admitted to The Emergency Hospital - Cairo University over a period of 6 months?

Q2: What is the frequency of systemic inflammatory response syndrome and sepsis among adult trauma patients admitted to The Emergency Hospital - Cairo University over a period of 6 months?

Q3: What is the relationship between the development of sepsis, systemic inflammatory response syndrome and body mass index among adult trauma patients admitted to The Emergency Hospital - Cairo University over a period of 6 months?

5. Subjects and Methods:

5.1. Research Design

A descriptive correlational research design was utilized in the current study. Descriptive correlational research is to describe relationships among variables rather than to support inferences of causality (Polit & Beck, 2012)

5.2. Setting

The study was conducted in The Emergency Hospital, Cairo University. The Emergency Hospital consisted of ICU of department (5) one room containing 8 beds Separated by curtains receiving approximate 56 patients every year. ICU of the 7th floor containing two rooms, each room contains 6 beds receiving approximate 95 patients every year.

5.3. Subject

A purposive sample of 52 adult male and female trauma patients who were hospitalized over a period of 6 months from a total of 151 patients who were admitted to ICU of department (5) and ICU of the 7th floor at The Emergency Hospital (According to the Statistical & Medical Records Department – Cairo University Hospitals - 2012) and were willing to participate in this study with a revised trauma score of 10 or more was included in this study.

5.4 Tools

Four tools were utilized for data collection; one of these tools was designed by the investigator (sociodemographic and medical data tool), and the other one was adapted (SIRS assessment tool) then reviewed by a panel of three experts. The other two tools were adopted (Revised trauma score, and Sequential organ failure assessment tool (SOFA score). These tools were:

5.4.1 Socio demographic and medical data tool: This included the patient's age, gender, diagnosis, BMI, mid arm circumference...etc.

5.4.2. Systemic inflammatory response syndrome assessment tool: to detect the incidence of SIRS. The criteria of presence of SIRS include the following clinical manifestations:

- A. Fever of more than 38°C or less than 36°C
- B. Heart rate of more than 90 beats per minute
- C. Respiratory rate of more than 20 breaths per minute or arterial carbon dioxide tension (PaCO₂) of less than 32mm Hg
- D. Abnormal white blood cell count (>12,000/μL or < 4,000/μL or >10% immature [band] forms). Presence of two or more of the pervious criteria will indicate SIRS

5.4.3. Revised trauma score: this tool was adopted from Champion (1989). It is a scoring system to evaluate the severity of trauma and used internationally in both the pre hospital and hospital environment primarily as an instrument to predict the likelihood of serious injury and mortality. RTS record three areas 1- Respiratory rate (RR) contains 5 elements (RR= 0 take score 0, RR= 1-5 br/min take score 1, RR= 6-9 br/min take score 2, RR > 29 br/min take score 3, and RR= 10-26 br/min take score 4. 2- Systolic blood pressure(SBP) contains 5 elements (SBP = 0 mm/hg take score 0, SBP = 1-49 mm/hg take score 1, SBP = 50-75 mm/hg take score 2, SBP = 76 – 89 mm/hg take score 3, and SBP > 89 mm/hg take score 4. 3- Glasgow coma scale (GCS) contains 5 elements (GCS = 3 take score 0, GCS = 4-5 take score 1, GCS = 6-8 take score 2, GCS = 9-12 take score 3, GCS = 13-15 take score 4) . The RTS score is reliable, valid, and effective method to predict outcome and prognosis of trauma patient. RTS scores are ranging from 0-12 points. Lower values indicate poor prognosis and higher values indicate good prognosis.

5.4.4. Sequential organ failure assessment tool: This tool was adopted from Vincent (1996). It is a scoring system used to determine the extent of organ dysfunction or rate of failure during stay in the intensive care unit. It was designed to provide simple score that indicates how the status of the patient evolves over time. The assessment is based on six different scores, one for the respiratory, cardiovascular, hepatic, coagulation, renal and neurological systems. The SOFA score is reliable, valid, and effective method to describe organ dysfunction/failure in critically ill patients. Regular and repeated soring help in monitoring patients' condition and disease development. Each organ is graded from 0 (normal) to 4 (the most abnormal), providing score of 0 to 24 points.

