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Correlation between Blood Types and Intraabdominal Infection: A Preliminary Study

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Abstract

Introduction. Intra-abdominal infection (IAI) remain a clinical problem with high mortality rate. Among factors contributed to this mortality, the important one is blood type that never be considered. It was thought to have correlation with a certain type. Thus, a retrospective study as a preliminary study run to find out the evidence.

Method. A descriptive analytic with cross sectional design was run. Data of those diagnosed with intraabdominal infection due to abdominal trauma and gastrointestinal infections managed at dr Cipto Mangunkusumo General Hospital was taken from medical record. ABO blood types and microbial culture results in two groups were the focus of a study and were analyzed statistically.

Results. In the study, out of 230 subjects, there were 22 subjects (9.6%) with postoperative intra-abdominal infection were observed during January 2014-March 2016. There was a significant correlation between blood transfusion (p <0.001, OR = 0.02) with intraabdominal infection. However, there was no significant correlations found in blood type to the occurrence of intra-abdominal infection.

Conclusion. The study unable to show that blood type has a correlation to intra-abdominal infection in those diagnosed with abdominal trauma and gastrointestinal infections.

Keywords: *intra-abdominal infection, blood type*

Introduction

Intra-abdominal infection (IAI) remain a problem leading to high mortality. Incidence in the United States in 2012 is 3.5 million patients with mortality rate reach up 60%, while as in Western part of Europe up to 30%. Sepsis is the leading cause of death in the Intensive Care Unit (ICU) and referred the tenth most common cause of death. Organ failure occurs in one-third of patients with sepsis and is associated with deaths of 30-50%.[1–6] The main issue found in those with sepsis is circulatory derangement, and should it continue, this catastrophe in perfusion lead to multi organ dysfunction and death. It is believed that lack of perfusion on gastrointestinal mucosa lead to intestinal failure followed by multi-organ failure.[7–9] Hypo-perfused mucosa lead to atrophy of intestinal villi as well as intestinal mucosal barrier disruption. With this disrupted barrier, bacterial translocation is a logic consequence, lead to bacteremia.[8] Amongst important factors in the pathway, the bio phenotype of intestinal epithelial which is glycocalyx plays an important role as a biologic marker (or, biomarker) of cell survival. Evidence showed that glycocalyx which is a carbohydrate-rich layer lining the luminal side of endothelium are found disrupted in sepsis.[10–13]

There's postulated that the configuration and structure of glycocalyx is found in vary depends on blood type of ABO system.[14,15] It was thought that those of O group of a system to be prone to sepsis, which is correlated to this structure and configuration of glycocalyx. Therefore, a retrospective study run as a preliminary one to find out the correlation of this ABO group to IAI.

Method

A descriptive study with cross sectional design preceded to find out correlation between blood group of ABO system with intraabdominal infection in those diagnosed with abdominal trauma and gastrointestinal infection managed at Cipto Mangunkusumo General Hospital (RSCM) in period of January 2014 to March 2016. Those who met the criteria of inclusion namely patients with abdominal trauma and infection who were primary treated at RSCM. Surgical site infection (SSI) was excluded since it wasn't intraabdominal infection. Data of demography such as age and gender were tabulated descriptively following normality test using Shapiro-Wilk test. Bivariate analysis of relationship between blood group and sepsis preceded using Chi square test. The significant found if p value <0.05. Such analysis carried out using SPSS ver. 20.

Results

Out of 230 subjects with post-traumatic abdominal and gastrointestinal infections managed, there were 22 subjects (9.6%) diagnosed with IAI. In these subjects, microbial culture showed positive culture of Escherichia coli and Klebsiella pneumonia. Data of demographic and clinical characteristics were as follows. Most of subjects were of 41-60-year old (50%), males (56.1%), did not transfused (90.9%). The most indications for surgery were gastrointestinal infection (92.6%) and mechanical obstruction (24.8%). Those who survived was 96.5%. Those with blood group O was found in 46.1% subjects.

There was a significant correlation (p <0.05) between blood transfusion (p = 0.0001) and diagnostic group (p = 0.015) in the occurrence of IAI. In those who receive blood transfusion, the odds ratio (OR) 0.02 and OR group diagnosis was 4.7 at 95% confidence interval. It found there was no significant correlation (p> 0.05) of age (p = 0.855), gender (p = 0.339), blood group (p = 0.385) in the occurrence of IAI.

