Coinfection of Schistosoma species with Hepatitis B or Hepatitis C Viruses

Table 1.3.3 Studies Conducted on Subjects with Schistosomiasis.

No	Reference	Location (Years)	Study Design (Objective) and Study Population	Exclusion Criteria	Diagnosis of Disease	Findings on Coinfection
1	Lyra et al 1976	University of Bahia, Hospital Professor Edgard Santos, Bahia, Brazil (1973-1975)	*Case Control* (severity, complications): Cases: 103 HSS patients with viable Sm ova in stool, mean age 29 years, 67% male; Controls: 134 patients with other illnesses not related to HBV, including 66 patients with HIS, mean age 34 years, 63% male; In addition, 600 blood donors were used to estimate the prevalence of HbsAg in the local population.	No evidence of cirrhosis or other causes of hepatosplenomegaly	HBV: HBsAg; HSS(Sm): stool, liver biopsy/clinical exam; DHSS: low serum albumin/ascites/other sign of liver insufficiency; All HSS or DHSS had viable Sm ova in stool	Patients with HSS were more likely to have a higher frequency of HBsAg+ than either of the other patient control groups (8% vs. 1%); a greater proportion of HBsAg+ was noted among patients with decompensated disease (12%) when compared with other HSS patients (6%), but this difference was not statistically significant; the incidence of HBsAg+ in the patient control groups did not differ from that observed among blood donors (both 1%); Coinfected patients had more clinical signs of LD, with greater inflammation of portal spaces on liver biopsy
2	Pereria et al. 1994	Sao Paulo Liver Unit and University of Pernambuco Liver Unit, Brazil (1990-1992)	*Cross-sectional* (prevalence, severity): Subjects: 189 consecutive chronic Sch (46 ISS, 143 HSS) patients, ages 8 - 68 years, 11% male; Controls: 50 other patients undergoing surgery with negative stools and no signs of LD used in some analyses.	No alcohol exceeding 80 g/day, anti-HCV+, or other chronic LD	HBV: HBsAg, HBcAb, HBsAb, HBV-DNA; HIS (Sm): stool, clinical exam; HSS: ultrasound, liver biopsy in some; *Note:* All HSS patients had evidence of portal hypertension, splenomegaly or PPF.	Chronic Sch patients were more likely to have at least one HBV marker (44%) and be HBsAg+ (10%) than controls (20%, 0%), respectively; Overall, there was no sig difference in the frequency of HBV markers between HIS or HSS groups, although the 12 patients with DHSS all had markers of HBV, with 83% HBsAg+; these patients also had a greater proportion of replicating virus (50%) than any other group, suggesting

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						that HBV is a major pathogenic factor in progression to the more severe forms of HSS.
3	Pereira et al. 1995	Sao Paulo Liver Unit and University of Pernambuco Liver Unit, Brazil (1990-1993)	*Cross-sectional* (complications, severity): Subjects: 215 chronic Sm patients, with various forms including HIS, HSS, some with decompensated disease, ages 12-75 years, 53% male; Controls: 50 other patients admitted to hospital for elective surgical procedures, without Sm or CLD, all from same endemic area, aged 20-76 years, 42% male; *Note:* 162 chronic Sm subjects included from previous study; see Pereria et al. 1994 (entry number 2)	All patients were HBsAg-; No pregnant women, or history of alcohol intake exceeding 80 g/day or chronic liver diseases from other known causes.	HCV: anti-HCV, HCV-RNA; Sch(Sm): stool/rectal biopsy; case history; LD: ultrasound/biopsy	Evidence of HCV infection (anti-HCV+ and/or HCV-RNA+) was present in 24% patients with chronic Sch as compared with 2% of controls; Among chronic Sch patients, there was a greater proportion of anti-HCV+ in those with decompensated LD (81%) than those with less severe infection (12% or less); Overall, 62% of chronic Sm patients who were anti-HCV+ were found to be HCV-RNA+; Concomitant HCV appears to be a major factor contributing to severity of LD in patients which chronic Sch in Brazil.
4	Conceicao et al 1998	Fraga Filho University Hospital, Universidade Federal, Rio de Janeiro, Brazil (1983 - n.a.)	*Cross-sectional* (prevalence, severity): Subjects: 398 outpatients with clinical Sm, aged 10-62 years, 47.5% male; clinical forms included 6% toxemic, 57% Sch infection, 25% hepatointestinal, 12% HSS; Controls: 50 other patients without Sm and normal liver functions	n.a.	HBV: HBsAg, anti-HBsAg, anti-HBc; Sch(Sm): stool/rectal biopsy; HSS: liver biopsy	HBsAg+ was more common among patients with Sm than among controls (8% vs. 2%); There was n.s. difference in HBsAg+ between clinical forms Sch, though HSS form had higher predominance of HBV markers and presented with more severe clinical disease, higher frequency of cirrhosis and worse prognosis than other groups; There was no association between