5.5. Ethical consideration

An official permission to conduct the proposed study was obtained from the research ethical committee and from hospital administrators to conduct the study. Participation in this study was entirely voluntary; each patient /relative had the right to accept participation in the study or not.

Informed consent was obtained from trauma patient or their relatives. Anonymity and confidentiality were assured through coding the data, every participant had the right to withdraw from the study at any time; subjects were assured that the data will not be reused in another research without second /other new permission

5.6. Procedure:

The study was conducted through two phases: Preparatory phase and Implementation phase.

1- Preparatory phase:

This phase was concerned with the managerial arrangements to carry out the study in addition to the construction, preparation of two data collection tools by an extensive review of relevant literature either from textbooks, scientific research articles or web sites searches as well as seeking experts' advice. After obtaining the primary approval from the research ethical committee of the Faculty of Nursing- Cairo University, the investigator prepared formal requests to the head of the Emergency Departments. The purpose and the nature of the study were explained to the physician and nurses to gain their assistance, sharing and support to carry out the current study. A pilot study was carried out on eight patients admitted to emergency department (over a period of 18 days) and diagnosed as trauma patients who fulfilled the inclusion criteria to test the feasibility, objectivity, and applicability of the study tools and the 8 patients of pilot study were included in the current study.

2. Implementation phase:

Data of the current study were collected from January 2014 to July 2014, once official permissions were granted. A total number of 52 patients who fulfilled the criteria of inclusion were recruited into the present study. The first step in the implementation phase was classifying patients by using the revised trauma score to decide either they can be included (if RTS 10 or more) or excluded (if RTS is less than 10) from the study, it consumed about 5 minutes for each patients covering three parameters of the revised trauma score from the patient admission data. The patients/relatives (in case of unconscious patient) who were agreed to participate in the study were interviewed individually by the investigator to explain the nature and purpose of the current study. A written consent was obtained and this step took about 15 minutes. Then, Socio demographic and medical data sheet was filled out and body mass index profile was obtained which and took about 10 minutes. And the last step of implementation phase was using SOFA and SIRS assessment tools to assess for development of sepsis and systemic inflammatory response syndrome from admission to discharge (on daily basis). This required about 15 minutes for each assessment time.

5.7. Statistical data analysis

The collected data were scored, tabulated and analyzed by personal computer using statistical package for the social science (SPSS) program version 20. Descriptive as well as inferential statistics will be utilized to analyze data pertinent to the study. Level of significant will be set at $p \leq 0.05$

6. Results

Statistical findings of the current study are presented in three main sections: first section describes the studied sample as regards to their socio-demographic and medical data (figures 1-3) (tables 1 and 2). The second section answering the research questions (figure 4 and 5) tables (3- 10) and the third section is devoted to additional findings table (11).

Section 1:

Figure (1) shows that, 85 % of the studied subjects were males. Figure (2), shows that, (36.5 %) of studied subjects stayed in the hospital for more than one week and (36.5 %) stayed more than two weeks. Table (1) reveals that the mean age of all studied subjects is (34.15 + 10.6) years, and (51.5%) were none smokers, (96.2%) had no past medical history and (53.8 %) were admitted with head trauma. Table (2) shows that (38.5 %) were admitted with disturbed conscious level as a main reason of admission.

Section 2:

Figure (3) reveals that, (61.5 %) had normal body mass index. Figure (4) illustrates that, 84.6% had systemic inflammatory response syndrome. Table (3) reveals that, 90% had Heart rate of more than 90 beats per minute followed by 73% had abnormal white blood cell count ($>12,000/\mu\text{L}$ or $<4,000/\mu\text{L}$ or $>10\%$ immature [band] forms).

Table (4) reveals that 100 % of underweight patients had SIRS on admission (71.4 % had SIRS with three criteria, 14.3 % had SIRS with two criteria, and the same percentage had SIRS with 4 criteria). 100 % of underweight patients had SIRS during hospitalization (28.5 % had SIRS with two criteria, 57.2 % had SIRS with 3 criteria, 14.3 % had SIRS with four criteria). 57.2 % of underweight patients had SIRS on discharge (42.9 % had SIRS with three criteria, and 14.3 % had SIRS with two criteria). Table (5) reveals that 77 % of obese patients of the studied subject had SIRS on admission, 92.3 % had SIRS during hospitalization, and 76.7 % hadn't SIRS on discharge.

