Journal of Advances in Medicine and Medical Research

28(10): 1-8, 2018; Article no.JAMMR.46614
ISSN: 2456-8899
(Past name: British Journal of Medicine and Medical Research, Past ISSN: 2231-0614, NLM ID: 101570965)

ABO, Rhesus Blood Groups and Haemoglobin Variants Distribution among Individuals with *Helicobacter pylori* in Igwuruta-Ali, Rivers State

Christian, Serekara Gideon[1*], Eze, Evelyn Mgbeoma[1] and Essor, Joy Eruchi[1]

[1]Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2018/46614
Editor(s):
(1) Dr. E. Umit Bagriacik, Department of Immunology, Gazi University, Turkey.
Reviewers:
(1) Shigeki Matsubara, Jichi Medical University, Japan.
(2) Nagahito Saito, Hokkaido University Graduate School of Internal Medicine, Japan.
(3) Pradeep Kumar, VBS Purvanchal University, India.
Complete Peer review History: http://www.sdiarticle3.com/review-history/46614

Original Research Article

Received 30 October 2018
Accepted 18 January 2019
Published 11 February 2019

ABSTRACT

Aims: The aim of the study is to determine the distribution of ABO & Rhesus blood groups, and haemoglobin variants among individuals in Igwuruta-Ali with *Helicobacter pylori* infection.
Study Design: This was a cross-sectional, field-based study carried out in Igwuruta-Ali, Ikwerre Local Government Area, in Rivers State.
Place and Duration of Study: All samples were analyzed at the Haematology Laboratory, Department of Medical Laboratory Science, Rivers State University, Port Harcourt, Nigeria, between July and September, 2018.
Methodology: Qualitative determination of *Helicobacter pylori* antigens using serological method. Qualitative determination of ABO and Rhesus blood group using tube method. Qualitative determination of haemoglobin genotype using electrophoretic method (cellulose acetate method). Blood samples were collected randomly based on convenient sampling from a total of 120 volunteers (age 10 to 70 years).
Results: A total of 103 subjects were sero-positive for *Helicobacter pylori* (37 males and 66 females; 35.9% and 64.1% respectively), while 17 subjects were sero-negative (8 males and 9

**Corresponding author: E-mail: serekara.christian1@ust.edu.ng*

females; 47.1% and 52.9% respectively. ABO blood group distribution among sero-positive individuals were A(22.3%), B(13.6%), AB(8.7%), O(55.3%). The Rhesus blood group distributions in sero-positive individuals were Rhesus D positive (30.8%) and Rhesus D negative (6.67%); Sero-positivity for *Helicobacter pylori* was increased in females than in males and subjects with ABO blood group O were more prone to *Helicobacter pylori* than in other groups. The distribution of haemoglobin variants among sero-positive subjects were AA(71.84%), AS(22.33%), SS(5.83%).

Conclusion: The study reveals that O blood group individuals are more susceptible to *Helicobacter pylori* infection and they have more cellular and immunological response to it (expressed by sero-positivity) than other ABO blood groups (group B in particular), while no strong relationship exist between Rhesus D positive and Rhesus D negative subjects, and also no clear relationship based on haemoglobin genotype. Based on the fact that 55.3% of the study population that tested positive for *Helicobacter pylori* was O blood group individuals, O blood group is therefore associated with *Helicobacter pylori*. Also, the study revealed that females were more prone to *Helicobacter pylori* infection.

Keywords: Igwuruta-Ali; Helicobacter pylori; ABO and Rhesus Blood Group; haemoglobin variants.

1. INTRODUCTION

Blood groups are inherited characteristics present on red blood cell surface and can be detected by specific antibodies. Blood groups are associated with proteins and glycoproteins that are part of the integral structure of the red blood cell membrane. Blood groups are detected based on antigens found on red blood cells and thus can be defined by a specific antibody. The importance of blood to humans cannot be over-emphasized, its importance in health and diseases is critical and various blood types have its own unique association with diseases, hence the need to re-evaluate and underpin established findings that *Helicobacter pylori* infection is associated with O blood group, albeit in Igwuruta-Ali.

