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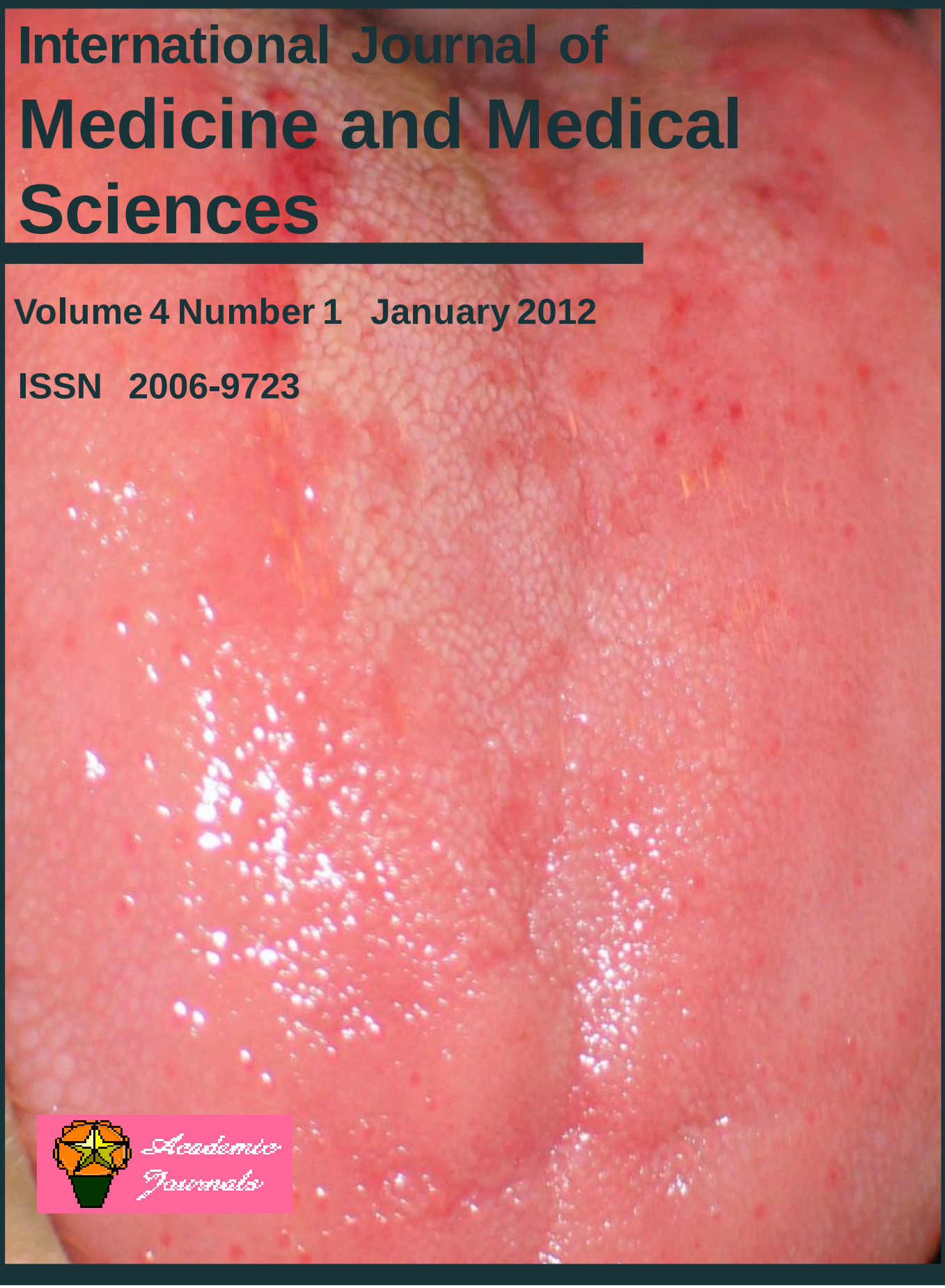

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Stoy N, Mackay GM, Forrest CM, Christofides J, Egerton M, Stone TW, Darlington LG (2005). Tryptophan metabolism and oxidative stress in patients with Huntington’s disease. N. J. Neurochem. 93: 611–623.

Mussel RL, De Sa Silva E, Costa AM, Mandarim-De-Lacerda CA (2003). Mast cells in tissue response to dentistry materials: an adhesive resin, a calcium hydroxide and a glass ionomer cement. J. Cell. Mol. Med. 7:171-178.

Booth M, Bundy DA, Albonico P, Chwaya M, Alawi K (1998). Associations among multiple geohelminth infections in school children from Pemba Island. Parasitol. 116: 85-93.0.

Fransiscus RG, Long JC, (1991). Variation in human nasal height and breath, Am. J. Phys. Anthropol. 85(4):419-427.

Stanislawski L, Lefeuvre M, Bourd K, Soheili-Majd E, Goldberg M, Perianin A (2003). TEGDMA-induced toxicity in human fibroblasts is associated with early and drastic glutathione depletion with subsequent production of oxygen reactive species. J. Biomed. Res. 66:476-82.

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Case Report

Mixed *Plasmodium falciparum* and *Plasmodium vivax* infection with acute viral hepatitis in two brothers: A rare occurrence

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Two brothers aged 14 and 17 years presented in our emergency department with complaints of fever and yellowish discoloration of eyes and urine for 6 and 10 days, respectively. They had similar clinical presentation, examination findings, laboratory biochemical derangements and positive results for rapid tests of *Plasmodium falciparum* and *vivax* species along with IgM Enzyme-linked immunosorbent assay (ELISA) test for hepatitis A virus. They also showed similar response to therapy and improved simultaneously within two to three days. This suggests the role of immunogenetics in modifying the natural course of disease. Moreover, triple infection by these hepatotropic pathogens lead to a presentation that is much more severe than that caused by either of them alone. This could only be explained by a synergistic interaction between these pathogens. This case foretells that co-infections with two or more hepatotropic pathogens require immediate attention with an aggressive management and role of immunogenetics along with co-infections in altering the phenotypic expression of a disease.

Key words: *Plasmodium falciparum, Plasmodium vivax,* hepatitis A, co-infection, immunogenetics.

INTRODUCTION

Acute viral hepatitis due to hepatitis A and malaria are very common diseases in the developing world. Many factors alter the outcome in co-infection with *Plasmodium falciparum* and *Plasmodium vivax* when concomitant viral hepatitis is also associated. Among the less studied factors are co-infections (agent factors) and immunogenetics (host factors) and their role in modifying the natural history of the disease. Our case sheds some light in this direction and may also provide stimuli for further large prospective studies so that such life threatening illness could be effectively managed. As in this case, triple infection with hepatitis A*, P. falciparum* and *P. vivax,* also presenting simultaneously among brothers, is yet to be reported to the best of our knowledge.