Table (6) reveals that 90.6 % of normal weight patients had SIRS on admission, 78.1% had SIRS during hospitalization, and 84.4 % hadn't SIRS on discharge. Table (7) illustrates that 100 % of underweight trauma patients had mild sepsis – related organ failure on admission, 100 % had sepsis during hospitalization (57.1 % had mild sepsis - related organ failure, and 42.9 % had moderate sepsis - related organ failure), and 100 % had sepsis - related organ failure (57.1 % had moderate sepsis - related organ failure, and 42.9 % had mild sepsis - related organ failure) on discharge. Table (8) illustrates that 84.6 % of obese trauma patients had mild sepsis - related organ failure on admission, 100 % had mild sepsis - related organ failure during hospitalization, and 84.6 % had mild sepsis - related organ failure on discharge.

Table (9) illustrates that 100 % of normal weight patients had mild sepsis - related organ failure on admission, during hospitalization and on discharge. Figure (5) shows that, mean initial SOFA score of underweight adult trauma patients was (4.4 + 1.6) indicated mild sepsis - related organ failure and mean last SOFA score of them was (8.3 + 5.3) indicated moderate sepsis - related organ failure and No statistical significant relationship between BMI and SOFA scores ($p = 0.073$ and $\chi^2 = 5.23$). Table (10) shows that mean of length of hospital stay of the underweight trauma patients is 20 ± 6.7 day, mean of length of hospital stay of the normal weight patients is 14 ± 4.8 day, and mean of length of hospital stay of the obese patients is 18.5 ± 6.2 day.

Section3:

Table (11) concludes that, there are not significant statistical correlation between BMI, age, gender, past medical problems, marital status, place of residence, type of trauma, occupation, smoking habits, and length of hospital stay, and SIRS.

(A). Figures:

Figure (1): Percentage Distribution as regards to Gender (N=52)

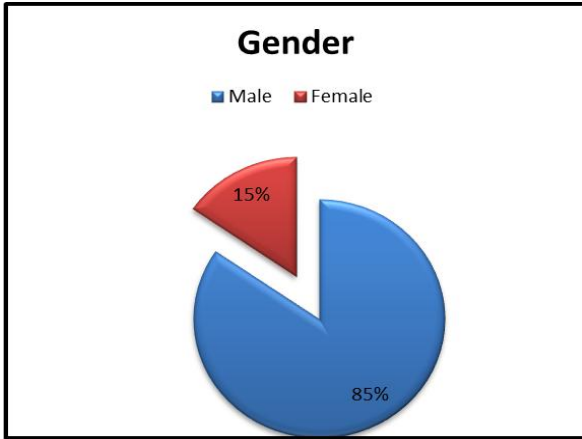


Figure (2): Percentage Distribution as regards to Length of Hospital Stay (N= 52)

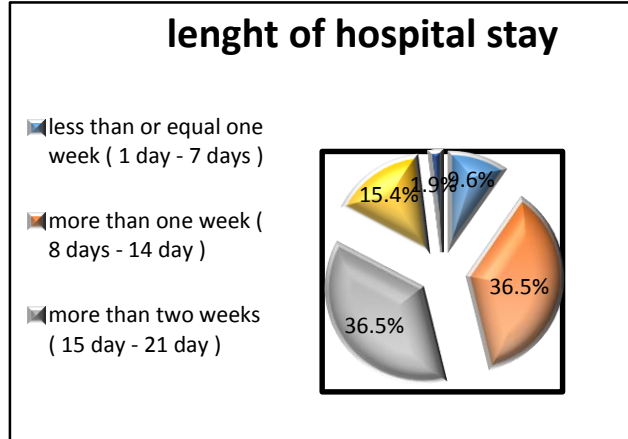


Figure (3): Percentage Distribution of the Studied Subjects as regards to Body Mass Index (N=52)