Helicobacter pylori can be identified as a spiral shaped gram-negative bacteria that usually colonize the human stomach [1]. The ABO and Rhesus blood groups has remain immunologically important to the blacks and ABO and Rhesus blood groups have been associated with some infectious and non-infectious diseases [2]. Most studies [3,4] have shown that ABO blood group individuals are susceptible to infection of *Helicobacter pylori*, however, there are paucity of scientific based information to verify if this association exist between *Helicobacter pylori* and Rhesus blood groups system, and also with heamoglobin variants.

Helicobacter pylori have multiple flagella at one pole and are actively motile. *Helicobacter pylori* grow in 3–6 days when incubated at 37°C in a micro-aerophilic environment [5]. The colonies are translucent, 1–2 mm in diameter. *Helicobacter pylori* are oxidase-positive and catalase-positive; has a characteristic morphology, motile, and is a strong producer of urease. It is present in 20 to 50% of the population in developed countries and 80% of the population in developing countries. *Helicobacter pylori* represent the most widely reported causative pathogen of most gastrointestinal ulcerations and gastric cancer; this has been found to cause considerable morbidity and mortality worldwide [6].

Helicobacter pylori is a bacteria that is found in the gastric mucous layer or adherent to the epithelial lining of the stomach. *Helicobacter pylori* causes more than 90% of duodenal ulcers, up to 80% of gastric ulcers, gastritis (inflammation of the lining of the stomach) [1]. The mechanisms by which *Helicobacter pylori* cause mucosal inflammation and damage are not well defined but probably involve both bacterial and host factors. The bacteria invade the epithelial cell surface to a limited degree. Toxins and lipo-polysaccharide may damage the mucosal cells, and the ammonia produced by the urease activity may also directly damage the cells [7]. Studies carried out by [8,9] and others have associated *Helicobacter pylori* with some blood groups. Their different outcomes necessitated our quest to investigate risk factors associated with *Helicobacter pylori* infection in one of our local community based on blood type.

Igwurutali-Ali is an area in Rivers state with poor socio-economic amenities which increases the risk to microbiological infections especially of the bacterial origin. This community is in Ikwerre Local Government Area of Rivers State, Nigeria.

The aim of the study is to determine the distribution of ABO, Rhesus blood groups, and haemoglobin variants among individuals in Igwuruta-Ali with *Helicobacter pylori* infection. The objectives of this study are: (i) to determine the ABO and Rhesus Blood groups distribution among *Helicobacter pylori* infected individuals, (ii) to determine the haemoglobin variants distribution among *Helicobacter pylori* infected individuals, (iii) to determine the distribution of *Helicobacter pylori* infection among male and female individuals in Igwuruta-Ali.

2. MATERIALS AND METHODS

2.1 Research Design

This is a cross sectional study and was conducted in Igwuruta-Ali, a town in Ikwerre Local Government Area of Rivers State, Nigeria, specifically to determine the ABO, Rhesus blood groups and haemoglobin variants distribution pattern among natives of Igwuruta-Ali that reside in the community.

2.2 Study Area

Igwuruta-Ali is located in Nigeria about 458 km south of Abuja, the country's capital. The Port Harcourt International Airport is about 7 km northwest from the community. The community is along the Bonny River having an estimated population of about 111,000 inhabitants as at 2016. The climate in Igwuruta-Ali is usually rainy and dry season. Igwuruta-Ali is situated at longitude and latitude 4.9682° N, 6.9847° E respectively. The indigenes of Igwuruta-Ali are mainly farmers and as such survive from its proceeds. The analysis was carried out at the Haematology Laboratory, Medical Laboratory Science Department, Rivers State University, Port Harcourt.

2.3 Study Population

A total of 120 subjects [45 males and 75 females] within the age range of 10-70 years were randomly selected based on convenient sampling method for the study and a total of 103 subjects were confirmed to be positive for *Helicobacter pylori* and were part of the study.