CASE PRESENTATION

On September 14th 2011, two brothers, 17 and 14 years old, resident of Rohtas district of Bihar, presented simultaneously in the emergency department of Sir Sunderlal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India, with fever and yellowish discoloration of eyes and urine. Fever had a similar pattern in the siblings and was continuous, associated with chills and rigors and relieved incompletely with antipyretics. The elder brother had these complaints for 6 days. On examination, he had

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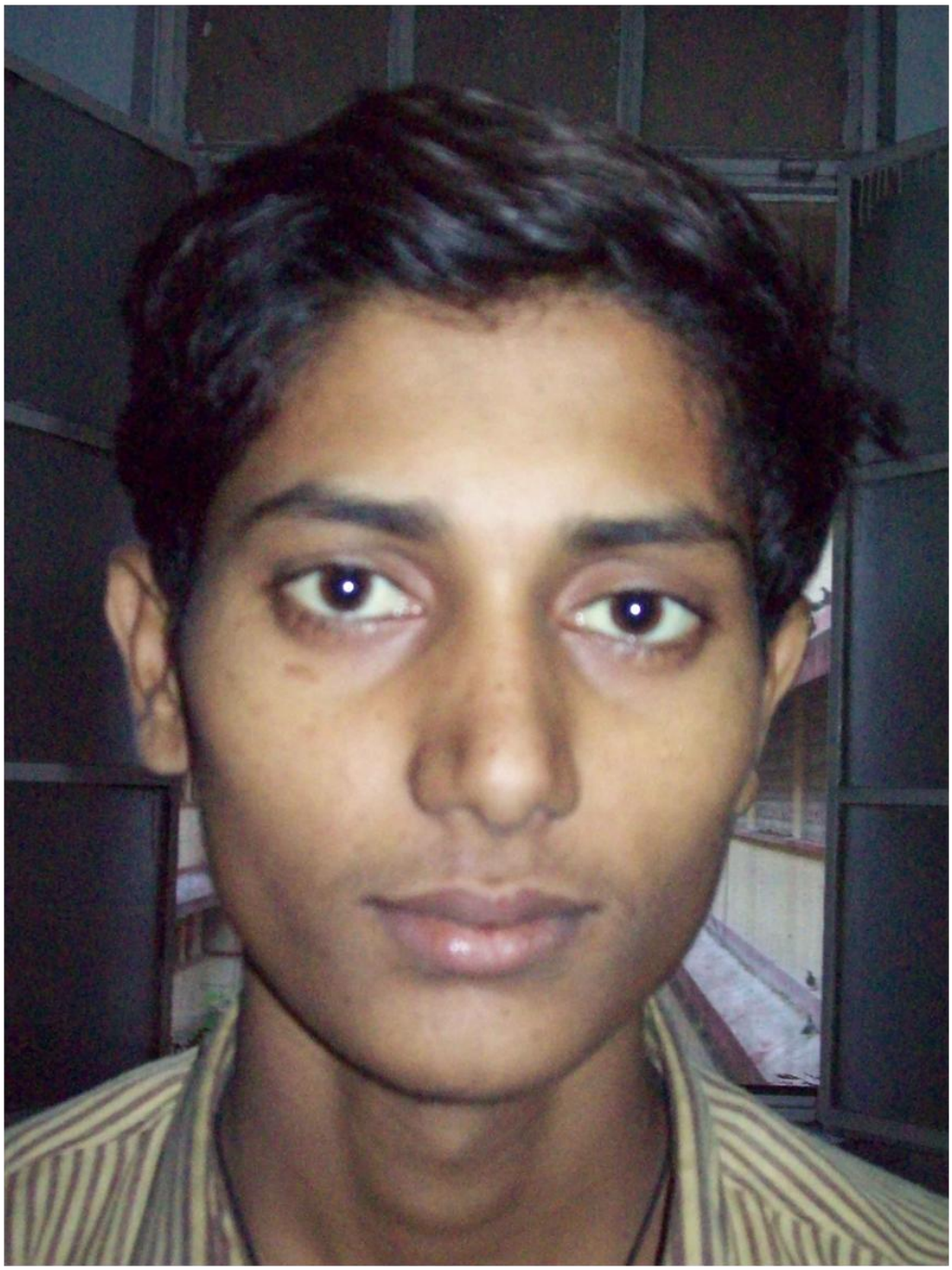

Figure 1. Elder brother showing icterus.

hypotension (blood pressure 80/50 mmHg), pallor, and icterus (Figures 1 and 3). Fundus examination revealed no abnormality. Systemic examination revealed hepatosplenomegaly. The other general and systemic examination was unremarkable. Haematological profile revealed anemia (haemoglobin 85 g/L), thrombocytopenia (platelet count 18×10^9/L), raised total and direct bilirubin (263.5 and 137.7 µmol/L respectively) and total leukocyte count being normal (4.5×10^9/L). Serum aminotransferases (alanine aminotransferase and aspartate aminotransferase were 0.6 and 0.7 µkat/L respectively) were within normal range and alkaline phosphatise (336 U/L) was mildly raised. Renal function tests were normal. Plasmodium lactate dehydrogenase (LDH) card test (SD Bio Standard Diagnostics Pvt. Ltd.) revealed concomitant *P. falciparum* and *P. vivax* infection

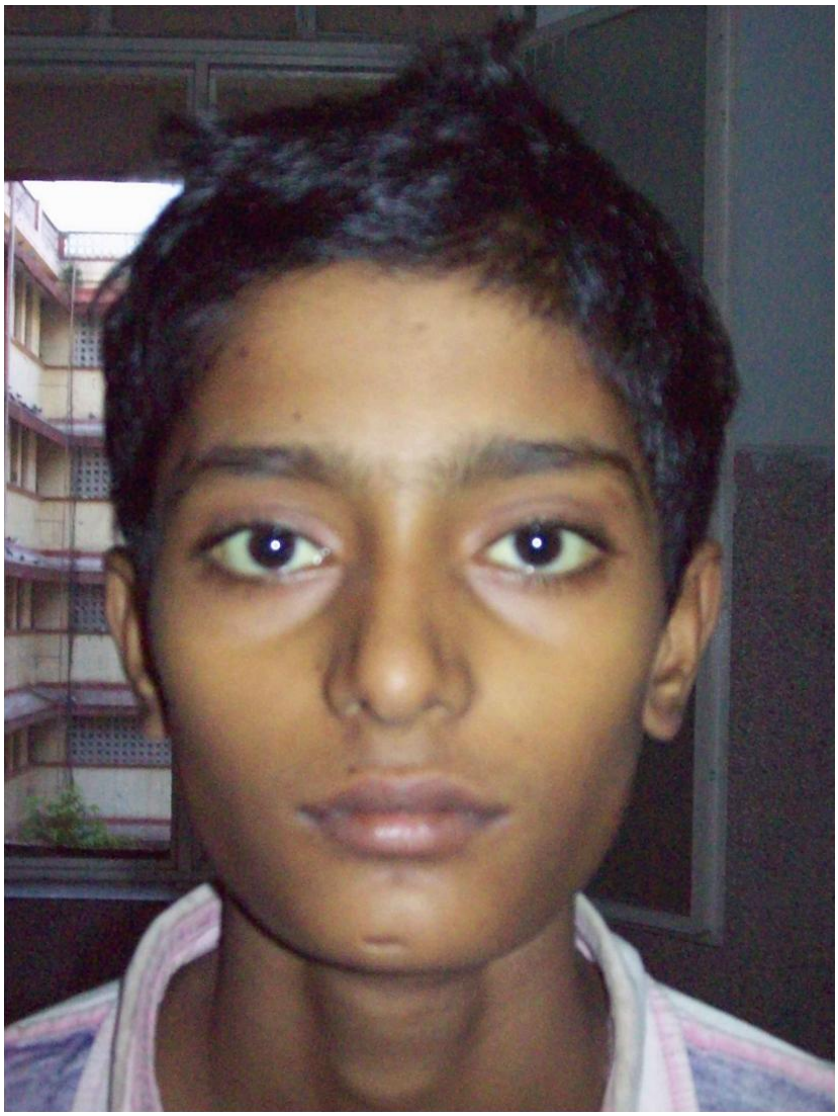

Figure 2. Younger brother showing icterus.

which was confirmed on microscopic evidence of malarial trophozoites. IgM ELISA for leptospirosis was negative. Viral marker studies revealed high titres of IgM against hepatitis A on enzyme immunoassay (DSI srl, Italy).