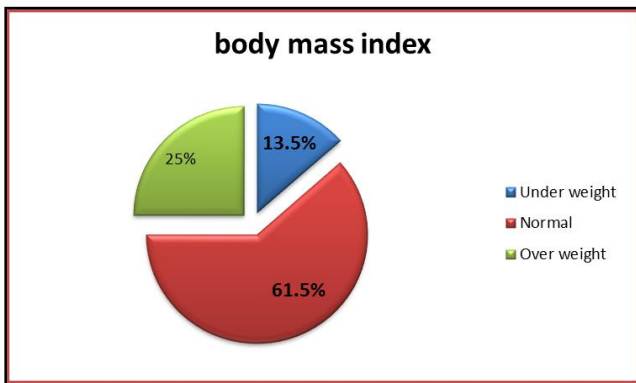


Table (4) Frequency of Systemic Inflammatory Response Syndrome (SIRS) (N =52)

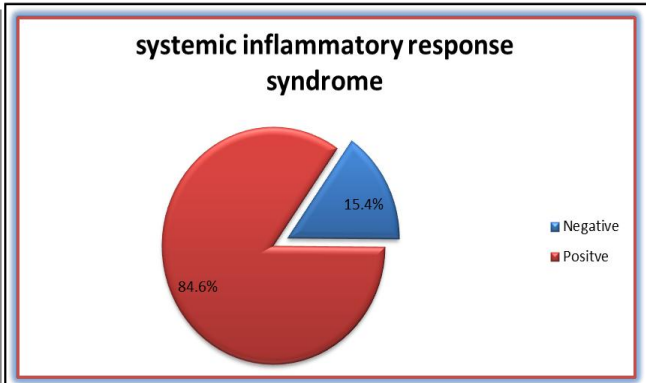
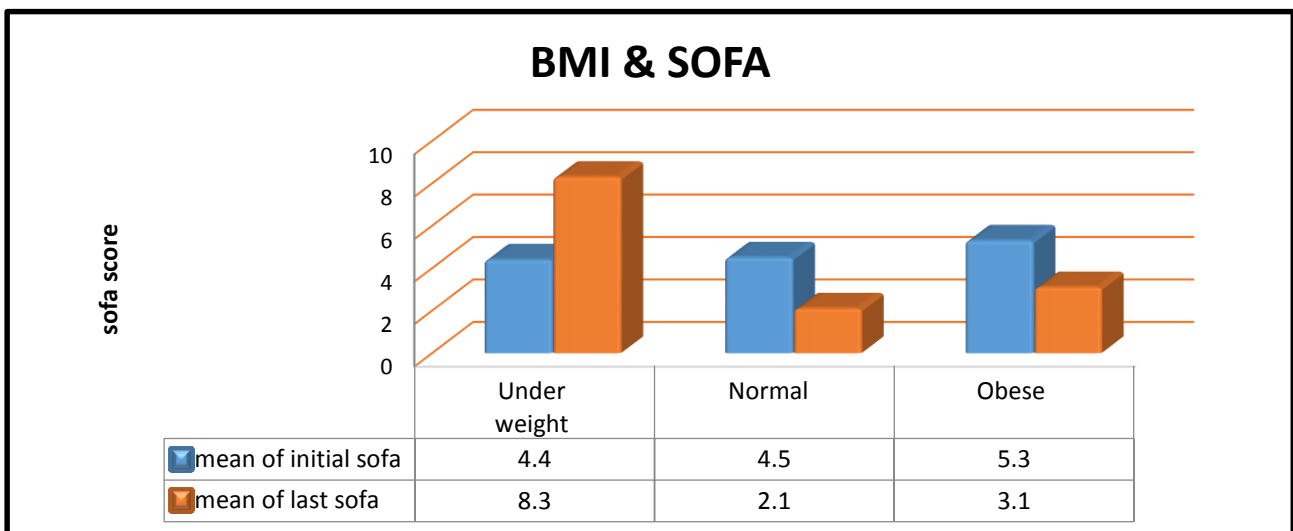


Figure (5): Relation between Sequential Organ Failure Assessment Scores (SOFA) and Body Mass Index (N=52).



(B) Tables:

Table (1): Percentage Distribution of the Studied Subjects as regards to socio-demographics characteristic and medical data (N=52).

