

Prevalence of bacterial infection among hospital traumatic patients in relation to ABO blood group

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Abstract

Background: there are many studies demonstrated a correlation between blood group antigens and susceptibility to infectious diseases such as bacteria, parasites and viruses.

Objectives: to assess the prevalence of bacterial infection among patients in the trauma hospital, and to assess the susceptibility of ABO blood groups to the isolated bacteria.

Methods and Findings: 166 samples included, wound swabs, sputum and midstream urine were received for routine culture diagnostic procedures from the in-patients at Abosleem Traumatic Hospital and ABO group was obtained from Blood bank documented system for each patient. A correlation between isolated organisms and ABO system was determined. 51% patients were infected during their stay in the hospital by one of the following isolates: *Pseudomonas* (22%); *Klebsiella* (9%); *Staphylococci* (15%); and *Streptococci* (4%). The majority of in-patients belong to blood group O (45%), preceded by group A (37%); B (14%) and AB (4%). The distribution of different blood group within four main bacterial isolates was determined as following: 43% of blood group A patients were susceptible to *pseudomonas*; (27%) *Klebsiella*; (36%) *Staphylococci*; and (29%) *Streptococci*. While, group B individuals were infected with these organisms: 16% with *Pseudomonas*, 13% with *Klebsiella*, 8% with *Staphylococci*, and 29% with *Streptococci*. Meanwhile, blood group O patients had following strains: 38% *Pseudomonas*, 53% *Klebsiella*, 52% *Staphylococci*, 42% *Streptococci*. Only, 3% of *Pseudomonas*, 7% of *Klebsiella*, and 4% of *Staphylococci* infected in-patients who expressed blood group AB.

Conclusion: the most common bacterial infection among traumatic patient was *Pseudomonas*, *Staphylococci* and *Klebsiella* respectively and individuals of blood group A were found more susceptible to *Pseudomonas* infection while blood group O more susceptible to *Klebsiella* and *Staphylococci* among traumatic patient.

Key words: ABO blood group, infection, traumatic patient, Libya.



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Introduction

There are many sources of infection including environmental sources, person to person, self infection, and medical or surgical procedures [1]. Hospital associated infection is an

important cause of patient morbidity and death and it represents a serious and growing health problem, it is estimated that about 2 million people acquire hospital infections each year and that about 90000 of these patients die as a result of their infections [2, 3]. *Enterobacteriaceae*, *Staphylococci*,

Pseudomonas and *Acinetobacter* species are the most common pathogens associated with infection and the most common sites of infection are urinary tract, lower respiratory tract, and blood stream and wound infection [4]. Risk factors for the invasion of colonizing pathogens can be categorized into many factors including iatrogenic, organizational, the severity of illness, underlying immunocompromised state, length of stay, and susceptibility to infection such as blood group antigens [2]. The role of blood group antigens in human diseases has been debated over many years and has been implicated as at least partially, responsible for the observed distribution of the major ABO blood group antigens [5]. Many of the associations of blood group antigens with specific pathogens involve the glycosphingolipids (GSLs) belonging to the histo-blood group P1Pk and GLOB blood group systems, specifically the P and Pk blood group antigens [6]. A recent discovery implicated that the Pk blood group antigen plays a role for protection from infection with HIV-1 [7], and the increased expression of P/Gb3 histo-blood group antigen correlates to decreased HIV infection, whereas decreased or absent P/Gb3 increases HIV susceptibility [8].

There is a large number of publications attempting to correlate blood groups susceptibility to infectious diseases such as malaria parasite, *Helicobacter pylori*, *Klebsiella* and *Parvovirus B19*, and there is evidence that blood group antigens, that found on surface of cells, can act as receptors such as (P, ABH, Lewis, MNss, Kell, Duffy etc) for many bacteria and viruses [9]. The objective of this study is to assess the prevalence of bacterial infection among patients in the trauma hospital, and to correlate the susceptibility of ABO blood groups to the isolated bacteria.

Patients and methods

166 samples for culture and sensitivity were received from the in-patients at Abosleem Traumatic Hospital and ABO group was obtained from Blood bank documented system for each patient. Culture samples included, swabs from wounds, sputum and midstream urine, were cultivated on many types of media as routine diagnostic procedure. The bacterial growth identified by Gram stain and biochemical reaction.

Results

During the study 166 samples obtained from urine, wound, and sputum, 82 (49%) samples showed no growth, while 84 (51%) patients were infected during their stay in the hospital by one of the following isolates: *Pseudomonas* (22%); *Klebsiella* (9%); *Staphylococci* (15%); and *Streptococci* (4%) (Table 1). The majority of in-patients belong to blood group O (45%), preceded by group A (37%); B (14%) and AB (4%) (Table 2).

