International Journal of Infection Control
www.ijic.info ISSN 1996-9783

ORIGINAL ARTICLE

How useful is routine pre-endoscopy viral screening?

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doi: 10.3396/ijic.v15i3.013.19

Abstract

Pre-procedural screening for hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) are routinely done in several endoscopy centres in Nigeria. These tests constitute an additional layer of financial burden to the patients since most of them settle their medical bills out of pocket. At the same time, the burden of these viral infections on the society demands that all measures are taken to prevent their iatrogenic transmission. The aim of this study was to evaluate the prevalence of HBV, HCV and HIV among patients referred for gastrointestinal endoscopy so as to determine the relevance of routine screening before procedures. The study was a retrospective cross-sectional survey of patients referred to the Digestive Endoscopy Unit of the Babcock University Teaching Hospital, Ilisan-Remo, for endoscopy from January 2015 to December 2018. A total of 432 patients were included in the study. The mean age was 48.15 (±15.89) while the age range was 12-86 years. Of these, 240 (54.7%) were females while 199 (45.3%) were males. The results of the viral screening available in the record book varied: HBV (n = 419), HCV (n = 238) and HIV (n = 417). The prevalence of HBV, HCV and HIV was 4.3% (95% CI = 2.4% - 6.2%), 2.1% (95% CI = 0.4% - 4.2%) and 1.0% (95% CI = 0.2% - 1.9%) respectively. Fourteen (3.3%), 5 (2.2%) and 14 (3.4%) patients who were initially negative, were rescreened for HBV, HCV and HIV respectively for repeat endoscopy. None of these patients tested positive for the viruses. We found no evidence of viral transmission from endoscope to patients in our centre. Viral pre-screening for endoscopy in settings with low to moderate prevalence rates of HBV, HCV and HIV infections may not be necessary.

Keywords: Gastrointestinal endoscopy, hepatitis B virus, hepatitis C virus, human immunodeficiency virus, screening, Nigeria

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Introduction

In modern practice of medicine, gastrointestinal (GI) endoscopy has become indispensable in the diagnosis and treatment of various digestive diseases worldwide. For example, it was reported that 17 million flexible sigmoidoscopies and colonoscopies were performed in 2002 in the United States of America (USA).[1] This implies the possibility of performance of over 34 million upper and lower GI endoscopies per annum in the USA alone exists. Although GI endoscopic procedures are not as popular in the developing countries like in the developed world, they have become a regular feature of medical practice in many of these countries.

Due to the fact that GI endoscopy involves close contact between the endoscope and the mucous membrane of the patient, any breach in the standard guidelines for scope reprocessing carries a substantial risk of iatrogenic infection to patients. The risk of infection transmission from endoscopy has been reported to be very low (about 1 in 1.8 million procedures)[2] but concerns about the possibility of transmission of infectious diseases remain for both patients and physicians due to the invasive nature of the procedures.[3] In addition, more healthcare-related disease outbreaks have been associated with contaminated endoscopes than to any other medical device.[4–6]

A review of literature containing data generated between 1966 and 1992 by Spach *et al.* documented 281 reported cases of microorganisms' transmission by gastrointestinal endoscopy.[6] Direct patient-to-patient transmission of microorganisms such as *Salmonella* spp., *Pseudomonas aeruginosa*, *Helicobacter pylori*, mycobacteria, hepatitis B virus (HBV) and hepatitis C virus (HCV) through contaminated endoscopes have been documented but transmission of HIV infection through this means is yet to be confirmed.[5]

The HIV, HBV and HCV infections are among the most common chronic viral infections worldwide. The global populations of people living with HIV, HBV and HCV infections currently stand at 36.9 million, 257 million, and 71 million respectively.[7–9] These infectious diseases are a major source of public health concern globally and particularly in the developing nations where they are highly prevalent. Owing to their long incubation periods and the insidious nature of their symptoms, it is more difficult to document the transmission of viral infections by digestive endoscopy compared to bacterial infections.[10]

Pre-endoscopy viral (HBV, HCV, and HIV) screenings are routinely done in several endoscopy centres in Nigeria. These tests constitute an additional layer of financial burden to the patients since most of them settle their medical bills out of pocket. Though it is still not a standard of practice to have separate endoscopes for patients with viral infections like it is commonly practiced in renal dialysis, some are suggesting the practice. At the same time, the burden of these viral infections demands that all measures are taken to prevent their iatrogenic transmission either from patient to patient or from patient to members of the healthcare team.