Variables	frequency	Frequency	Percent
• Age:			
	Mean+ SD	34.15± 10.6	
• Smoking habits			
None smokers		27	51.1
Smokers		25	49.1
• Past medical history			
No medical problems		50	96.2
Hypertension		2	3.8
• Type of traumas :			
Head trauma		28	53.8
Chest trauma		6	11.5
Abdominal trauma		6	11.5
Fracture		2	3.8
Multiple traumas		10	19.2

Table (2): Percentage Distribution of the Studied Subjects as Regards to Main Reason of Admission (N=52).

Variables	frequency	Frequency (No)	Percent (%)
• Main reason of admission :			
Disturbed Conscious Level (DCL)		20	38.5
DCL & Abdominal trauma		6	11.5
Hemodynamic instability		1	1.9
Brain edema		2	3.8
Intra-abdominal bleeding and fracture pelvic		2	3.8
DCL & intra cranial hemorrhage		5	9.6
Fracture pelvic , mandible fracture & compound leg		1	3.8
DCL & lung contusion		8	15.4
Fracture femur and Hemodynamic instability		3	5.7
Flail chest and pneumothorax		2	3.8
DCL & fracture pelvic & bladder tear & peritoneal tear & sub arachnoid hemorrhage		1	1.9

Table (3) Frequency Distribution of Systemic Inflammatory Response Syndrome criteria (N=52).

	Criteria	Frequency	%
1-	Fever of more than 38°C (100.4°F) or less than 36°C (96.8°F)	33	63.3 %
2-	Heart rate of more than 90 beats per minute.	47	90 %
3-	Respiratory rate of more than 20 breaths per minute or arterial	15	28%
4-	Abnormal white blood cell count (>12,000/ μ L or < 4,000/ μ L or	38	73%
Presence of two or more of the pervious criteria will indicate SIRS			

Table (4) Frequency of Systemic Inflammatory Response Syndrome (SIRS) among underweight trauma patients (N=7/52) with mean of length of hospital stay is 20 ± 6.7 day

SIRS incidence \ No. Of pts.	On Admission		During Hospitalization		On Discharge	
	N	%	N	%	N	%
0 (negative)	0	0	0	0	1	14.3
1 (negative with one criteria)	0	0	0	0	2	28.5
2 (positive with two criteria)	1	14.3	2	28.5	1	14.3
3 (positive with three criteria)	5	71.4	4	57.2	3	42.9
4 (positive with four criteria)	1	14.3	1	14.3	0	0

Table (5) Frequency of Systemic Inflammatory Response Syndrome (SIRS) among obese trauma patients (N=13) with mean of length of hospital stay is 18.5 ± 6.2 day

SIRS incidence \ No. Of pts.	On Admission		During Hospitalization		On Discharge	
	N	%	N	%	N	%
0 (negative)	1	7.7	0	0	9	69
1 (negative with one criteria)	2	15.4	1	7.7	1	7.7
2 (positive with two criteria)	3	23.1	10	77	2	15.4
3 (positive with three criteria)	6	46.2	2	15.3	1	7.7
4 (positive with four criteria)	1	7.7	0	0	0	0

Table (6) Frequency of Systemic Inflammatory Response Syndrome (SIRS) among normal weight trauma patients (N=32) with mean of length of hospital stay is 14 ± 4.8 day

SIRS incidence \ No. Of pts.	On admission		During hospitalization		On discharge	
	n	%	N	%	N	%
0 (negative)	0	0	1	3.1	16	50
1 (negative with one criteria)	3	9.4	6	18.8	11	34.4
2 (positive with two criteria)	16	50	21	65.6	4	12.5
3 (positive with three criteria)	12	37.5	4	12.5	1	3.1
4 (positive with four criteria)	1	3.1	0	0	0	0

Table (7) Frequency of Sequential Organ Failure Assessment Scores (SOFA) among underweight trauma patients (N=7).

SOFA category \ No. Of pts.	On admission		During hospitalization		On discharge	
	N	%	N	%	N	%
0 (no sepsis related organ failure)	0	0	0	0	0	0
Mild sepsis related organ failure	7	100	4	57.1	3	42.9
Moderate sepsis related organ	0	0	3	42.9	4	57.1
Severe sepsis related organ failure	0	0	0	0	0	0

Table (8) Frequency of Sequential Organ Failure Assessment Scores (SOFA) among obese trauma patients (N=13).