Table 1. Demographic data of subject enrolled to a study

Subject characteristics	n	%
Age		
1-20 years old	15	6.53
21-40 years old	98	42.6
41-60 years old	115	50
61-80 years old	2	0.87
Gender		
Male	129	56.1
Female	101	43.9
Blood transfusion		
No	209	90.87
Yes	21	9.13
Diagnosis		
Abdominal blunt trauma	1	0.43
Anastomosis leakage	4	1.73
Peri-appendicular mass	7	3.04
Penetrating abdominal trauma	16	6.95
Intraabdominal sepsis	17	7.39
Perforated appendicitis	25	10.86
Strangulated hernia	28	12.17
Viscus perforation	31	13.47
Acute appendicitis	44	19.1
Mechanical bowel obstruction	57	24.78
Diagnosis group		
Abdominal trauma	17	7.4
Gastrointestinal infection	213	92.6

Table 2. Blood group of subjects enrolled to a study

	n	%
Blood type		
A	56	24.66
B	61	26.87
AB	4	1.76
O	106	46.69
Mortality		
Mortality	7	3
Survive	222	96.5

Table 3. Subject with intraabdominal infection, blood type and the need of transfusion

Demographic variables	Sepsis n (%)	No Sepsis n (%)	Total n	p Value
Age				
1-20 years old	0 (0)	15(100)	15	
21-40 years old	13(13.5)	83(86.5)	96	0.855
41-60 years old	9 (7.9)	105(92.1)	114	
61-80 years old	0 (0)	2 (100)	2	
Sex				
Male	12 (9.4)	116(90.6)	128	0.339
Female	10(10.1)	89(89.9)	99	
Blood transfusion				
Yes	14(66.7)	7(33.3)	21	0.001
No	8(3.9)	198(96.1)	206	(OR 0.02)
Diagnosis group				
Abdominal trauma	5 (29.4)	12(70.6)	17	0.015
Gastrointestinal infection	17 (8.1)	193(91.9)	210	(OR 4.7)
Blood type				
A	7 (12.5)	49(87.5)	56	0.300
B	6 (9.8)	55(90.2)	61	0.607
AB	1 (25)	3 (75)	4	0.292
O	8 (7.5)	98(92.5)	106	0.685

Discussion

The number of subject enrolled is quite a lot, namely 230 subjects. However, since the incidence of IAI was relatively small, i.e. 22 subjects (9.6%), it might the cause why the research question was unable to be answered in the study. Although those with blood group O found not to be correlated significantly to IAI (p = 0.385), a forty-six percent was noted, and this should be of one consideration.

There are publications focused on the correlation of blood type to sepsis occurrence. Wittels and Lichtman (1986) found on their study, that those with blood group A were susceptible to be infected with Escherichia coli rather than other, namely O and B.[16] Further, Reilly et al (2015) found in his study that blood group A was independently associated with the risk of acute renal failure in a critical patient with a history of severe trauma or sepsis. He indicated the risk of acute renal failure due to the susceptibility of ABO glycans in blood group A.[17,18] In contrast to Wittels and Lichtman, Quraishy and Sapatnekar on the panel (2016) proposed that O was proposed to be susceptible of most as the group of ABO system as in blood group O, there is no anti A and anti B produced.[19] As in the theory of immunology explaining the development of sepsis, the condition is like those with no antibody produced when someone get infected with Gram–negative pathogen such as Escherichia coli as the common causal of sepsis to date. However, Escherichia coli and Klebsiella pneumonia are the most causal in Indonesia, instead of Pseudomonas aeruginosa.[20]

In the study, age is not likely a factor correlated to the occurrence of sepsis, although study of Martin et al (2006) found those with extreme age (over 65 years) are more vulnerable to Gram–negative germs.[6] The study also showed no relationship of gender to the occurrence of sepsis, while as study of Nasir et al (2015) showed that male with sepsis had a greater chance up to 70% to death than female, as it associated with higher plasma interleukin 6 (IL-6) levels.[21] What has the study showed significantly was the correlation between blood transfusion (p = 0.0001) to IAI with OR 0.02 with 95% confidence interval, by means that transfusion has a 0.02 chance leading to sepsis. There were studies focused on the risk of bacterial contamination in preparation of hematopoietic progenitors, skin cleansing methods, changes in time of intact blood storage, cold storage of platelet suspensions, leukoreduction of red blood cells, the development of rapid screening tests for bacteria, and methods for inactivation of platelet component bacteria.[22] A small number of sepsis might be the limitation of a study. In contrast, it was noted that this number referred to the incidence of IAI that relatively like those worldwide.[23]

Conclusion

In conclusion, this study unable to prove that blood type O to be correlated with intraabdominal infection in patients with a history of abdominal trauma and gastro intestinal infections.

A future study focused on glycocalyx is proposed as its correlation with the incidence of sepsis particularly in relation to blood group remain challenging.

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