In the light of the foregoing, we evaluated the prevalence of HBV, HCV and HIV among patients referred for gastrointestinal endoscopy so as to determine the relevance of routine pre-endoscopy screening of patients for these infections.

Materials and methods

Study design

This was a retrospective cross-sectional study.

Study setting

The study was conducted at the Digestive Endoscopy Unit of Babcock University Teaching Hospital (BUTH), Ilisan-Remo, Ogun State, Nigeria. Digestive endoscopy services began in January 2015 at this centre.

Study population

The study population consisted of male and female patients who were referred to the Digestive Endoscopy Unit of BUTH, Ilisan-Remo, for GI endoscopy from January 2015 to December 2018.

Data collection

We extracted patients' data from the procedure logbook. Patients' demographic information (age and gender) and HBV, HCV, and HIV status were copied into a spreadsheet with columns for each of the variables.

Statistical analysis

We analysed data with IBM-SPSS Statistics for Windows, Version 22.0 (IBM Corporation, Armonk, NY). Continuous variables were presented as means (±SD) and categorical variables as frequencies and percentages. Categorical variables were compared for differences by means of Pearson Chi-square test or Fisher exact test as occasion demanded. The cut-off for statistical significance was P-value < 0.05.

Ethical consideration

Ethical clearance was obtained from the Ethics Review Committee of the Babcock University, Ilisan-Remo. All data and information obtained from patients' record were treated with utmost confidentiality.

Results

A total of 432 patients were included in the study. The mean age was 48.15 (±15.89) while the age range was 12-86 years. Of these, 240 (54.7%) were females while 199 (45.3%) were males [Table I]. Those who were within age 40-59 years were most common [Table I]. In all, 324 (75.0%) patients had esophagogastroduodenoscopy (EGD), 93 (21.5%) had colonoscopy while 15 (3.5%) had both procedures.

The result of the viral screenings available in the record book varied: HBV (n= 419), HCV (n= 238) and HIV (n= 417) [Table II]. Eighteen patients [4.3% (95% CI = 2.4% - 6.2%)] tested positive for HBV. Patients who were less than 40 years (7.8%), male (5.7%), and those who had EGD alone (4.4%) had the highest HBV prevalence rates. The relationship between HBV prevalence and age-group was statistically significant (p = 0.039). Five patients [2.1% (95% CI = 0.4% - 4.2%)] were positive for HCV. Participants who were less than 40 years (4.6%), female (2.3%), and those who had EGD alone (3.1%) had the highest HCV prevalence rates. Two patients [1.0 % (95% CI = 0.2% - 1.9%)] tested positive for HIV. Participants who were 40-59 years (2.1%), male (1.1%), and those who had colonoscopy alone (1.1%) had the highest HIV prevalence rates.

Fourteen (3.3%), 5 (2.2%) and 14 (3.4%) patients who were initially negative were rescreened for HBV, HCV and HIV respectively for repeat endoscopy. None of these patients tested positive for the viruses on repeat testing.