SOFA category	No. Of pts.	On Admission		During Hospitalization		On Discharge	
		N	%	N	%	N	%
0 (no sepsis related organ failure)		0	0	0	0	0	0
Mild sepsis related organ failure		11	84.6	13	100	11	84.6
Moderate sepsis related organ		2	15.4	0	0	2	15.4
Severe sepsis related organ failure		0	0	0	0	0	0

Table (9) Frequency of Sequential Organ Failure Assessment Scores (SOFA) among normal weight trauma patients (N=32).

SOFA category	No. Of pts.	On admission		During hospitalization		On discharge	
		N	%	n	%	N	%
0 (no sepsis related organ failure)		0	0	0	0	0	0
Mild sepsis related organ failure		32	100	32	100	32	100
Moderate sepsis related organ		0	0	0	0	0	0
Severe sepsis related organ failure		0	0	0	0	0	0

Table (10): Mean of Length of Hospital Stay in relation to Body Mass Index (N=52).

BMI	Mean Length of Hospital Stay
Normal weight	14 ± 4.8 day
Obese	18.5 ± 6.2 day
Underweight	20 ± 6.7 day

Table (11): Correlation Coefficient Between Body mass index, Age, gender, type of trauma, past medical history, marital status, occupation, place of residence, educational level, smoking habits, length of hospital stay and SIRS of the studied subjects (N=52).

Items	x2 or r/value	P/value
1. Body mass index / SIRS	2.899	.235
2. Age / SIRS	.162	.197NS
3. Gender / SIRS	1.71	.19NS
4. Type of trauma / SIRS	3.29	.510NS
5. Past medical problems / SIRS	.378	.539NS
6. Marital status / SIRS	1.417	.234 NS
7. Occupation / SIRS	7.830	.098NS
8. Place of residence / SIRS	2.043	.153 NS
9. Educational level / SIRS	14.89	.002*
10. Smoking habits / SIRS	0.014	.906NS
11. Length of hospital stay / SIRS	6.465	.167NS

*Significant at the $p < 0.05$ probability level

NS= not statistically significant

7. Discussion

The present study delineated that the majority of the studied subjects were male, with a mean age of all studied subjects was (34.15 + 10.6) years. This is in agreement with **Mica, Vomela, Keel, and Trentz (2012)** in a study entitled with "The impact of body mass index on the development of systemic inflammatory response syndrome and sepsis in patients with poly trauma" who mentioned that incidence of trauma is most common between the young age and male gender. Also the present study revealed that more than half of the study subjects were smokers, this is in agreement with **Tammy, Pamela, Andrej, and Scott (2010)** in a study entitled as "Smoking in Trauma Patients: The Effects on the Incidence of Sepsis, Respiratory Failure, Organ Failure, and Mortality" who mentioned that 47.8 % of the studied subjects were smokers. The current study results reported that the mean of length of hospital stay (LOS) of underweight trauma patients is 20 ± 6.7 day, the mean of (LOS) of normal body weight trauma patients is 14 ± 4.8 day, and the mean of (LOS) of obese trauma patients is 18.5 ± 6.2 day. These results were supported by the results of **Mica, Vomela, Keel, and Trentz (2012)** reported that the mean of length of hospital stay (LOS) of underweight trauma patients is 20 day, the mean of (LOS) of normal body weight traumatized patients is 17.2 day, and the mean of (LOS) of obese traumatized patients is 18.5 day.

In contrast with our study, the study of **Hoffmann, Lefering, Rathmann, Rueger, and Lehmann (2012)** in a published study entitled as "The impact of BMI on polytrauma outcome" reported that the mean of length of hospital stay (LOS) of underweight trauma patients is 7.8 day, the mean of (LOS) of normal body weight trauma patients is 10.7 day, and the mean of (LOS) of obese trauma patients is 12.7 day. Also the study of **Andruszkow, et al (2013)** reported that the mean length of hospital stay (LOS) of underweight trauma patients is 20.2 day, the mean (LOS) of normal body weight trauma patients is 25.7 day, and the mean (LOS) of obese trauma patients is 34.4 day.