2.4 Eligibility of Subjects, Ethical Clearance and Informed Consent

Non-indigenes of Igwuruta-Ali were excluded and indigenes who have not been residing in Igwuruta-Ali for a period of not less than one year were also excluded from the study. Informed consent was obtained from subjects who were apparently healthy prior to enrolment. Ethical clearance was given by the Ethics Committee of the Department of Medical Laboratory Science, Rivers State University. The Community Leaders of Igwuruta-Ali gave verbal approval to carry out the study on their kinsmen.

2.5 Sample Collection

4 ml of blood was collected by venipuncture into a K_3EDTA anticoagulated bottle (at a concentration of 1.2 mg/ml), with sample container already labelled with subject's name, sex and age. Analysis was carried out within two hours of sample collection.

2.6 Sample Analysis

For serological detection of *Helicobacter pylori*, the test is based on the principle of double antigen-sandwich technique. When an adequate volume of test specimen antibody of *Helicobacter pylori* present in commercially prepared anti-sera binds to red cell antigen(sensitization), it results in an observable clumping of red cells(agglutination). Presence of agglutinated red cells indicates *Helicobacter pylori* infection. This one step test for the qualitative detection of IgG antibodies of *Helicobacter pylori* in the serum was done using Rapid Diagnostic Test Kit (ACON, USA). A drop of patient plasma is placed in the specimen well of the test cassette and then one drop of buffer is added on same specimen well. 15 minutes after, the result was read. The burgundy colored T band indicates a positive result; absence of the T band suggests a negative result. The test contains an internal control (C band) which should exhibit a burgundy colored band of the immune-complex conjugate regardless of the presence of any antibodies to *Helicobacter pylori*. Otherwise the test is invalid.

Haemoglobin electrophoresis was carried out with method as described by Brown [10]. A small quantity of haemolysate of venous blood from each of the subjects was placed on the cellulose acetate membrane and carefully introduced into the electrophoretic tank containing Tris/EDTA/Borate buffer at a pH of 8.9. The electrophoresis was then allowed to run for 15 to 20 minutes at an electromotive force (emf) of 160V. The results were read immediately. Haemolysates from blood samples of known haemoglobin (i.e. AA, AS, AC) were run as controls at the same time.

Red cell phenotyping was carried out with standard tube techniques as described by Judd [11] and Brecher [12]. For ABO blood phenotyping, a drop of anti-A, anti-B, and anti AB (Biotec, Ipswich, UK) each was placed in clean test tubes labelled 1, 2, 3. To each tube was added a drop of 5% red blood cell suspension in saline. The contents were gently mixed together and centrifuged for 30 seconds at 1000 g. The cell buttons were re-suspended and observed for agglutination. Agglutination of tested red cells constituted positive results. A smooth cell suspension after re-suspension followed by a microscopic confirmation constituted negative test results.

2.7 Statistical Analysis

Data were analyzed to obtain percentage distribution using Microsoft excel packages for the various parameters. Data are represented in Tables and Figures.

3. RESULTS

3.1 Demographic Details of Participants

A total of 120 subjects including 45 males and 75 females within the age range of 10-70 years were recruited for the research in Igwuruta-Ali, Rivers State, Nigeria within the period of July and September 2018. The subjects were screened for *Helicobacter pylori* infection and thereafter, their ABO and Rhesus blood group typed, and haemoglobin variants determined.

3.2 Distribution of Male and Female Subjects in Relation to *Helicobacter pylori* Infection

Sero-positivity for *Helicobacter pylori* was observed in 103 subjects of which 37 were males and 66 were females (64.1% and 35.9% respectively) and absent in 17 subjects of which 8 were males and 9 were females (47.1% and 52.9% respectively). The graphical representation can be seen in Fig. 1.

3.3 Distribution of ABO and Rhesus Blood Group in Relation to *Helicobacter pylori*

The ABO blood group distribution from the total population of study were 28 for A (23.3%), 17 for blood group B (14.2%), 65 for blood group O (54.1%), 10 for blood group AB (8.3%). The graphical representation can be seen in Fig. 2.