The younger sibling presented with similar complaints for the past 10 days. On examination, he had pallor and icterus with stable vital signs (Figures 2 and 3). Further examination findings were exactly similar to the elder brother. Haematological investigations depicted anemia (haemoglobin 69 g/L), thrombocytopenia (platelet count 23×10^9/L) and raised total and direct bilirubin (489.6 and 226.1 µmol/L respectively). Serum aminotransferases (alanine aminotransferase and aspartate aminotransferase were 0.62 and 1 µkat/L respectively) were in range and alkaline phosphatise (423 U/L) was mildly raised. Renal function tests were normal. All other specific investigations, including plasmodium LDH card test, and viral marker studies were also exactly similar to those of his elder brother.

Following treatment with injectable artemesinin-based combination therapy (ACT) and initial fluid resuscitation, there was a dramatic improvement in their clinical and haematological parameters. Within two to three days of starting the therapy, the brothers became afebrile and the platelet count rose rapidly and bilirubin levels dropped close to normal levels, with improvement in anemia.

DISCUSSION

Malaria is a vector borne disease transmitted by females of the anopheline mosquito. Similarly, hepatitis A is water

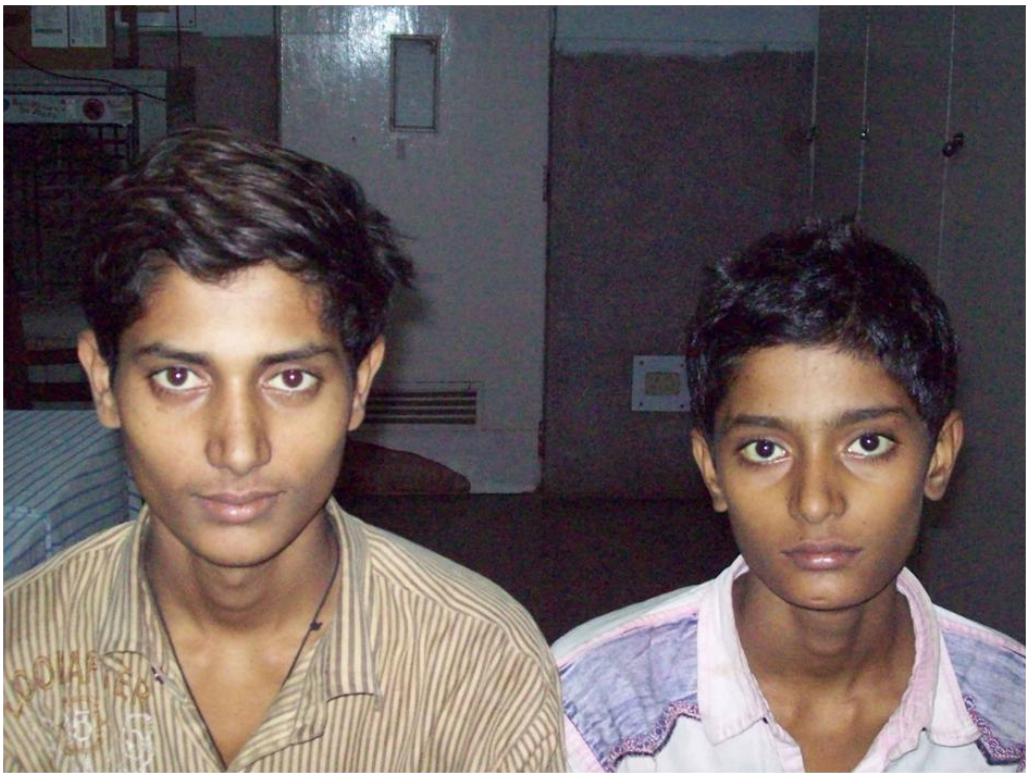

Figure 3. The two brothers

borne viral disease. In India, total malaria cases reported in 2010 were 1.49 million, of which 52% were attributed to *P. falciparum* infection and a total of 767 deaths were reported (Internet, 2011). Incidence of hepatitis A virus in India is not exactly known with numerous reports of sporadic and epidemic occurrence in various cities (Indian Council of Medical Research, 1980). The concomitant infection of the two disease (in fact three different players, *P. vivax*, *P. falciparum* and Hep A virus) in two members of a family indicate that the area is highly endemic to both vector and water borne diseases. Aggressive vector control and effective hygiene practices are required to limit the epidemic of the disease. Until now, many studies done in the past has shown an association between viral diseases like hepatitis B and *P. falciparum* co-infection (Thursz et al., 1995; Barcus et al., 2002). Natural course of *P. falciparum* has also been shown to be modified by Epstein Barr Virus *(EBV*) co-infection (Chene et al., 2007; Moormann et al., 2005). Also, the progression of *P. falciparum* infection has been reported earlier in patients infected with human immunodeficiency virus (HIV) (Abu-Raddad et al., 2006). Few other studies like Snow et al. (2005) and Jacobsen et al. (2004) studied the role of environmental factors in predisposing the population to *Plasmodium* and hepatitis A virus infections, more so in children in developing nations (Snow et al., 2005; Jacobsen and Koopman 2004). Concomitant infections with these hepatotropic organisms could escalate or inhibit the progression of either or both of them, suggesting a direct or immunological interaction between the two. Promotion of replication or facilitation of survival of one pathogen can occur in the presence of the other one. Either of these could lead to increased number of infective particles/ bodies leading to increased likelihood of subsequent infections. This could be a possible explanation for the synergistic interaction between the two pathogens. To the best of our knowledge, it is the first case reported of such kind. Moreover, in our case, the three infections were present simultaneously in two siblings with almost similar clinical presentation, biochemical derangements and therapeutic response. This further substantiates the role of immunogenetics and co infection in modifying the natural history of a disease.

Conclusion

As we are already aware of multi-factorial nature of non-communicable diseases responsible for their varied presentations, the similar analogy could explain the vast spectrum of communicable disease presentations and response to treatments offered despite similar biochemical abnormalities. In developing countries with high burden of communicable diseases, this paradigm approach could play a substantial role in the

management of such diseases. But much work is needed in this regard and larger prospective studies are required to further elucidate the epidemiological interactions between these important human pathogens, if any.

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Full Length Research Paper

Ultrasound image acquisition by a personal computer-Application of artificial neural network

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Accepted 20 January, 2012

Traditional probes consist of 40 to 60 crystals each attached to a pin attached to a specialized cable of minimum 2 to 3 m. Each crystal has piezoelectric properties. To capture images by personal computers to improve accessibility and reduce the cost of having ultrasonic image with special reference to obstetrics and gynecology emergency settings, a probe was designed consisting of three Doppler transducers (each with 4 pins hence generating 4 signals, altogether 12 signal) that by an analog switching with micro (1000 HZ per second) can generate 12000 signals per second changing the scan line form linear into a plane. The signals are translated into WAV sound format file that can be displayed by a Windows-based program of a personal computer. The pattern produced is created by the sound of blood flow in an organ. This vascular pattern was matched with traditional sonography of the organ. By training the network, the resolution of images can be improved further based on the formula:
output = 0.77*target + 38. The probe can capture images 1/6 resolution of a traditional probe, deeper penetration (19 cm depth), 1/34 price and weight of a traditional ultrasound equipment

Key words: Doppler transducers, scan line, artificial neural network, ultrasound, obstetrics and gynecology.

INTRODUCTION

Ultrasound imaging is based on the same principles involved in the sonar used by bats, ships, fishermen and the weather service. When a sound wave strikes an object, it bounces back, or echoes. By measuring these echo waves, it is possible to determine the objects' size, shape and nature. Doppler ultrasound is a special application of ultrasound that can measure the direction and speed of blood cells as they move through vessels (Radiologyinfo.org, 2011). There are two types of Doppler system (Figures 1a and b):

1. Continuous wave systems use continuous transmission and reception of ultrasound. Continuous wave Doppler is used in adult cardiac scanners to investigate the high velocities in the aorta.
2. Pulsed Wave Ultrasound are used in general and obstetric ultrasound scanners which allows measurement of the depth (or range) of the flow site. It is used to provide data for Doppler sonograms and color flow images. The best resolution of the sonogram occurs when the B-mode image and color image are frozen, allowing all the time to be employed for spectral Doppler (Deane, 2002).