Discussion

The prevalence of chronic hepatitis B infection varies from one global region to another. This is classified into low (<2%), intermediate (2-7%) and high (>8%) endemicity.[11] Nigeria falls within the high endemic category of HBV in global ranking with a prevalence

Table I. Age, Gender and Procedure distribution among patients (n=432)

Variable	Frequency [n (%)]
Age group	
≤ 39	132 (30.6)
40-59	196 (45.4)
≥60	104 (24.1)
Gender	
Male	198 (45.8)
Female	234 (54.2)
Procedure	
EGD	324 (75.0)
Colonoscopy	93 (21.5)
Both procedures	15 (3.5)

EGD = Esophagogastroduodenoscopy

of 12.2%.[12] The prevalence of 4.3% obtained in this study falls short of the national prevalence. It is also lower compared to 11.5% obtained in a similar study by Akere *et al.* in Ibadan, Nigeria. This disparity may be due to the fact that HBV prevalence variation exists among different groups of people in the society.[13] However, our finding is comparable to 2.7% obtained by Cakabay *et al.*[14] and the 2.8% obtained by Gulsen *et al.*[15] among patients undergoing digestive endoscopy in Turkey, which all fall within intermediate endemicity.

The observation of highest HBV infection rate among the young age-group (≤ 39 years) of the study subjects could be related to the fact that young people are more adventurous and more sexually active, making them to be more exposed to the virus than the older age groups.

Although the potential for HBV transmission through endoscopy exists, confirmed cases of transmission are very rare.[16] There are only five reported cases of endoscopy-related HBV transmission.[16–21] Nelson *et al.* in their review suggested that three of these cases were related to inadequate endoscope reprocessing.[16–19] In the remaining two cases, there was no well-established causal association of infection with endoscopy.[20,21]

Several retrospective and prospective studies that evaluated a causal relationship between improperly reprocessed endoscopes and new viral infections yielded no evidence of new infection. For example, 25,589 out of 34,879 patients who were screened for infection with HBV and HCV in a glutaraldehyde disinfection failure in Belgium showed no evidence of acute infections.[22] Another large scale retrospective epidemiological study involving 9,879 patients that investigated the possibility of transmission of HBV, HCV and HIV from improperly reprocessed endoscopes to patients who had ear-nose-and-throat (ENT) endoscopy and colonoscopy from four veteran affairs medical centres in the USA showed no evidence of viral transmission in those who had ENT procedures and no conclusive evidence in those who had colonoscopy.[23] Also, six prospective studies which studied endoscopes that were used on HBV-infected persons to perform procedures on 223 noninfected patients did not show evidence of infection during a follow-up period of six months.[16,24]

Table II. Prevalence of HBV, HCV and HIV infection by age, gender and procedure

Variable	HBV (n= 419)			HCV (n = 238)			HIV (n = 417)		
	Prevalence (%)	N	P-value	Prevalence (%)	N	P-value	Prevalence (%)	N	P-value
Age group			0.039			0.195			0.094
≤ 39	10 (7.8)	129		3 (4.6)	65		0 (0.0)	127	
40-59	7 (3.6)	192		2 (1.7)	118		4 (2.1)	192	
≥60	1 (1.0)	98		0 (0.0)	55		0 (0.0)	98	
Gender			0.190			0.807			0.858
Male	11 (5.7)	193		2 (1.9)	108		2 (1.1)	190	
Female	7 (3.1)	226		3 (2.3)	130		2 (0.9)	227	
Procedure			0.501			0.281			0.924
EGD	15 (4.4)	315		5 (3.1)	159		3 (1.0)	313	
Colo	2 (2.2)	90		0 (0.0)	67		1 (1.1)	90	
Both	1 (7.1)	14		0 (0.0)	12		0 (0.0)	14	
Total	**18 (4.3%)**	**419**		**5 (2.1)**	**238**		**4 (1.0)**	**417**	

HBV = Hepatitis B virus, HCV = Hepatitis C virus, HIV = Human immunodeficiency virus,
EGD = Esophagogastroduodenoscopy, Colo = Colonoscopy, N = Number

We obtained a prevalence of 2.1% for HCV in this study. This value is higher than the 1% cut-off for the WHO low endemic category to which Nigeria belongs.[9] Also, a Nigerian nationwide study had previously reported a prevalence of 0.9%.[25] The reason for this disparity could be that the category of patients presenting for GI endoscopy at our centre disproportionately have a higher seroprevalence rate compared to the general population. Despite the low national prevalence rate, several studies in the past have shown that there is a wide disparity in HCV seroprevalence among different population groups and subgroups in Nigeria.[26]