From the total population, the ABO blood group distribution among sero-positive individuals were 23 for A blood group (22.3%) in which 6 were males and 17 were females; 14 for blood group B (13.6%), 7 were males and 7 females; 9 for AB blood group (8.7%), 6 were males and 3 females; 57 for O blood group (55.3%), 19 were males and 39 females. The ABO distribution among sero-negative individuals were 5 for blood group A (29.4%); having 1 male and 4 females, 3 for blood group B (17.6%); having 3 males and no female, 1 for AB blood group (5.9%) having 1 male and no female, 8 for O (47.1%), having 3 males and 5 females. The graphical representation can be seen in Figs. 3 and 4.

The Rhesus D positive blood group individuals in the total population were 103 while Rhesus D negative individuals were 17. Among the Rhesus D positive individuals, were 37 (30.8%) *Helicobacter pylori* sero-positive individuals and 66(55%) *Helicobacter pylori* sero-negative subjects. Among the Rhesus D negative subjects were 8(6.7%) *Helicobacter pylori* sero-positive individuals and 9(7.5%) sero-negative individuals. Details can be seen in Table 1.

3.4 The Distribution of Haemoglobin Variants among the Total Population

The distribution of haemoglobin variants in the total population were 81 for genotype AA (67.5%); 29 for genotype AS (24.2%); and 10 for genotype SS (8.3%). The graphical representation can be seen in Fig. 5.

The distribution of haemoglobin variants in sero-positive subjects were 74 for genotype AA (71.84%), having 25 males and 49 females; 23 individuals were of the genotype AS (22.33%), 12 males and 11 females; 6 were of the genotype SS (5.83%), 3 males and 3 females. Haemoglobin variants distribution in sero-negative subjects were 7 (41.2%) of genotype AA, 4 males and 3 females; 6 individuals of genotype AS (35.3%), 2 males and 4 females; 4 of genotype SS (23.5%), 2 males and 2 females. Details are shown in graphical representation (Fig. 6.) and Table 2.

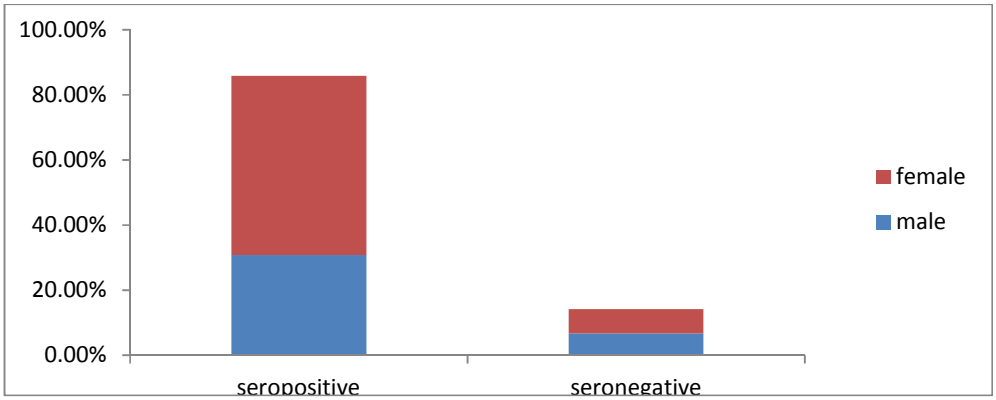

Fig. 1. Percentage distribution of male and female subjects in relation to *Helicobacter pylori* Infection

