The infection with HBV and HCV and their relationship to ABO blood group among blood donors

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Summary:

Background: Hepatitis B virus (HBV) and C virus (HCV) known to be transmitted through blood and blood products and has been implicated as a major cause of chronic liver disease and hepatocellular carcinoma worldwide.

Objective: This study aim to detect the relationship between the HBV and HCV infections with ABO blood groups and age of blood donor in Al- Ramadi city.

Patients & Methods: We conducted Hepatitis B surface antigen test strip (ACON Laboratories) (USA) and HCVAb, as step to detect the infections among blood donors at the laboratories for central blood bank in Alanbar health directory, M.O.H.

The results of this study were analyzed statistically using the T-test to find the significance of probability level according to SPSS ver[12] program. (P) Value < 0.05 were considered significant.

Results: Among (430) volunteer blood donors, there were 71(16.511%) positive for HBs Ag and 12(2.790%) for HCVAb. Hepatitis B and C infections were significantly associated with blood group of the donors; percentage of HBs Ag and HCVAb were found to be higher in donors who has blood group O and lowest in blood group AB donors, while the distribution of Rh in hepatitis infected donors was higher among Rh positive donors. HCV infections show a high percentage at age group (26–35) years old, while the percentage of HBV infections increase with progress of age group among blood donors.

Conclusion: There were a significant association between blood group of donors and hepatitis infections and the infections of HCV increase among (26-35) years old blood donors while the HBV infections increase with progress of age groups.

Keywords: Hepatitis B virus, Hepatitis C virus, Blood group, Rh.

Introduction:-

Hepatitis B virus (HBV) is the most common cause of chronic liver disease worldwide. HBV is a DNA virus that is transmitted primarily through blood exposure and sexual contact. (1) Most people who become infected with HBV are able to clear the virus without treatment, and they subsequently become immune to HBV. A small proportion of the individual infected with HBV (approximately 10% in the general population) develop chronic HBV infection. Over time, chronic HBV can cause hepatic fibrosis and cirrhosis, carcinoma and end stage liver disease (ESLD). (2) Symptoms of acute HBV infection may include fatigue, nausea, vomiting, fever, right upper quadrant pain, jaundice, dark urine and clay-colored stools. Some patients may have no symptoms. (2). Hepatitis could be caused by many factors such as virus named HBV (Hepatitis B virus). Several serological determinants e.g. Glycoprotein surface antigen (HBs Ag), viral peptide antigen (HBe Ag), antibody against viral nucleoprotein (HBc Ab)] and PCR lead to recognition of HBV. (3) Hepatitis C virus (HCV) infection is a leading cause of silent liver inflammation (hepatitis), scarring (cirrhosis) and hepatocellular carcinoma. Although it is primarily and efficiently transmitted through large and repeated percutaneous exposure to blood and blood products, overt percutaneous exposure can not be identified in 10-50% of cases. (15). the complex antigen that used in the diagnosis in our study, found on the surface of HBV is called HBs Ag. The presence of HBs Ag in serum or plasma is an indication of an active Hepatitis B infection it will be detected 3-5 weeks before symptoms or jaundice develop, while in HCV, the presence of HCV antibody (HCVAb) was detected in the serum or plasma specimens. The ACON hepatitis B surface antigen test strip and hepatitis C virus antibody test strip is a rapid test to qualitatively detect the presence of HBs Ag and HCVAb in serum or plasma specimens. The test utilizes a combination of monoclonal and polyclonal antibodies to selectively detect elevated levels of HBs Ag in serum or plasma, and it use recombinant HCV antigen to detect the infections with HCV. (4) Many studies have been performed to determine relationship between infectious diseases and blood groups. Interaction of microorganisms and RBC membrane is probably because of antigenic similarity, adherence through specific receptors or modulation of antibody response. (5) The first known relationship between blood group and infectious

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diseases was seen in Plasmodium vivax, and it is believed that susceptibility to HIV infection is related to blood groups and Rh factor.(6)

