

PRE-OPERATIVE SCREENING FOR HBV AND HCV INFECTIONS: A PREVENTIVE MEASURE! WHERE ARE WE TODAY?

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ABSTRACT

*Viral hepatitis B and C are common causes of chronic liver disease and a major public health issue all over the world. Chronic hepatitis B and hepatitis C infections are indolent, often sub-clinical diseases that may lead to cirrhosis and hepatocellular carcinoma after decades. In this study, our aim was to find out the frequency of HBsAg and Anti-HCV in the subjects planned to undergo eye surgery and to stress the importance of pre-operative screening by using cost effective immunochromatographic test kits. Subjects of both genders (n=6340) attending Madina Teaching Hospital, Faisalabad for ophthalmic surgery were randomly selected as study subjects and were screened for HBsAg and Anti-HCV during the pre-operative period. This study was conducted for a period of 27 months, in Faisalabad, Pakistan. Blood specimens were collected and tested for the qualitative detection of HBsAg and Anti-HCV in serum using simple, one step immunochromatographic assay. Our study was conducted in hospital based population and a total of 6340 subjects were screened for both hepatitis B and C. The carrier state of hepatitis was detected in 19.97% of the subjects. The prevalence of HCV among the total cases studied was 17.85 %, hepatitis B, 1.35% and hepatitis B and C (dual infection) 0.46%. More than half (51.06%) of the adults \geq 60 years of age were HCV seropositive indicating a strong increase in the older age group. A higher percentage of male subjects showed positive results for HBsAg as compared to females but this difference was insignificant in Anti-HCV reactive subjects. This study **concludes** that frequency of HCV infection is quite high in the studied population and is much higher than that of HBV infection that is much lower in this population. Routine and pre-operative screening for HBV and HCV infection can help reduction in transmission of infection. The simple and accurate ICT for HBsAg and Anti-HCV immunoassays provide a flexible, technically undemandable and relatively inexpensive approach to ensure a safer blood supply and pre-operative screening of surgical patients and donors.*

INTRODUCTION

Viral hepatitis B and C are common and important causes of chronic liver disease and a major public health issue globally. The importance of hepatitis B and C is illustrated by the fact that chronic active hepatitis B or hepatitis C infection carries a high risk for the development of hepatic cirrhosis. Furthermore, chronic hepatitis B and hepatitis C are the major predisposing causes of primary hepatocellular carcinoma worldwide.¹⁻⁴

Hepatitis B and C viruses are blood born and mainly transmitted parentally by transfusion or the use of contaminated needles/ surgical instruments. Percutaneous and permucosal exposure to infected blood or blood products and body fluids are the known sources of transmitting infection.³⁻⁵

Health care workers are at an increased risk to develop infection through needle stick injury or direct transfer of the virus through broken skin.⁵⁻⁸

A significant number of surgical and haemodialysis patients are sero-positive either for HBV, HCV or both.⁹⁻¹⁰ Lack of proper precautionary measures while managing this cohort of infected patients and lack of vaccination (against HBV) among medical, paramedical and laboratory staff may lead to transmission of HBV or HCV infection from patients to them or vice versa.⁵⁻¹⁰

In developed countries, pre-operative screening for HBV or HCV infection has become a standard laboratory investigation prior to elective/emergency surgical procedures, so that precautionary measures can be adopted to curb the further transmission of this lethal infection.^{1,4,11-13} In developing countries like Pakistan, pre-operative screening facilities for hepatitis B and hepatitis C are not available particularly at primary and secondary level even for elective/ planned surgery. Ter-

tiary care facilities are available only in the large / teaching hospitals of the big cities.

In this study, we aimed to find out the frequency of HBsAg and Anti-HCV in the patients who plan eye surgery. In them we stressed the importance of pre-operative screening particularly where basic diagnostic laboratory facilities are not available by using simple, low cost immunochromatographic test kits. It is important that during and after surgery we need to safeguard health care workers who can be infected through exposure to infected patients to prevent further dissemination of the infection.

SUBJECTS AND METHODS

Study Population: Subjects of both genders (n=6340) attending Madina Teaching Hospital, Faisalabad for ophthalmic surgery were randomly selected as study subjects and were screened for HBsAg and Anti-HCV during the pre-operative period. Screening facility was provided free of cost to all.

Duration and Location of Study: This study was conducted for a period of 27 months extending from May 2005 to July, 2007, as a hospital-based study the city of Faisalabad, Pakistan. The main reason for selecting this area was that no previous studies were carried out to investigate the prevalence of both human viral (HBV and HCV) infections in the catchments area of this newly established teaching hospital.

Distribution of Subjects According to Age: Subjects were divided into four different age groups: Group 1 (upto 19 years), Group 2 (20-39 years), Group 3 (40-59 years) and Group 4 (≥ 60 years). Most of the subjects screened were within the age

group 20-39 (12.85%), 40-59 (30.83%) and ≥ 60 (50.85%) for each. However, only 5.45% of subjects were under 20 years of age (Table 1).