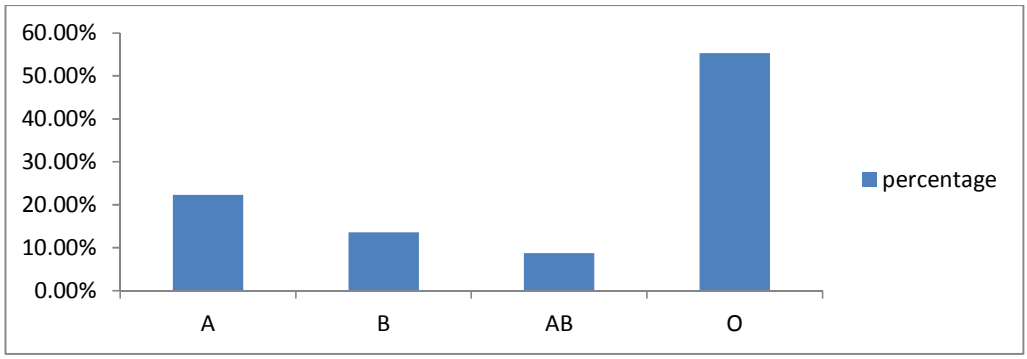

Fig. 2. Percentage distribution of ABO blood group in sero-positive individuals

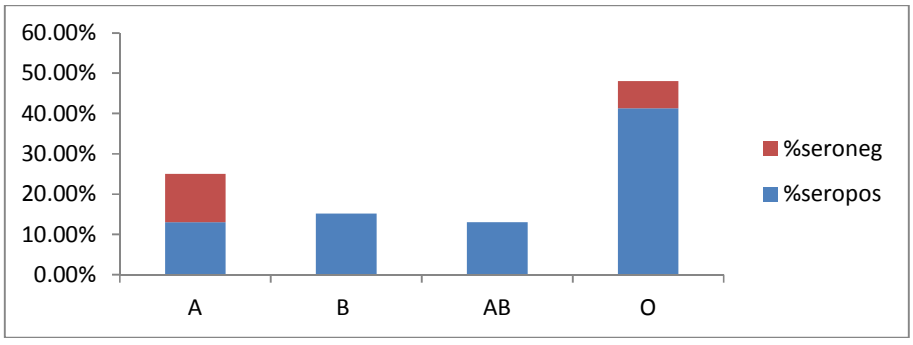

Fig. 3. ABO blood group distribution among females in relation to *Helicobacter pylori* infection

Table 1. Distribution of Rhesus blood group in relation to *Helicobacter pylori* infection

Parameters	Percentage %
Rhesus positive with *H. pylori*	30.8
Rhesus positive without *H. pylori*	55.0
Rhesus negative with *H. pylori*	6.7
Rhesus without without *H. pylori*	7.5

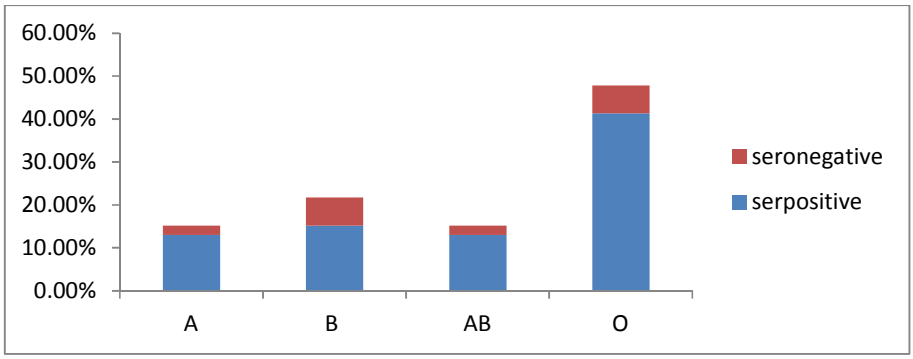

Fig. 4. ABO blood distribution among males in relation to *Helicobacter pylori* infection

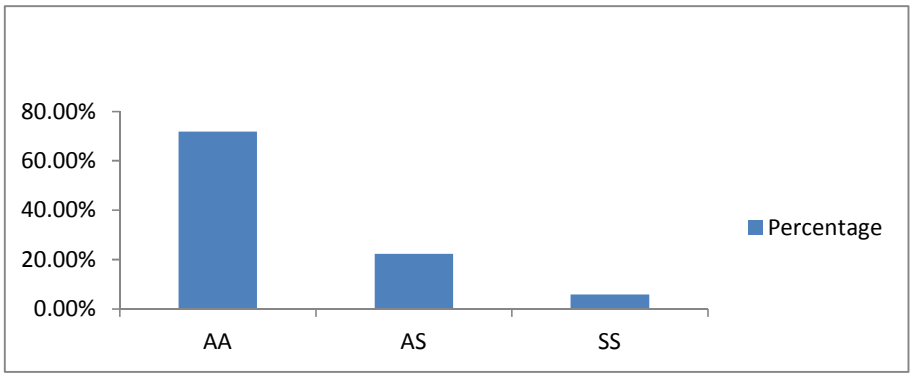

Fig. 5. Distribution of heamoglobin variants among *Helicobacter pylori* sero-positive subjects