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			used in some analyses; Both patients and controls were treated by Infectious and Parasitic Disease service			HBsAg status and prior history of PAT.
5	Aquino et al 2000	Gastroenterological Clinic of Santa Casa de Sao Paulo, Brazil (1994-1997)	*Case Series* (retrospective; severity): Cases: 101 HSS patients, aged 19-74 years, 43% male, all from Northeastern states and from Minas Gerais; Controls: Mean values 29,406 registered blood donors at same hospital used in some analyses.	No other liver disease, such as Wilson's disease, autoimmune hepatitis, or HCC.	HBV: HBsAg, HBcAb; HCV: Anti-HCV, HCV-RNA; HSS(Sm): stool/rectal biopsy w/SchAb, ultrasound; All patients were SchAb+	The frequency of HBV and HCV serologic markers was higher among patients with HSS (i.e., HBsAg 3%, anti-HCV 13%) than among controls (HBsAg 1%, anti-HCV 1%), and was associated with a greater proportion of hepatic cell decompensation; Among the coinfected, decomposition was highest among HSS patients who were HBsAg+ (100%) or anti-HCV+ w/HCV-RNA+ (81.8%); these patients also had notably higher AST levels; Presence of viral coinfection could be an important factor in the decompensation of patients with HSS.
6	Silva et al 2011	Clinics Hospital, Federal University of Pernambuco, Recife, Brazil (2008)	*Cross-sectional* (prevalence, risk factors): Subjects: 230 HSS patients, mean age 55 years, 41% male, attending gastroenterology outpatient clinic.	Patients presenting with symptoms of other diseases and those with other clinical forms of Sch.	HBV: HBsAg, HBcAb, HBsAb; HCV: anti-HCV; HSS(Sm): patient history, ultrasound/splenectomy; *Note:* only HBcAb+ were tested for HBsAg.	34% of HSS patients had viral markers for HBV infection (30% HBcAb+ including 3% HBsAg+, with an additional 4% HBsAb+ alone), and 7% were anti-HCV+; there was a higher proportion of females who were coinfected with HSS and HBV, aged 50 years and over; Anti-HCV+ was most common among individuals who had received 6 or more blood transfusions.

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7	Li et al 1993	Dongting lake area, Hunan, China (1985-1990)	*Case Series* (retrospective, mortality): Subjects: 245 patients who died of advanced Sj infection, ages 9-77 years, 93.9% male, 75% farmers; patients had 50% ascites, 23% splenomegaly, 26% hepatosplenomegaly, 19% HCC; *Note*: 70% of cases died below age 50 year	Incomplete medical records without confirmation of Sj and evidence or not of HBV	HBV: HBsAg; Advanced Sj: stool, SchAb, autopsy w/liver biopsy.	Overall, 43% of patients were HBsAg+, with increased trend towards advanced Sch; Among those with the poorest grade of liver function, 64% were HBsAg+; Among those cases complicated by liver carcinoma, 62% were HBsAG+.
8	Ye et al. 1998	A village in Dongting lake region, China, (n.a.)	*Cross-sectional* (prevalence): Subjects: 205 subjects aged 0-40+; all subjects identified house to house	None of the subjects sought medical care due because of illness	HBV: HBsAg, HbsAb, HBcAb; Sch(Sj): stool	57% of subjects had long lasting Sj infection; HBV was not associated with Sj infection in this study population; the frequency of HBsAg+ was comparable between Sj+ and Sj- subjects (13% vs. 13%), as was the distribution of HBcAb+ (60% Sj+ vs. 53% Sj-).
9	Li et al 2011	Dongting lake area, Hunan, China	*Cross-sectional* (prevalence, risk factors, severity): Subjects: 102 patients who underwent splenectomy for advanced Sj, aged 17-77 years, 64% male, all longtime residents of highly endemic area, 89% had history repeated contact with Sj infested water	No patients were alcoholics, though 21% had a history of alcohol use	HBV: HbsAg, HBsAb; HCV: anti-HCV; Advanced Sj: patient history, stool, SchAb, ultrasound, liver biopsy; *Note*: all Sj patients were symptomatic w/splenomegaly; 35% of patients had fresh eggs in feces; HDV also tested	Active HBV infection based on HBsAg+ liver sample was present in 44% of the advanced Sj patients; In addition, 55% of these patients were HBsAb+ and 6% anti-HCV+; 1 patient was seropositive for both HBV and HCV antibodies; Patients who were coinfected with HBV had higher fibrosis and inflammation scores than patients with advanced Sj alone; coinfection with HBV