Immunoassays;

Laboratory Techniques: HBsAg and Anti-HCV immunochromatographic (ICT) kits/ devices were used to screen all blood specimens. The results were recorded as 'Reactive or Non- Reactive.' The results of 75 and 250 randomly selected reactive, weakly reactive and non-reactive sera for HBsAg and Anti-HCV respectively were subjected to cross check using ELISA system, and were confirmed.

Statistical Analysis: Processing and analysis of data were performed by means of the SPSS-PC version 12.0, (statistical package for social sciences- computer software). Percentages were calculated directly for HBV and HCV infection in different age groups. Chi-square test was used to analyze the difference between the various groups. Statistical significance was accepted for $P < 0.05$ (significant) and $P > 0.05$ (insignificant).

RESULTS

Our study was conducted in a hospital based population randomly selected for ophthalmic surgery. In a total of 6340 subjects screened, they included 3418 males (53.91%) and 2922 females (46.09%), 1247 (19.67%) were positive for HBV, HCV or both infections (Table 1, 2). The hepatitis B surface antigen (HBsAg), the main serological marker for hepatitis B virus infection was detected in 1.35% subjects using visual immunochromatographic test (ICT) devices. Hepatitis C virus specific antibodies (Anti-HCV) were detected among 17.85% subjects

Table 1: Distribution of Hepatitis B and C reactive cases in different age groups.

Age Group	Age (Years)	Subjects Screened	Anti-HCV reactive cases	HBs Ag reactive cases	Dual infection (HBV & HCV)
Group 1	≤ 19	346	19 (5.49%)	5 (1.44%)	0 (00.00%)
Group 2	20-39	815	157 (19.26%)	16 (1.96%)	3 (00.37%)
Group 3	40-59	1955	378 (19.34%)	27 (1.38%)	16 (00.82%)
Group 4	≥ 60	3224	578 (17.93%)	38 (1.17%)	10 (0.31%)
Total		6340	1132 (17.85%)	86 (1.35%)	29 (00.46%)

Table 2: Sex wise distribution of HBV and HCV reactive subjects.

Subjects		Anti-HCV reactive cases		HBsAg reactive cases	
Sex	Total No.	No.	Percentage	No.	Percentage
Male	3418 (53.91%)	585 (17.11%)	51.67%	58 (1.69%)	67.44%
Female	2922 (46.09%)	547 (18.72%)	48.32%	28 (0.95%)	32.55%
Grand total	6340	1132 (17.85%)	99.99%	86 (1.35%)	99.99%

using ICT kits. In all the subjects examined, dual infection with both viruses (HBV and HCV) was detected in 0.46% subjects. The proportion of hepatitis C amongst the total cases of hepatitis was 90.77%, hepatitis B - 6.89% and for dual infection (HBV and HCV) 2.33% (Table 1, 3).

In a total of 6340 subjects screened, 1132 (17.85%) including 585 males (51.67%) and 547 females (48.32%) were reactive for Anti- HCV. (Table 2 and 4). These tables show that 17.11% males and 18.72% females were seropositive for

Table 3: Percentage distribution of viral hepatitis and Proportion of Hepatitis B and C amongst total reported positive cases of hepatitis.

Type of Hepatitis	Positive Cases	Proportion (% age) (n = 1247)
Hepatitis C	1132 (17.85%)	90.77%
Hepatitis B	86 (1.35%)	6.89%
Hepatitis B and C (dual infection)	29 (0.46%)	2.33%
Total (n= 6340)	1247 (19.67%)	99.99%

Table 4: Percentage distribution and proportion of hepatitis C reactive cases in different age groups and genders.

Age	Total subjects	Male subjects	C reactive (M)	Female subjects	C reactive (F)	Proportion (n = 1132)
Group 1	346	212	11 (5.18%)	134	8 (5.97%)	1.67%
Group 2	815	413	75 (18.15%)	402	82 (20.39 %)	13.87%
Group 3	1955	959	175 (18.24%)	996	203 (20.38%)	33.39%
Group 4	3224	1834	324 (17.66%)	1390	254 (18.27%)	51.06%
Total	6340	3418	585 (17.11%)	2922	547 (18.72%)	99.99%

HCV. The seroprevalence did not differ by gender ($P > 0.05$), but increased significantly with age ($P < 0.05$); with a notable increase in the age group 3 (19.34%) (Table 1 and 4). More than one-half (51.06%) of the adults (≥ 60 years old) were HCV seropositive indicating a strong increase in the elderly age group (Table 4).

In this study, 86 (1.35%) subjects including 58 males (67.44%) and 28 females (32.55%) were reactive for HBsAg (Table 1 and 2). The table 2 reveals the fact that a higher percentage of male subjects (1.69%) were positive for HBsAg as compared to females (0.95%) and the difference was significant ($P < 0.05$). The highest prevalence (1.96%) was noted in the age group 2 (20-39 years) (Table 1).

Only 29 (0.46%) subjects including 17 males and 12 females were positive for dual infection (HBV and HCV). The prevalence increased from 00.00% in subjects < 20 years of age to 0.82% in those in the age group 3 (40-59 years) (Table 1).