Table 2. Distribution of haemoglobin variants among females in relation to *Helicobacter pylori* infection

Genotype	Reaction to *H. pylori*	No. (% Distribution)
AA	Sero-positive	74(71.84)
	Sero-negative	7(41.2)
AS	Sero-positive	23(22.33)
	Sero-negative	6(35.3)
SS	Sero-positive	6(5.83)
	Sero-negative	4(23.5)

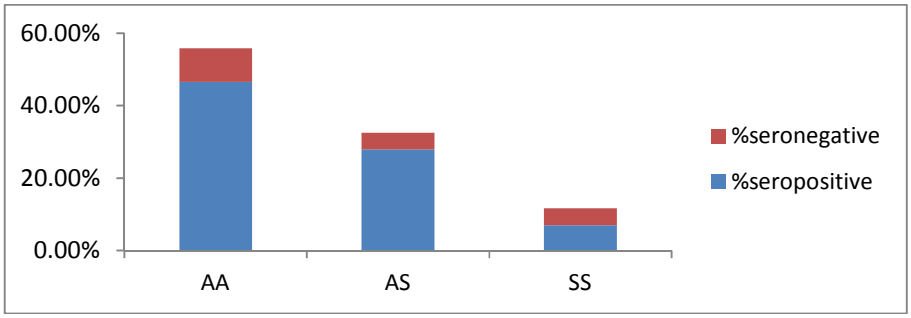

Fig. 6. Haemoglobin variants distribution among male subjects in respect to *Helicobacter pylori* infection

4. DISCUSSION

Helicobacter pylori is a bacteria that is found in the gastric mucous layer or adherent to the epithelia lining of the stomach. It causes more than 90% of duodenal ulcer, up to 80% of gastric ulcer, and gastritis [1]. This research carried out on 120 individuals of both sexes, shows a higher frequency of *Helicobacter pylori* in females than in males (64.1% and 35.9% respectively). This study disagrees with a research survey conducted by [11], that showed percentage distribution of *Helicobacter pylori* among males and females (84.5% and 58.9% respectively).

The ABO blood group contains antigens on red blood cellular surfaces that may confer advantage of resistance against some infectious disease. That an individual have a particular surface antigen present on the surface of his/her red cells can help in associating a particular blood group with a disease/infection based on the prevalence of such disease/infection that is dominant in the blood groups of the population under study.

The results of this study showed an association between ABO blood groups and *Helicobacter pylori* infection, in which blood group O has a greater tendency towards infection and blood group AB to non-infection. These findings are in agreement with that of other researchers [13], and disagree with some previous studies which demonstrated that the O blood group did not represent a risk factor for *Helicobacter pylori* infection [14].

The Rhesus blood group is an immunological important blood group system second to the ABO blood group. Although its association with *Helicobacter pylori* infection have been widely overlooked, however a study carried out by [4] shows that over 95% of the individuals in the population, who tested positive to *Helicobacter pylori* were Rhesus D positive, and 5% were Rhesus D negative. This study shows that 30.8% Rhesus D positive patients and 6.67% Rhesus D negative patients were positive for *Helicobacter pylori*, and therefore showed no strong differences between those that were positive and negative, indicating that the presence of *Helicobacter pylori* is not associated with Rhesus factor, which is in agreement with a previous study by [15].