MATERIALS AND METHODS

For the objective of providing an image acquisition system in an emergency setting of Obstetrics and Gynecology (pelvic and Lower Quadrants views for determination of intraperitoneal free fluid, fetal presentation and viability, and intrauterine space in instrumentations), a probe was designed based on three goals of isolating analog and digital signals, minimizing connector pin counts, and reducing power and cost.

Traditional probes consist of 40 to 60 crystals each attached to a pin attached to a specialized cable of minimum 2 to 3 m cable. Each crystal has piezoelectric properties. The claimed probe consists of three Doppler transducers (Summit Doppler Systems,

Figure 1. Comparisons of two types of Doppler systems, a and b.

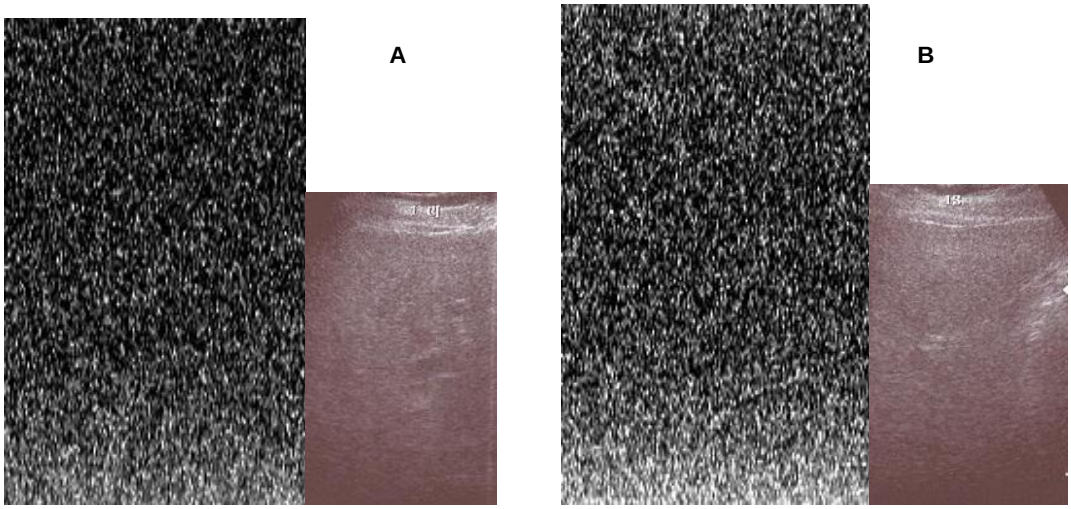

Figure 2. A) Right Upper Quadrant –Coronal view of the Invented probe and the Traditional probe; B) RUQ- Sagital view of invented probe and traditional probe.

Inc.LifeDop user manual 2011) with 4 pins each generating 4 signals that by an analog switching can generate 12000 signals per second changing the linear image into a plane. The signals are translated into WAV format that is displayed by a Windows- based program (Beskow and Sjölander, 2011) which can also provide concentrating all echoes into the central lobe. In a traditional probe of 77000 signals per second the depth of penetration is 1 cm per period of 13 µs (one-millionth of a second) (Fleischer et al., 2004). The period of the invented probe is 250 µs which gives the penetration of 19 cm but the resolution is 1/6 of the traditional probe.

The simplicity of the probe causes deeper penetration, less unwanted divergence, but at the expense of resolution. But the solution of this problem is by image modifying software with hamming properties (Anderson and MacNeill, 1999) applicable to personal computers.

To estimate the degree of fitness of images obtained from the probe with traditional image acquisition, a clinical trial was designed. Nine points on the abdomen were chosen and marked to apply the probes (I-probe and T-probe) perpendicular to the surface in coronal and sagital planes. The procedure was: taking the image by the T-probe (right angle to the skin, in coronal and then sagital view) and then by I-probe in that order. This was the rule because subject's position, bladder fullness and GI contents can alter images to a great extent. The points were in the Right Upper Quadrant (Figures 2a and b), Right Kidney region (Figures 3a and b), Right Lower Quadrant (Figures 4a and b), Left Upper Quadrant (Figures 5a and b), Left kidney region (Figures 6a and b) Left Lower Quadrant (Figures 7a and b), Heart (Figures 8a and b), Suprapubic (Figures 9a and b) and Pelvis (Figures 10a and b). Eighteen images were obtained as controls (inputs or targets) for their 18 matched images captured by the I-probe (output). Images were cropped and modified by Wavelet tool box so they can be processed in MATLAB in R2011a. Then the Neural Network was trained to calculate the average square difference between outputs and targets (MSE) and the correlation between outputs and targets based on Levenberg Marquardt Back Propagation (R). The results are presented in Table 1.

RESULTS

According to table-1, the R value obtained by tests of fitness shows that the invented probe (I-probe) images were correlated with the traditional convex probe (T-

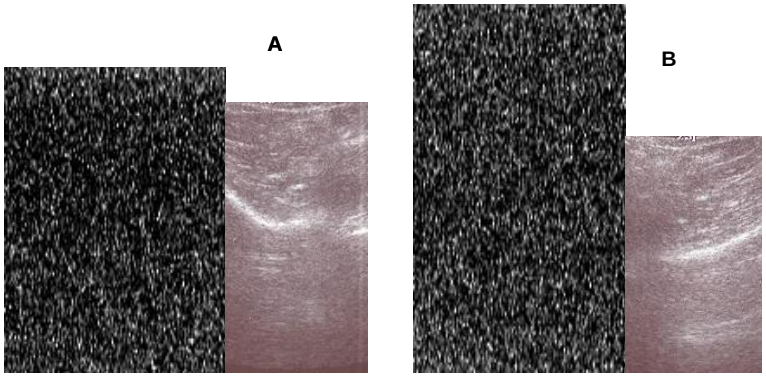

Figure 3. A) Right Kidney region- Coronal view of the Invented probe and the Traditional probe; B) Sagital view of the invented probe and the Traditional probe.

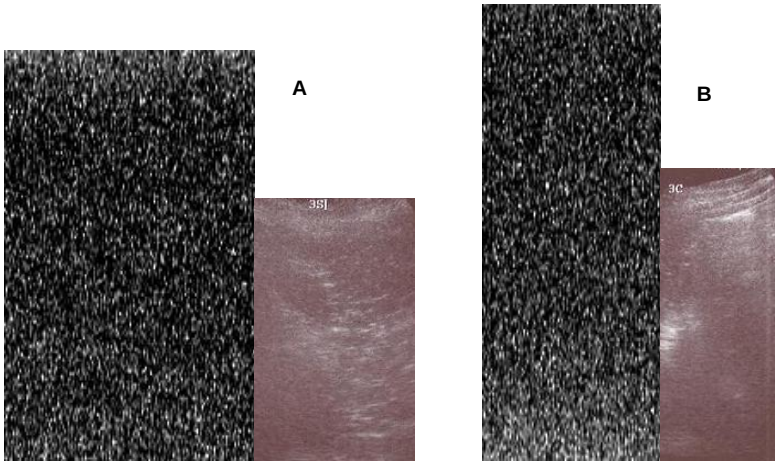

Figure 4. A) Right Lower Quadrant- Coronal view of the Invented probe and the Traditional probe; B) Right Lower Quadrant- Sagital view of the invented probe and the Traditional probe.