Table 5: Reactive, weakly reactive and Non-reactive HBsAg and Anti-HCV results of ICT devices compared with the ELISA results (75 and 250 specimens).

Parameters	ELISA Positive	ELISA Negative	Total
HBs Ag (ICT- Reactive)	25 (100.00%)	0 (0.00%)	25
HBs Ag (ICT- weakly Reactive)	23 (92.00%)	2 (08.00%)	25
HBs Ag (ICT- Non-Reactive)	0 (0.00%)	25 (100.00%)	25
Anti-HCV (ICT- Reactive)	99 (99.00%)	1 (01.00%)	100
Anti-HCV (ICT- weakly Reactive)	97 (97.00%)	3 (03.00%)	100
Anti-HCV (ICT- Non-Reactive)	0 (0.00%)	50 (100.00%)	50

ELISA was found to be fairly sensitive in detecting HBsAg and Anti-HCV compared to ICT; however, statistically there was no significant difference ($P > 0.05$) between the two test techniques used (Table 5).

DISCUSSION

The prevalence of HBV infection in the studied population was lower (1.35%) than that previously reported in various studies from different parts of Pakistan and many neighbouring countries, the total reservoir of infection is still significant.^{1-3,14-15}

The prevalence of HCV infection is quite high (17.85%) in this cohort of people and is comparable with published reports from Egypt, Cameroon and other countries,^{4,16,17} it calls for public health measures, including health education to limit the magnitude of the problem. The seroprevalence did not differ by gender but increased significantly with age ($P < 0.05$), with a high increase in the oldest age groups. Indeed, about one-half (51.06%) of the adults ≥ 60 years old were HCV seropositive comparable to the studies of Sampietro et al.¹⁷ and Njouom et al.¹⁸ In the United States, 65% of persons with HCV infection were aged 30-49 years.¹⁹

According to many studies, most of the cases of hepatitis B or C occurred in developing countries, where resources available for prevention, diagnosis and treatment are limited or non-existent.^{3,18-20} Even in Pakistan²⁰ screening facility for HBV and HCV is being provided only in a few tertiary care hospitals and is not available at primary/ secondary levels mainly due to inadequate funding for health care, poor infrastructure, and lack of public awareness about the disease.^{1,3,4,9,11-14,20} Quantitative enzyme immunoassay (EIA) methods are considered to be the most sensitive tests and are widely used at well-equipped reference centers or central blood banks. ICT test kits/ devices are intended for qualitative detection of HBsAg and Anti-HCV in human serum, plasma, or whole blood,²¹⁻²⁵ can be easily used for pre-operative serological screening of high-risk surgical subjects in small, rural laboratories or at centers wherever EIA systems are impractical or can not be sustained. Public policies decision-makers need criteria to appreciate the costs and benefits of such screening programs.⁵

This study was also designed to examine a pre-operative cost-effective strategy for the diagnosis of hepatitis B and C virus infection in clinical laboratories where facilities like ELISA are not available. Simple and low-cost screening facilities for HBV and HCV can be provided to reach the majority of target population where basic health and diagnostic facilities are inadequate or non-existent.

In this study, low cost, simple, one step immunochromatographic test kits for qualitative detection of HBsAg and Anti-HCV sero-markers were used, they delivered accurate and reliable results in only 15 minutes and are quite helpful in effective patient management and improved quality of patient care. These test kits greatly facilitate screening and follow up for health care professionals. The high sensitivity and specificity ($\geq 97\%$) of these test kits deliver reliable results and cost effective.^{18,21-25}

These test kits/ devices are quite suitable for underdeveloped countries like Pakistan that lacks suitable infrastructure and finances. Since no test is 100% reliable, a supplement test can also be used to confirm or refute a positive HBsAg or anti-HCV test result, wherever other facilities like ELISA are available. However, the results of the ICT kits used in our study/screening program were quite comparable with those published by others.^{19,23-25} ELISA system was found to be fairly sensitive in detecting HBsAg and Anti-HCV compared to ICT; however, statistically there was no significant difference ($P > 0.05$) between the two test techniques used.

This study also revealed that effective vaccination and medications are not the only answer to the problem but more important is the setting of suitable aid programs for the training of local health workers as well as the provision of health education and basic health and diagnostic facilities, to curb the spread of this lethal disease in view of its indolent nature.

This study **concludes** that frequency of HCV carriers in the studied population is very high as compared to HBV with a notable increase in the age group 3 (19.34%) and 51.06% of subjects with HCV infection are aged ≥ 60 years. There is lack of routine serological screening in our hospitals prior to invasive procedures which is one of the major risk factors responsible for dissemination of viral hepatitis B and C. This study further concludes that pre-operative screening protocol must be observed and cost effective screening facilities for HBV and HCV should be provided to reach the majority of the target population, across the country.

ACKNOWLEDGEMENTS

The authors are thankful to the V.C. of University of Faisalabad and The Principal of SIMS.

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