Amino acid sequences of the various haemoglobin variants are not the same, these differences forms the basis for the different haemoglobin variants. There is paucity of information on the association of *Helicobacter pylori* infection with haemoglobin variants, however this study shows that there was a higher frequency of haemoglobin genotype AA(71.84%) followed by haemoglobin genotype AS(22.33%) and haemoglobin genotype SS(5.83) among sero-positive individuals.

5. CONCLUSION

Conclusively, O blood group individuals are more susceptible to *Helicobacter pylori* infection and they have more cellular and immunological response to it (expressed by sero-positivity) than other ABO blood groups (group B in particular), while no significant differences between Rhesus D positive and Rhesus D negative patients were observed. Also, haemoglobin AA individuals were mostly affected in Igwuruta-Ali and females were more prone to *Helicobacter pylori* infection, probably due to their abstinence from food while trying to “watch their weight”, as excessive gastric acid in the stomach mucosa contributes to the ulceration.

CONSENT AND ETHICAL APPROVAL

Informed consent was obtained from apparently healthy subjects prior to enrolment upon ethical clearance by the Ethics Committee of the Department of Medical Laboratory Science, Rivers State University.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Passaro DJ, Chosy EJ, Parsonnet J. *Helicobacter pylori,* concensus and controversy. Clinical Infectious Disease. 2004;35:298-304.
2. Mourant AE, Kopec AC, Domaniewska-Sobczak K. Blood groups and diseases: A study of associations of diseases with blood groups and other polymorphisms. London: Oxford University Press; 1978.
3. Alkout AM, Blackwell CC, Weir DM. Increased inflammatory responses of persons of blood group O to *Helicobacter pylori.* Journal of Infectious Disease. 2000;181(4):1364-1369.

4. Moawia EM, Omer HS, Osman K. Association between *Helicobacter pylori* infection, ABO blood groups and Rhesus factor in peptic ulcer disease patients, in Gezira Central Sudan. British Journal of Medicine. 2015;7(1):11-16.
5. Sasidharan S, Ghayethry B, Ravichandran M, Latha LY, Lachumy SJ, Leng KM, Rao SGS. Prevalence of *Helicobacter pylori* infection among patients referred for endoscopy: Gender and ethnic differences in Kedah, Malaysia. Asian Pacific Journal of Tropical Disease. 2012;55-59.
6. Sutton P, Mitchell HM. *Helicobacter pylori* in the 21st century. Advances in Molecular and Cellular Microbiology. UK: CAB International; 2010.
7. Geo FB, Karren CC, Janet S, Butel SA, Morse TA. A Lang medical book: Medical microbiology. 26th Ed. USA: The McGraw-Hill Companies; 2013.
8. Gaidaa KB, Amin A, Saad SH. Relationship between ABO blood groups and *Helicobacter pylori* infection among patients with dyspepsia. Journal of Virology & Microbiology. 2013;1-3.
9. Manal K, Abdulridha R. The relationship between ABO blood group distribution and the incidence of upper gastric and duodenal ulcer in Iraqi patients. Iraqi Journal of Pharmaceutical Science. 2013;22(1):97-100.
10. Brown BA. Haematology: Principles and procedures. 6th Ed., Philadelphia, USA: Lea and Febiger; 1993.
11. Judd JW. Methods in immunohematology. 2nd Ed., Durham, USA: Montogomery Scientific Publications; 1994.
12. Brecher M. Technical manual. 14th Ed., Bethesda, USA: American Association of Blood Banks; 2002.
13. Kanbay M, Gur G, Arslan H. The relationship of ABO blood group, age, gender, smoking, and *Helicobacter pylori* infection. Diagnostics District Science. 2005;50:1214-1217.
14. Seyda T, Derya C, Fusun A, Meliha K. The relationship of *Helicobacter pylori* positivity with age, sex, and ABO/Rhesus blood groups in patients with gastrointestinal complaints in Turkey. Helicobacter. 2007;12(3):244-250.
15. Petrovic M, Artiko V, Novosel S, Ille T. Relationship between *Helicobacter pylori* infection estimated by 14C-urea breath test and gender, blood groups and Rhesus factor. Hell. J. Nucl. Med. 2011;14(1):21-24.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle3.com/review-history/46614