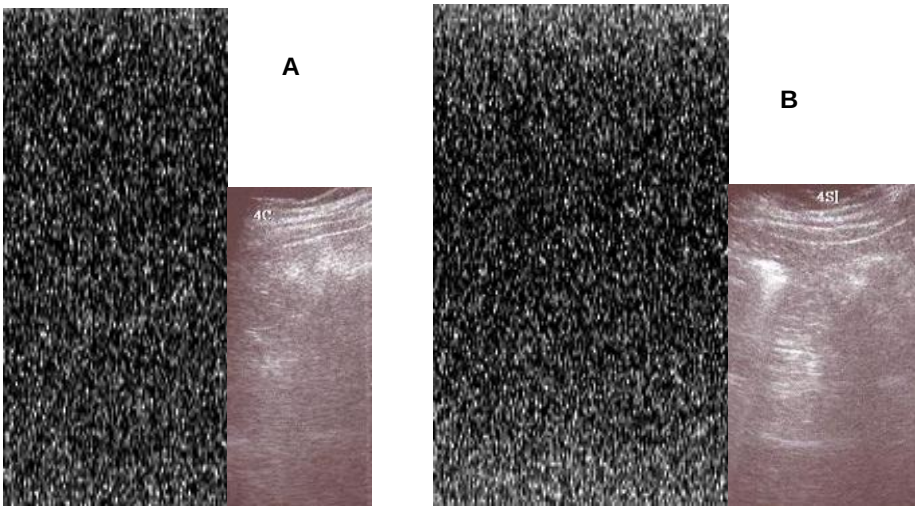

Figure 5. A) Left Upper Quadrant- Coronal view of the Invented probe and the Traditional probe; B) Sagital view of the invented probe and the Traditional probe.

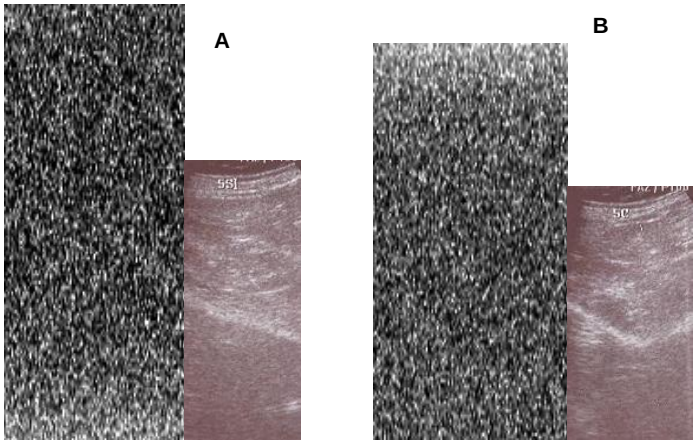

Figure 6. A) Left kidney region- Coronal view of the Invented probe and the Traditional probe; B) Sagital view of the invented probe and the Traditional probe.

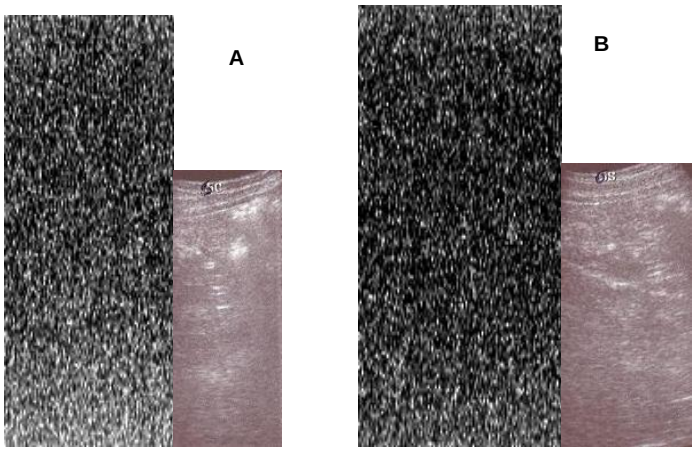

Figure 7. A) Left Lower Qualdrant - Coronal view of the Invented probe and the Traditional probe; B) Sagital view of the invented probe and the traditional probe.

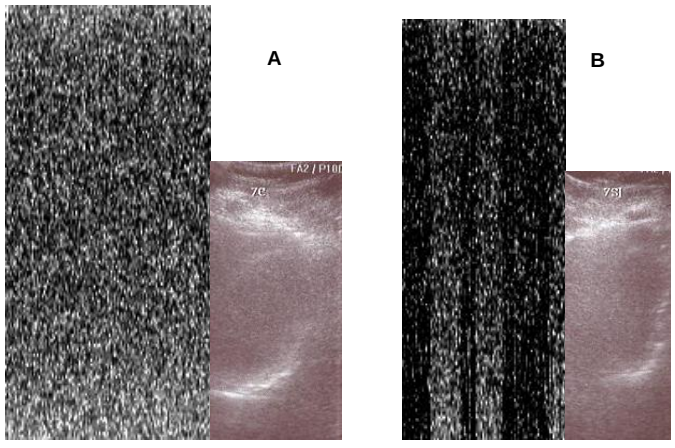

Figure 8. A) Heart- Coronal view of the invented probe and the Traditional probe; B) : Heart- Sagital view of the invented probe and the Traditional probe.

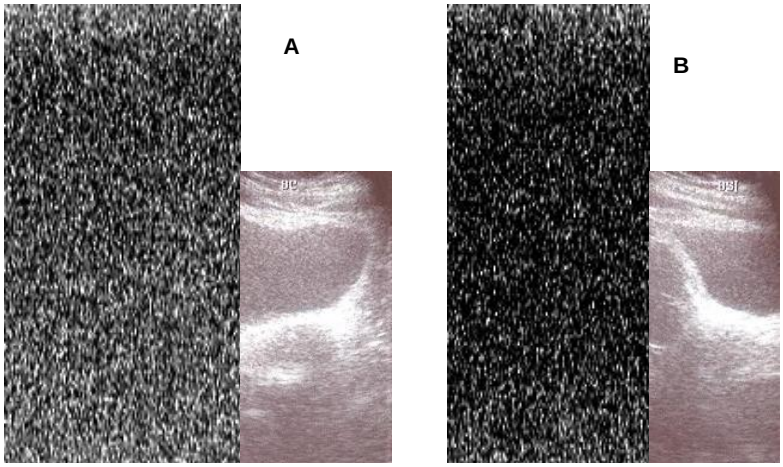

Figure 9. A) Suprapubic - Coronal view of the invented probe and the traditional probe; B) Sagital view of the invented probe and the traditional probe.

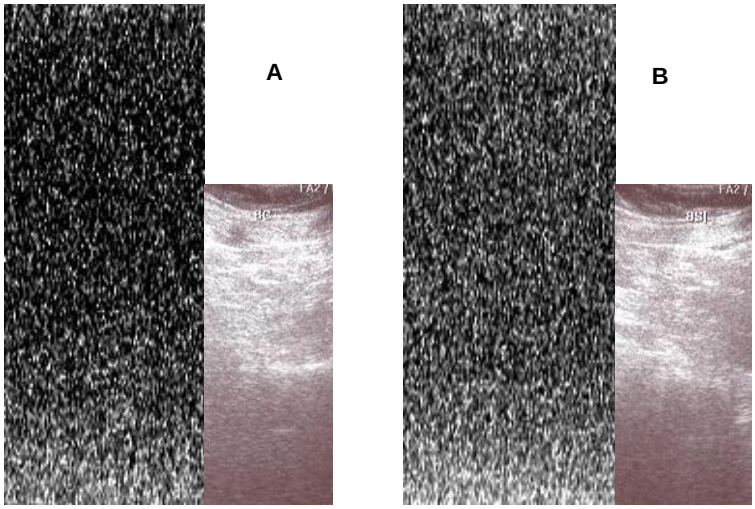

Figure 10. A) Pelvis- Coronal view of the invented probe and the traditional probe; B) Sagital view of the invented probe and the traditional probe.

probe) images. The R values in the order from higher to lower was from Right Upper Quadrant (coronal view = 8.59) (sagital = 8.44),Pelvis (c = 8.81, s = 8.76), Right Kidney (c = 7.55, s = 4.17), Left Upper Quadrant (c = 7.54, s = 7.74), Right Lower Quadrant (c = 7.52,s = 5.48), Left Kidney (c = 7.27, s = 6.00), Left Lower Quadrant (c = 5.42, s = 5.11), Suprapubic (c = 4.90, s = 5.89), and the heart (c = 4.36, s = 6.75). This means that the I-probe can be used for its objective of utility in emergency settings of obstetrics and gynecology (Pelvic and lower quadrants views for determination of intra abdominal free fluid, fetal presentation and viability, and intrauterine space in instrumentations). By training the network, the resolution of images can be improved further based on the formula:

Output = 0.77*target + 38 (Figure 11). In order to test the network, an image taken by the I-probe was given to the network and it provided the image based on its training.