Patients and Methods:-

During the period from March 2005 to January 2007, (430) serum specimens were collected from volunteer blood donors at Al- Ramadi Medical Center of M.O.H. Identification was made locally with the help of ACON Laboratories as a rapid chromatographic immunoassay for detection of hepatitis and Plasmatec Laboratory Products (UK) for detection of blood group. (4, 7). The membrane of chromographic immunoassay strips is pre-coated with anti-HBsAg antibody or recombinant HCV antigen on the test line region of the strips. During testing, the serum or plasma specimen reacts with the particle coated with anti-HBsAg antibodies or with protein A coated particles in case of HCVAb on the membrane, the mixture migrates upward on the membrane chromatographically by capillary action to react with anti-HBsAg or recombinant HCV antigen in the membrane and generate a colored line. presence of this colored line in the test region indicates a positive result, while its absence indicates a negative result. The serum specimens separated from the blood as soon as possible to avoid hemolysis. Only clear, non-hemolyzed specimens would be used. Testing should be performed immediately after the specimens have been collected. Specimens were stored at 2-8˚C for 3 days. Chromographic immunoassay test strips, serum specimens, and controls allow equilibrating to room temperature prior to testing. Best results will be obtained if the assay is performed within one hour after specimen's collection. Blood group reagents will cause direct agglutination (clumping) of test red blood corpuscles (RBCs) that carry the corresponding ABO antigen. No agglutination generally indicates the absence of the corresponding ABO antigen. Slide technique was the recommended technique. Prepare 35-45% suspension of test RBCs in phosphate buffer saline (pH=7.2). Place on a labeled glass slide, 1 volume of Plasmatec Anti-ABO reagent and 1 volume of RBCs test suspension. Using a disposable applicator stick, mix reagent and cells over an area of about 20×40mm. slowly tilt the slide back and forth for 30 seconds with occasional further mixing during the 2 minutes period, maintaining slide at room temperature. Then read macroscopically after 2 minutes over a diffuse light.The results were analyzed statistically using the T-test to find the significance of probability level according to SPSS ver12 program. (P) value < 0.05 were considered significant.

Results:-

During the period from March 2005 to January 2007, 430 serum specimens were collected from volunteer blood donors at the Laboratories for Central Blood Bank in Alanbar Health Directory, M.O.H. The specimens were tested by a chromatographic immunoassay for detection of hepatitis infections. Among the blood donors, there are 347 (80.70%) healthy blood donors considered as control and 71 (16.51%) cases of hepatitis B infections and 12 (2.79%) cases of hepatitis C infections, and there are 396 (92.09%) male and only 34 (7.91%) female. The distribution of Rh on HBsAg positive cases showed 66 (92.958%) Rh positive, 5 (7.042%) Rh negative, while on hepatitis C viral Ab positive cases showed 7 (58.333%) Rh positive, and 5 (41.667%) Rh negative (table 1). Although, there was no significant differences regarding Rh factor in hepatitis B infection group (T-test=1.714) and Rh factor of control group, as well as there was no significant difference regarding Rh factor in hepatitis C infection group (T-test=2.248) and Rh factor of control group. The ABO blood groups distribution in the hepatitis B viral Ag positive group was as follows: group A 15 (21.127%), B 21 (29.578%), AB 3 (4.225%), and O 32 (45.070%). while the blood groups distribution in the hepatitis C positive group was as follows: group A 4 (33.333%), B 2 (16.667%), AB 1 (8.333%), and O 5 (41.667%). There was a significant association among the blood group of the patient who infected with hepatitis B virus and control (T-test=4.346) and there was a highly significant association among the blood group of the patient who infected with hepatitis C virus and control (T-test=5.690), (table 2). Table 3 shows that, the majority of hepatitis B infected patients have age between (36 – 45) years with (42.254%) followed by (26 – 35) years (38.028%) and (15 – 25) years (19.718%) respectively. While the majority of hepatitis C infected patients have age between (26 – 35) years with (41.667%) followed by (36 – 45) years (33.333%) and (15 – 25) years (25.0%) respectively. The prevalence of hepatitis B infections (T-test=12.800) and of hepatitis C infections (T-test=22.400) in age groups were highly significantly different from that in the age groups of control.

Table (1) Distribution of Rh factor in hepatitis B & C - positive patients.

Rh factor	Healthy Blood Donors		HCV		HBV	
	No.	%	No.	%	No.	%
Positive	248	71.470%	7	58.333%	66	92.958%
Negative	99	28.530%	5	41.667%	5	7.042%
Total	347	100 %	12	100 %	71	100 %

[P< 0.05, df=2, T-table=4.303]

Table (2) Distribution of blood groups in hepatitis B & C infection groups.

Blood groups	Healthy Blood Donors		HCV		HBV	
	No.	%	No.	%	No.	%
A	101	29.107%	4	33.333 %	15	21.127%
B	75	21.614%	2	16.667 %	21	29.578%
AB	52	14.986%	1	8.333%	3	4.225 %
O	119	34.293%	5	41.667 %	32	45.070%
Total	347	100 %	12	100%	71	100%

[P< 0.05, DF=6, T-table=2.306]

Table (3) the relationship between age group and Hepatitis infections.