There are at least 11 reported cases of HCV transmission attributed to digestive endoscopy.[16,21,27–33] Apart from temporal association, serious attempt was made to establish patient-to-patient transmission by nucleotide sequencing only in six of these patients.[16,27,29,32,33] Although the reports identified inadequate disinfection of a colonoscope in five of the cases, they also raised the possibility of contamination of syringes, multidose vials, use of a peripheral catheter and anaesthesia as the sources of infection transmission.

While several epidemiologic studies from different countries have suggested an association between GI endoscopy and HCV infection, their relevance may be limited because they are all observational studies that did not establish patient-to-patient transmission by means of genetic studies.[14,16,34–41] It is not known whether the current generally accepted standard of endoscope reprocessing was adhered to in the majority of the cases. Also, general infection control practice compliance was not evaluated in these studies, bearing in mind that improper use or reuse of multiple dose vials and syringes for sedation are now recognized as an important risk factor for pathogen transmission.

The most important evidence against transmission of HCV by digestive endoscope is the landmark study that included 8,260 patients undergoing endoscopy who were initially tested for HCV seropositivity prior and 6 months after the procedure, with no cases of seroconversion.[42] This study seems to be the most objective evidence that adequate compliance with generally accepted endoscope reprocessing standards effectively prevents HCV transmission.

The HIV prevalence of 1% obtained in this study is lower than 2.8% which is the national prevalence among Nigerian adults.[43] It should be borne in mind that the prevalence of HIV among various regions and population groups in Nigeria varies widely. Among the six geopolitical zones, the South-South zone has the highest prevalence (5.5%) while the South-East zone has the lowest (1.8%).[43] Also, three minority groups which include sex workers, people who inject drugs and men who have sex with men bear a far greater burden of the disease compared to the rest of the population. These groups make up only 3.4% of the population but account for about 32% of new HIV infections in Nigeria.[43]

There has been no reported case of HIV transmission through endoscopy in the literature.[16] This may be connected to the fact that the virus is fragile and highly susceptible to chemical disinfection. Therefore, the generally accepted endoscope reprocessing standards would be sufficient to prevent its transmission.

We found no increased seroprevalence of HBV, HCV or HIV among patients who had repeat procedures in our study, although the number of patients undergoing repeat procedures was small. In fact, none of them tested positive. Contrary to our finding, Cakabay *et al.* in Turkey found increased seroprevalence of HCV among patients who had previous endoscopy.[14] Since no effort was made to exclude other possible sources of infection in these patients, a causal relationship between the procedures and infection cannot be adequately established.

In many dialysis centres worldwide, it is common practice to pre-screen patients for these viruses and dialyze those who are positive with dedicated machines in order to prevent transmission to other patients. However, there is no such pre-screening for HBV, HCV and HIV or dedication of endoscopes to infected patients in many digestive endoscopy centres around the world.

It may not be out of place to pre-screen patients for these viruses in localities that are highly endemic, in

addition to adoption of appropriate precautionary measures, so as to forestall their transmission to either patients or medical personnel. It is also advisable to pre-screen all patients, even in localities with low to medium prevalence rates, if strict adherence to standard reprocessing guidelines cannot be guaranteed. For the purpose of economic sustainability, a thorough comparative cost-benefit analysis needs to be done with due regard to the volume of infected patients seen at each endoscopy centre before a decision to designate particular endoscopes to such purpose could be taken.

Conclusion

We found no evidence of viral transmission from endoscopes to patients in our centre. It appears it is not necessary to make patients undergo pre-endoscopy viral screening in settings with low to moderate prevalence rates of HBV, HCV and HIV infections like ours. The strategy for preventing infection transmission from patients to patients in such a setting should include proper training of the endoscopy personnel on infection control measures, strict adherence to general infection preventive guidelines and proper observance of endoscope reprocessing standards.

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