Conclusions

To achieve three goals of isolating analog and digital signals, minimizing connector pin counts, and reducing power and cost, three Doppler transducers each having 4 pins (generating 4 signals) were connected to an analog switching to generate 12000 signals per second changing

Table 1. Results of test of fitness of I-probe images with T-probe images.

Site	Plane	Training MSE	Training R
RUQ	Coronal	134.22	8.59
	Sagital	154.34	8.44
RLQ	Coronal	324.39	7.52
	Sagital	513.29	5.48
Right Kidney	Coronal	242.83	7.55
	Sagital	187.01	4.17
LUQ	Coronal	392.69	7.54
	Sagital	347.81	7.74
LLQ	Coronal	488.60	5.42
	Sagital	460.75	5.11
Left Kidney	Coronal	274.33	7.27
	Sagital	292.74	6.00
Heart	Coronal	637.00	4.36
	Sagital	429.39	6.75
suprapubic	Coronal	1215.64	4.90
	Sagital	1159.07	5.89
Pelvis	Coronal	501.18	8.81
	Sagital	487.92	8.76

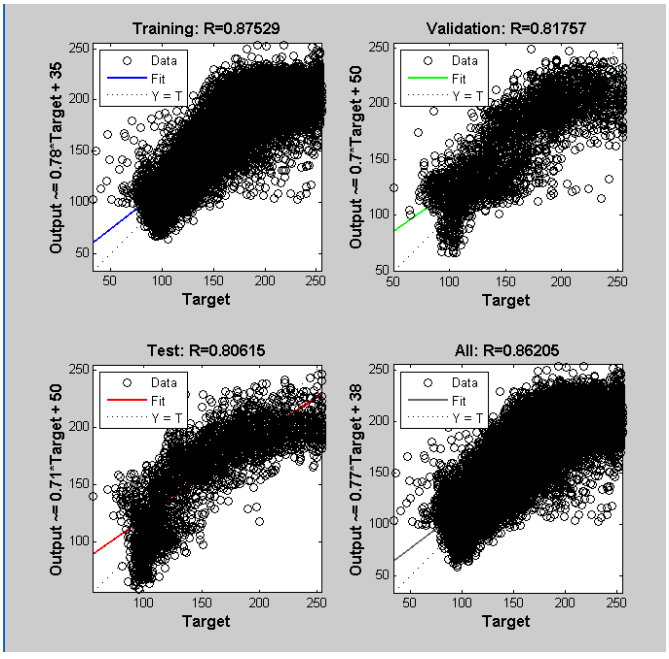

Figure 11. Fitness of Images captured by the invented probe with Images captured by the traditional probe.

the linear images into a plane. The signals are translated into WAV format displayed by a Windows- based program could provide images 1/6 resolution of a traditional probe, with 19 cm depth penetration, 1/34 price and weight of a traditional ultrasound equipment.

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Full Length Research paper

A survey of hepatitis B and C virus prevalence in human immunodeficiency virus positive patients in a tertiary health institution in North Eastern Nigeria

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Co-infection of hepatotropic virus(es), with HIV has been associated with a reduced survival rate, an increased risk of progression to severe liver disease, and an increased risk of hepatotoxicity associated with active antiretroviral therapy. Information regarding prevalence of HBV and HCV co-infection with HIV in Nigeria is limited. This study was designed to determine the seroprevalence of hepatitis B virus (HBV) and hepatitis C virus (HCV), and the impact of co-infection on baseline serum alanine transaminase (ALT), CD4+ T lymphocyte (CD4) count, and plasma HIV-RNA (viral load) in a cohort of HIV-infected Nigerians. Patients confirmed to be positive for HIV infection by Western blot analysis were consecutively recruited into the study from Infectious Disease Clinic, General Out-patient Department and Medical Wards of University of Maiduguri Teaching Hospital, Nigeria. Demographic data and pre-treatment laboratory results (hepatitis B surface antigen (HBsAg), and HCV antibodies (anti-HCV), ALT, CD4 count and viral load) were analysed. A total of 569 HIV-infected patients (male: female ratio, 1:1.4) were consecutively recruited. HBsAg was present in 12.3%; anti- HCV in 0.5% and both markers was not present in any patients. HBsAg prevalence was 12.3% in both male and females, while anti-HCV was detected in 0.8% in males and 0.3% females. HIV-infected patients alone had a higher mean baseline CD4 count compared to those without anti- HCV or HBsAg (181 vs. 117 cells/mm^3, respectively; p = 0.01). Serum ALT was higher among patients co-infected with HBsAg or anti-HCV than only HIV infected (37 vs. 34 International Units (IU), respectively p = 0.1). The high frequency of HBsAg confirms the need for routine screening for these markers in HIV-infected patients in our setting. CD4 count was significantly lower, in patients with prior exposure to hepatitis B or C, while ALT was slightly higher among those positive for HBV or C infection. These findings are pointer to the importance of testing for HBV and HCV in all HIV-infected persons in our setting.

Key words: Hepatitis B, hepatitis C, CD4, HIV.

INTRODUCTION

Chronic viral hepatitis due to hepatitis B virus (HBV) and hepatitis C virus (HCV), as well as infection with human immunodeficiency virus (HIV) are global public health problems (Alter, 1997; World Health Organization, 1998 Geneva:; Soriano et al., 2004). It has been estimated that about 2 billion people have been infected with hepatitis B virus (HBV) and 350 million have chronic lifelong infection. The prevalence of hepatitis C virus (HCV) is

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is also high and it is estimated that about 170 million people are chronically infected while 3 to 4 million people are newly infected every year (http/www.who.int/media centre/fact sheet/fs 164/en/accessed; Merican et al., 2000) A considerable proportion of these patients will progress onto cirrhosis and hepato-cellular carcinoma (Guan et al., 1995; Furusyo et al., 2002).

Worldwide, HIV is responsible for 38.6 million infections as estimated at the end of 2005 (http://www.unaids.org/en/HIV_data/2011GlobalReport/). An estimated one-third of deaths in HIV patients are directly or indirectly related to liver disease. Liver diseases in HIV infected persons can occur due to hepatitis B virus (HBV) and hepatitis C virus (HCV) co-infections, chronic alcoholism, hepatic tuberculosis, or due to the effects of antiretroviral therapy (ART) (Kumarasamy et al., 2005; Rathi et al., 1997).