The current study results delineated, more than half of the studied subjects had normal body mass index, on quarter were obese, and one eighth of them were under weight. These results were supported by the results of **Hoffmann, Lefering, Rathmann, Rueger, and Lehmann (2012)** reported that the lowest percentage of the studied subjects for underweight group with percentage 4.7 % (269/5766) and the largest percentage of them for normal weight group with percentage 45.4 % (2617/4766). Also these results were supported by the results of **Chae, et.al (2013)** in a published study entitled as " Body Mass Index and Outcomes in Patients with Severe Sepsis or Septic Shock" reported that 11.2 % of studied subjects were underweight patients (86/770), 63.5 % of them had normal body weight (489 /770), and 25.3 % of them were obese (195/770).In accordance to this study, the study of **Andruszkow, et al (2013)** in a published research article entitled as " Impact of the Body Mass on Complications and Outcome in Multiple Trauma Patients: What Does the Weight Weigh?" in an analysis of 586 of traumatized patients which revealed that about 4.8 % of them were underweight, 81.2 % had normal body weight, and 14 % were obese.

Also the current study results reported that majority of the studied subjects had (SIRS). In this regard, **Sakamoto, et.al (2010)** in a study entitled with "Systemic Inflammatory Response Syndrome Score at Admission Predicts Injury Severity, Organ Damage and Serum Neutrophil Elastase Production in Trauma Patients" supported these result when reporting that 86.4 % of 212 trauma patients were having SIRS. Also of **Andruszkow, et al (2013)** reported that 64.1 % from 660 adult trauma patients were having SIRS. Also the current study results reported that there are no significant statistical correlation between, body mass index, mid arm circumference and SIRS. These results were supported by the results of **Mica, Vomela, Keel, and Trentz (2012)** which reported that no significant differences were found between the three study groups.

The current study results delineated mean initial SOFA score of underweight adult trauma patients was (4.4 ± 1.6) indicated mild sepsis and mean last SOFA score of them was (8.3 ± 5.3) indicated moderate sepsis - related organ failure. In relation to the normal weight trauma patient,

mean initial SOFA score of trauma patients was (4.4± 1.6) indicated mild sepsis - related organ failure and mean last SOFA score of them was (2.2±1.1) indicated mild sepsis – related organ failure. Finally, obese trauma patients, mean initial SOFA score of them was (5.4 ± 1.9) indicated mild sepsis- related organ failure and mean last SOFA score of them was (3.2 ± 4.2) indicated mild sepsis - related organ failure. This explains underweight trauma patients showed significantly higher rate of developing sepsis - related organ failure than the normal weight patients and obese patients. These results were supported by the results of **Mica, Vomela, Keel, and Trentz (2012)** which reported that 46.1 % of underweight adult trauma patients were having and Fatty tissue seems to have a protective effect against inflammatory reactions in the body. Inflammatory parameters remained unaffected in the three study groups but the outcomes seemed to be better for higher BMI groups, according to the SIRS and sepsis. In contrast with our study, the study of **Hoffmann, Lefering, Rathmann, Rueger, and Lehmann (2012)** reported that increased multi – organ failure and sepsis rate in obese patients.

8. Conclusion:

Considering the results of the present study and the available evidence, more than half of adult trauma patients have normal body weight. Also the majority of the adult trauma patients had systemic inflammatory response syndrome. Underweight trauma patients showed significantly higher rate of developing sepsis- related organ failure than the normal weight patients and obese patients. Also underweight trauma patients were sequential having longer length of hospital stay than normal weight and obese group.

9. Recommendation:

Based on the findings of the present study, the following recommendations are suggested:

Recommendations for further researches:

1. Replication of the study on a larger probability sample selected from different geographical areas in Egypt is recommended to obtain more generalizable data.
2. Further studies have to be carried out in order to assess the other risk factors influencing trauma outcome and incidence of its complications
3. Further studies have to be carried out in order to assess nurses' knowledge and practices regarding trauma scoring system, dealing with trauma patient.

Recommendations related to patients:

1. Close observation and follow up for all trauma patients to assess their health conditions and to detect sepsis early.
2. Establishment of specific nursing intervention protocol for underweight trauma patient to monitor, early detect, and manage signs & symptoms of SIRS and sepsis.
3. Adding body mass index measurement for critically ill injured patients as one of the nursing assessment sheet element at Emergency department.

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