Variable Age Group (Year)	Healthy Blood Donors		HCV		HBV	
	No.	%	No.	%	No.	%
15 – 25	106	30.548%	3	25.0%	14	19.718 %
26 – 35	117	33.719%	5	41.667 %	27	38.028 %
36 – 45	124	35.734%	4	33.333 %	30	42.254 %
Total	347	100%	12	100%	71	100%

[P< 0.05, DF=4, T-table=2.776]

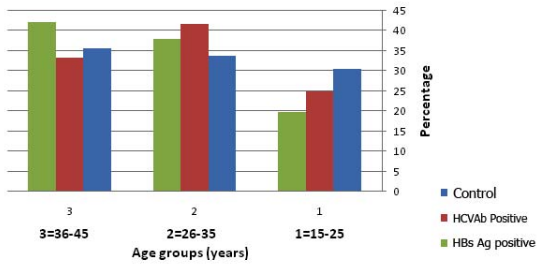

Fig. 2: The prevalence of hepatitis infections in age groups.

Discussion:

The military operations of American occupation forces lead to increase the need of blood transfusion (one of important roots of hepatitis infections) during the period of our study; the chromographic immunoassay strips provide a fast and accurate technique for detection of hepatitis infections in volunteer blood donors before blood transfusion operations. This study compared between the infections of hepatitis B and C with some risk factors in blood donors, regarding Rh factor, there were no significant differences between test groups and controls, but there was a highly percentage variation between Rh positive and Rh negative groups. (Table 1). H. Alaoddoleheo, et al. (2007) reported that Distribution of Rh in HBsAg positive patients was: Rh positive (98.4%) and Rh negative (1.6%), there are another articles agreeing to our results (8), however, more studies with larger sample size should be done to find out if there is a real association between them. ABO blood groups are one set of agglutinogens (antigens), which are genetically determined carbohydrate molecules carried on the surface of membranes of red blood corpuscles (10, 11). ABO blood groups have shown some association with various diseases (9). Although there are small studies in literature about association between ABO blood groups and chronic viral hepatitis B and C. Seroprevalence of HBs Ag and HCVAb were found to be higher in donors who has blood group O (45.070%, 41.667%) respectively and lowest in donors who has blood group AB (4.225%, 8.333%) respectively, the similar distribution of blood group were reported by Alireza E. Naeini, et al. (2010), R. Behal, et al. (2009) and H. Alaoddoleheo, et al.(2007) and others (17). A relation between the liability to develop hepatitis and the ABO blood groups would suggest that host factors may be of importance in the genesis of this disease (21). As well as the blood group O, Rh positive is more likely to develop hepatitis because the most of the Al-Ramadi population enrolled in this study are O, Rh positive, as reflected in this study and others (23), thus the blood groups of donors do not follow the usual pattern of statistical distribution in the general population. However, the results of this study demonstrate that a possible association between HBV & HCV infections and blood group antigens can not be ruled out. Other studies revealed that blood groups of patients not related to the hepatitis infections (22) and this converse blood group relationship in the present study, the possibility of antigenic differences between the respective viruses (21) maybe lead to this variety in results or it might be due to smaller sample size and different design of studies. In spite of that, the possible association of blood group antigens with HCV and HBV cannot be ruled out. (18) Regarding age group, HCV infections show a high percentage at age group (26–35) years old (table 3), the high positivity recorded in these groups may be as a result of their exposure to contaminated blood through blood transfusion. The similar findings were reported by O.O. Alao et al. (2009) and F. I. Buseri, et al. (2009). The percentage of HBV infections increase with progress of age among blood donors, (Figure 2). The prevalence of HBV infections and HCV infections in age groups show highly significantly different from that in the similar age groups of control, (T-test=12.800 and T-test=22.400 respectively). This finding agrees with data from I. Jbara, et al. (2006) and R. Behal, et al. (2010) (18, 24). S.A. Mujeeb et al.(2000) reported that exposure to the unsafe injections also increased with age as the total number of injections increase per person in year.(19) The reduction of the donor age group to 20 years and a stringent practice of voluntary donation would help to reduce the prevalence of hepatitis infections in our country. This recommendation is in line with the international objective of "reaching young blood donors" (25), a new strategy adopted by the international

community to recruit blood donors from 16–25 years old for the purpose of providing safe blood. The implementation of this policy in Zimbabwe reduced the prevalence of human immunodeficiency virus (HIV) from 4.45% in 1999 to 0.61% in 2001(25), as well as extension of facility for blood screening in large scale to help early detection of cases along with vaccination services for high risk groups and awareness program are the key to bring these diseases under control.The blood bank data could provide reliable information to monitor trends prevalence of these infections; on the other hand it seems more studies should be accomplished in this field. It is necessary to examine the patients for secretory forms and other blood group system in active carriers.

Conclusion:

Seroprevalence of HBs Ag and HCVAb were found to be higher in donors who has blood group O and lowest in blood group AB donors, while the distribution of Rh in hepatitis infections was higher between Rh positive donors. HCV infections show a high percentage at age group (26–35) years old, while the percentage of HBV infections increase with progress of age among blood donors.

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