Since the principal routes for HIV transmission are similar to that followed by the hepatotropic viruses, as a consequence, infections with HBV and HCV are expected in HIV infected patients. Co-infections of HBV and HCV with HIV have been associated with reduced survival, increased risk of progression to liver disease and increased risk of hepatotoxicity associated with anti-retroviral therapy. The reported co-infection rates of HBV and HCV in HIV patients have been variable worldwide depending on the geographic regions, risk groups and the type of exposure involved (Alter, 2006; Rockstroh, 2003; Dodig and Tavill, 2001; Tien, 2005; Sungkanuparph et al., 2004). In Europe and USA, HIV-HBV coinfection has been seen in 6 to 14% (Alter, 2006; Rockstroh, 2003) of all patients while HIV-HCV co-infection has been variably reported ranging from 25 to almost 50% (Dodig and Tavill, 2001; Tien, 2005) of these patients. Evidence of exposure to HBV and HCV has been found in 8.7 and 7.8%, respectively, of HIV patients from Thailand (Sungkanuparph et al., 2004) in Southeast Asia. The HIV sero-prevalence in adult Nigerians is estimated at 5%. Viral hepatitis and HIV/AIDS having become so intertwined have constituted a major public health problem in the country. However in spite of this, very little information on viral hepatitis and HIV-co-infection is available. The few reports documented were on HBV-HIV co-infection (Halim et al., 1992; Baba et al., 1998) and HIV /HBV-HCV co-infection in low risk group (Egah et al., 2007). With this background, we set out to determine the prevalence of hepatitis B and C virus infections in HIV-positive patients coming to a tertiary care hospital located in North Eastern Nigeria.

PATIENTS AND METHOD

Study area

The study was conducted in the Department of Medicine, University of Maiduguri Teaching Hospital, Borno State. This is a 500 bedded hospital designated as a Centre of Excellence for infectious diseases and provides primary, secondary and tertiary services for the North Eastern part of Nigeria. It also caters for the neighbouring countries such as Cameroon, Niger and Chad Republics. Maiduguri, the capital of Borno State, is situated in the North Eastern Nigeria and the largest settlement near the Lake Chad, located on the fringe of the Sahara desert between longitude 11°8E and 14°4' E and latitudes 10°2'N 13°4'N.

Study participants

Patients confirmed to be positive for HIV infection by Western blot analysis were recruited into the study from Infectious Disease Clinic, General Out-patient Department and Medical Wards of the Hospital from January to December 2010. Informed consent was obtained from each participant with the assurance that all information would be treated with utmost confidentiality. Using a structured, pre-evaluated questionnaire, information was obtained on demographic, clinical manifestation, blood transfusion, sexual behaviour and intravenous drug use. Seroprevalence of HBsAg and Anti-HCV antibodies in apparently, HIV-negative blood donors and those that presented for pre-marital HIV counselling and testing during the same period was also analysed for comparision with the prevalence of hepatitis markers in HIV positive individuals.

Viral diagnosis

Five millilitres of blood were obtained from each participants, the blood were allowed to clot and spun at 1000 x*g* for 10 min. The serum samples were separated into 2 ml cryorials containers and stored at -20°C until required for testing. The coded samples were anonymously tested using enzyme linked immunosorbent assay kits at a later date for the presence of HBsAg and HCV antibodies (DIA, PRO, Diagostic Bioprobes Sri, via columella no 20128 milano-Italy).

RESULT

A total of 569 patients were consecutively recruited into the study comprising 235 (41.5%) males and 333 (58.5%) females, with male to female ratio of 1:1.4. The mean age of both sexes was 34.2± 10.1 (14 to 81) years. Male patients were older than females, 37.7 ±10.8 (14 to 81) and 31.8±8.7 (14 to 72) years respectively ($p<0.05$). The presumed mode of acquiring HIV infection was through heterosexual contact in all the participants.

Data was available for 291 prospective blood donors during the same period. It was presumed that these blood donors represent the general population and they are exposed to similar risk as the general population. There were 249 males and 42 females. The mean age of the donors was 27.8±5.9 (18 to 52).

Prevalence of viral co-infection in HIV positives

The frequency of HBsAg co-infection in HIV+ cohort as reflected in Table 1, was 12.3% (70 in 569) compared to HCV antibody prevalence of 0.5% (3 in 569) with P value < 0.05. Triple infection with both HBsAg and HCV was not seen in any HIV patient.

Table 1. Seroprevalence of HBsAg and anti-HCV antibodies in HIV positive patients.

Variable	HBsAg {n(%)}	HCV {n(%)}
HIV patients (n=569)	70 (12.3)	3 (0.5)
Males (n=236)	29 (12.3)	2 (0.8)
Females (n=333)	41 (12.3)	1 (0.3)
Controls (n= 291	15 (5.2)	4 (1.4)
Males (n=249)	12 (4.8)	4 (1.6)
Females (n=42)	3 (7.1)	0 (0)

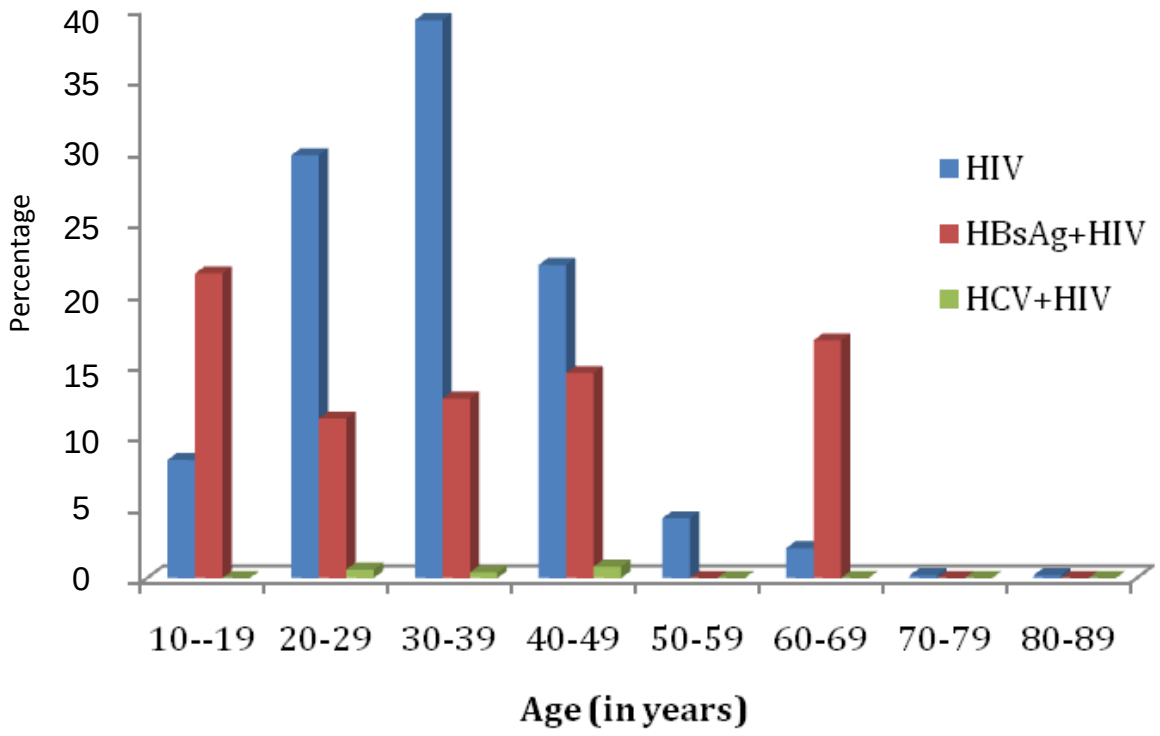

Figure 1. Age-related distribution of HBsAg and HCV in HIV positive patients.

The frequency of HBsAg co-infection in blood donors was 5.2% (15 in 291) compared to HCV antibody prevalence of 1.4% (4 in291) with P < 0.05) as depicted in Table 1. Co-infection of infection with both HBsAg and HCV was not seen in any blood donor.