The distribution of different blood group within four main bacterial isolates was determined as following: 43% of blood group A patients were infected by *pseudomonas*; (27%) *Klebsiella*; (36%) *Staphylococci*; and (29%) *Streptococci*. While, group B individuals were infected with: *Pseudomonas* (16%), *Klebsiella* (13%), *Staphylococci* (8%) and *Streptococci* (29%). Meanwhile, blood group O patients had one of the following strains: 38% *Pseudomonas*, 53% *Klebsiella*, 52% *Staphylococci*, 42% *Streptococci*. Only, 3% of *Pseudomonas*, 7% of

Table 1. Prevalence of bacterial infections among hospital traumatic patients.

samples	No	pseudomonas	klebsiella	Staphylococci	Streptococci	negative
urine	27	1	1	3	0	22
wound	109	35	8	19	0	47
sputum	30	1	6	3	7	13
Total	166	37 (22%)	15 (9%)	25 (15%)	7 (4%)	82 (49%)

Table 2. Prevalence of blood groups in infected patients.

Blood Group	No of patients	%
Group A	31	37%
Group B	12	14%
Group O	38	45%
Group AB	3	4%

Table 3. Susceptibility of blood group to different bacterial isolates.

Blood group	Pseudomonas	Klebsiella	Staphylococci	Streptococci
A	16 (43%)	4 (27%)	9 (36%)	2 (29%)
B	6 (16%)	2 (13%)	2 (8%)	2 (29%)
O	14 (38%)	8 (53%)	13 (52%)	3 (42%)
AB	1 (3%)	1 (7%)	1 (4%)	0 (0%)
Total	37	15	25	7

Klebsiella, and 4% of *Staphylococci* infected in-patients who expressed blood group AB, none of the patients had multiple infection (**Table 3**).

Discussion

Since the nosocomial infections are caused by viral, bacterial, and fungal pathogens. These pathogens should be investigated in all febrile patients who are admitted for a nonfebrile illness [2]. Many literature studies showed three important types of bacteria characterized to cause disease and associated with nosocomial infection, and linked to blood group antigens; *Staphylococcus aureus* were correlated to Le^a blood group antigen, *Pseudomonas aeruginosa* linked to P blood group antigen which found to act as a receptor of other pathogenic bacteria such as *E. coli*, and as ligands for verotoxins from some bacteria like *Shigella dysenteriae* [14]. *Klebsiella pneumoniae* an important bacteria of hospital acquired infection was associated with B, and AB blood group antigens, compared with other blood group antigens [11]. Distribution of ABO blood group antigens in other tissues was associated with the disease and bacterial infections, such as *Helicobacter pylori* infection of peptic ulcer patients were referred to expression of ABH antigens in the mucosa of the stomach, these relationship explained the increase susceptibility of *H. Pylori* to blood group O or A phenotype and the non secretor of Le^b blood group antigen [12, 14].

The distribution of blood group antigens among traumatic Libyan patients referred to Trauma Hospital were 46% O blood group, 35% blood group A; 17% B blood group; and 2% AB blood group. Despite the majority of patient were blood group O, *Pseudomonas* infected more blood group A patients compared with other blood groups, these observation might be due to the expiration of P blood group antigen which acts as receptor for *P. aeruginosa* leading to increased density of colonization [14], similar study of minor blood group and their effects on blood transfusion showed that the P blood group antigen expressed on the cell surface of

patients with blood group A more than other blood groups [17], this study strongly supports the association of P blood group antigens with *Pseudomonas* infection and the susceptibility of blood group A to *Pseudomonas* infection compared with other blood group antigen.

Staph aureus is one of an important agent associated with hospital associated infections, it was ranked the second causative agent in traumatic patients, mainly isolated from patients with blood group O more than other blood groups, these might be due to Le^a blood group antigen which act as receptor for *Staphylococci* [18], it has been observed that blood group O individuals express more Le^a compared with another blood groups among Libyan population [17], although 45% of Libyan population were blood group O these might explain the increased the prevalence of *Staphylococci* in traumatic Libyan patients.

In contrast to Kostink and colleagues [11] who demonstrated that blood group B and blood group AB individuals are at high risk of *Klebsiella*, this study found to be less prevalence in traumatic patients, it might be due to the high prevalence of blood group O among traumatic patients and the site of infection therefore the susceptible to *Klebsiella* infection is more with blood group O compared with other blood groups. The results of this study conclude that the most common bacterial infection among traumatic patients was *Pseudomonas* followed by *Staphylococci* and *Klebsiella*. Individuals of blood group A are more susceptible to *Pseudomonas* infection where as blood group O more susceptible to *Klebsiella* and *Staphylococci* but these observation require further study to include other blood group antigens and other factors which contribute to the infection includes the antibiotic resistance which is one of the important problem leading to nosocomial infection [15, 16] and other blood group antigens such as Lewis antigens, MNS antigens, Kel and Duffy antigens with more samples from different site of the body from other Libyan hospitals.

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