Taking the prevalence's of co-infection in HIV-positive with hepatitis viruses based on gender into accounts, HIV/HBV co-infection was the same in both sexes, it was seen in 29 of 236 (12.3%) males and in 41 of 333 (12.3%) females respectively (P>0.05). HIV co-infection with HCV antibody was seen in 2 of 236 (0.8%) males and in only 1 of 333 (0.3%) females.

The frequency of HBsAg was 4.8% (12 of 249) and 7.1% (3 of 42) in male and female blood donors respectively; the prevalence of HCVab was 1.6% in males and 0% in females.

Figure 1 shows age related prevalence of HIV co-infection with HBsAg and HCV antibodies. Individuals of age group 10 to 19 years had the highest prevalence of HBsAg (21.4%). This was followed by those of age-group 60 to 69 years (16.7%) and 14.4% in age group 40 to 49 years, while age-group 40 to 49 years has the highest prevalence of HCVab with 0.8% followed by age-groups 20 to 29 and 30 to 39 years with prevalence's of 0.6% and 0.4% respectively.

Table 2 shows immuno-virological parameter of the participants. The mean CD4 count for the HBsAg/HCVab negative was 181 cells/µl and it was significantly higher

Table 2. Biochemical, immunological and virological characteristics of patients.

Biochemical characteristics	HIV+	HIV+/HBsAg+/HCVab	p-value
ALT	34.7±12.5	37.3±9.6	0.2
Immunological characteristics			
Mean CD4+T-cells(cells/µl)	181.34 ± 70.8	117±82.23	0.01
Virological characteristics (copies/ml)	314561.43±4881.93	617272.38±1045.33	0.03

ALT, CD4 and viral load are expressed in mean values.

than those of the positive (117 cells/µl) ($p < 0.05$). On the contrary, the viral load of HBsAg/HCV negative had significantly lower values than HIV monoinfection ($P<0.05$). ALT levels did not show any significant difference between the two groups of patients ($P>0.05$).

DISCUSSION

According to WHO estimates, the global burden of HIV, HCV and HBV is 33.2 million, 170 million and 400 million, respectively. Knowledge of the prevalence and distribution of blood borne viruses and sexually transmitted diseases (STDs) in different parts of the world, and particularly in Africa, is important for the planning of preventive measures and the development of vaccination programmes. More females than males presented for care during the study period, but majority of blood donors were males, all the females were pregnant autologus donors. This gender inequality in presentation for therapy is consistent with the sex distribution documented in the majority of treatment centres particularly in the first decade of antiretroviral therapy. A potential explanation for more females at our centre is that women present for care after positive HIV test on their sick children, death of their husband, or perhaps they are more sensitive to changes in their health and may be socially conditioned to seek and receive assistance for their sickness. This, however, does not translate to more women are infected with HIV in our population, as study in Nigeria actually found that more men were afflicted with HIV/AIDS (Ola et al., 2005).

When asked about the risk factors concerning the viral infections, none of the study subjects reported the history of intravenous drug use or multiple sexual partnership. It is well known that HIV/HBV co-infection is linked most often to sexual intercourse (both heterosexual and men who have sex with men (MSM), followed by IDU, while HIV/HCV co-infection has predominantly been associated with a non-sexual parenteral route of transmission of blood or blood products, particularly IDU (Thomas et al., 1994; Gilson et al., 1997; Kellerman et al., 2003; Rodríguez-Méndez et al., 2000; Sherman et al., 2002). In our study, absence of triple HIV/HBV/HCV may be due to low prevalence of HIV/HCV co-infection as none of the subjects reported the history of intravenous drug use, neither was needle tract was noticed in their limbs. These results are in agreement with previous reports that HCV is not efficiently transmitted by perinatal or sexual exposure, which are major modes of transmission for HBV and HIV (Kellerman et al., 2003; Rodríguez-Méndez et al., 2000; Sherman et al., 2002). HCV is predominantly found in persons who have had percutaneous exposure to blood products and IDU in particular (Wasley and Alter, 2000). Studies had demonstrated that IDU is the most important factor associated with triple infections with HIV/HBV/HCV in urban HIV-infected populations. It has been reported that the prevalence of HIV-HCV co-infection among IDUs can surpass 90%, highlighting the need for special attention to populations with IDU for screening viral co-infections with HIV and HBV/HCV (Maier and Wu, 2002; Aceijas and Rhodes, 2007).

The co-infection prevalence of 12.3% for HIV and HBV is a pointer to the fact that HBV is a major threat to HIV/AIDS patients in Nigeria, as reported in other parts of the world (Weber et al., 2006) The HBV co-infection rate in this study is similar to prevalence of 11.9% documented in southwestern part of Nigeria,(Otegbayo et al., 2008) but higher than the 9.7% reported in healthy urban population Northern region (Sirisena et al., 2002) but lower than the 25.9% reported in HIV positive in the same region (Uneke et al., 2005). The factors driving these regional differences are unclear. No gender difference in prevalence of HBV was observed in this study. This finding is in contrast with higher prevalence in male, that observed that a high proportion of HBV infections in sub-Saharan Africa is acquired vertically or horizontally (from family members and other children) before the age of 5 years (Davis et al., 1989). Since boys have a predilection for aggressive sports and plays that may result in injury with bleeding, they may be more predisposed to horizontal HBV transmission. Further, societal acceptance of multiple sexual partners for men may contribute to the higher HBV prevalence among HIV-infected men (Zhou et al., 2007).

Anti-HCV co-infection was detected in 0.5% of the patients in this study. In an earlier study, HCV co-infection based on plasma HCV RNA quantification was detected in 8.2% of HIV-infected patients in Northern Nigeria (Agwale et al., 2004). However, cross-study

comparisons may be misleading because of the differences in HCV detection techniques. Quantifiable plasma HCV RNA is present only in patients with active HCV replication. In contrast, anti-HCV can be detected in patients with previous HCV exposure, including those with ongoing HCV replication and those whose immune responses curtailed viral replication. There may be very rare cases of falsely negative anti-HCV in patients with advanced immunosuppression (Mphahlele et al., 2006; Bonacini et al., 2001). In the current study, although the absolute number (n = 3) was relatively small for analysis, the rates of anti-HCV detection were comparable in males (0.8%) and females (0.3%). Although the association between HCV positivity and CD4 count shows conflicting reports (Greub et al., 2000; Anderson et al., 2004; Hershow et al., 2005) It would appear that the immunological status of monoinfection is higher than HBV/HCVab coinfection, as evidenced by the higher CD4 counts in HIV monoinfected than HIV-coinfected with HBV/HCVab. Contrary to observations made Idoko et al in the North-central (Idoko et al., 2009) and Ortegbayo et al in South-western part of Nigeria (Otegbayo et al., 2011). The viral load was higher in HBV/HCVab than HIV monoinfected. The mean values of transaminases (ALT) among HBV/HCVab coinfected patients, was similar to HIV monoinfected in this study.

HCV by itself has not been shown conclusively to be an independent risk factor for more rapid CD4 decline, although it has been associated with increased occurrence of AIDS-defining events (Rockstroh et al., 2005; Stebbing et al., 2005). Studies enrolling a larger number of subjects are needed to elucidate these potential associations further. The limitations of this study are that plasma HCV-RNA was not quantified in patients who had anti-HCV, making it impossible to distinguish active HCV infection from those that have spontaneously cleared the infection.

Conclusion

The high frequency of HBsAg confirms the need for routine screening for these markers in HIV-infected patients in our setting. Significantly lower CD4 and higher viral load, was observed in patients with prior exposure to hepatitis B or C, while ALT was similar among those positive for HBsAg/HCVab and HIV mono-infection. These findings underscore the importance of testing for HBV and HCV in all HIV-infected persons in our setting.

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