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						appears to have accelerated the development of liver fibrosis.
10	Bassily et al 1979	U.S. Naval Medical Research Unit and Cairo University, Cairo, Egypt (1970-1978)	*Cohort* (comparative, disease progression, mortality): <u>Patient groups:</u> 14 DHSS w/HBsAg+, HBsAB-, 9 DHSS w/high HBsAb+, and HBsAg,12 DHSS w/HBsAg-, HBsAb- subjects; all male, mean age 33 years, all farmers <u>*Note:*</u> Patients were re-evaluated at 6-12 months intervals for up to 36 months.	n.a.	<u>HBV:</u> HBsAg, HBsAB; <u>DHSS (Sm,Sh)</u>: stool, urine, liver biopsy; <u>CAH/LD/LC:</u> liver biopsy, other clinical exams; <u>*Note:*</u> all patients had Sch lesions on liver biopsy	Coinfected patients with HBsAg+ carried the antigen for up to 3 years, and had higher serum glutamin transaminases, with more destructive liver cell lesions in the form of CAHor liver cirrhosis; These patients were refractory to diuretic treatment and had higher mortality rate (64% in 3 years) compared to 22% and 33% in the other two groups; chronic active hepatitis, especially when related to HBV in patients with severe HSS carries a grave prognosis even when Sch infection is cured by specific chemotherapy.

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11	Zakaria et al 1979	Endemic Medical Department, Cairo University, Cairo, Egypt	*Cross-sectional* (prevalence, severity): Subjects: 1013 cases presenting to the medical department; includes 916 subjects with present/past Sch infection, including 432 HSS and 119 cases with ascites, and 97 subjects without present/past Sch infection	n.a.	HBV: HBsAg, HBsAb; Sch(Sm,Sh): stool, urine, rectosigmoidoscopy, SchAb; LD: liver biopsy in Sch group	90% of cases had a present or past Sch infection; A greater portion of patients with present or past Sch infection had evidence of HBV infection than controls; Among patients with Sch, 7% and 15% were HBsAg+ or HBsAg+, compared with 2% and 4% of subjects without Sch; A much greater proportion of HVB exposure (either marker) was found among Schis patients with HSS (26%) or Sch w/ascites(30%), than among those with simple Sch infection (10%); HBV infection in Sch patients appears to correlate with severity of disease.
12	Bassily et al. 1983	U.S. Naval Medical Research Unit and Cairo University, Cairo, Egypt (1976-1980)	*Cohort* (comparative, disease progression, mortality): Patient groups: 42 male villagers with Sm, 19 w/ chronic HBV, 23 w/transient HBV, aged 8 to 68 years, mean age 23; Subjects represent 89% of all males who were HBsAg+ in 1976 village survey; status based on repeated HBV test in 1978; Controls: 10 chronic HBsAg+, Sm- subjects, n.o.s.	Village women who tested positive for HBV were excluded due to social constraints	HBV: HBsAg; Sch (Sm): stool, isotope scans; CAH/LD/LC: liver biopsy, other clinical exams; *Note:* all subjects had positive stools w/mean 452 EPG; also, subjects were treated in 1978 for Sm+, and reinfected by 1980.	Coinfected villagers who had chronic HBsAg+ showed a substantial incidence of CAH and liver cirrhosis compared with other study groups; Over 4 the years of the study, mortality was 11% in those who were Sm+ w/chronic HBsAg+, while no deaths were observed among those with Sm+ w/transient HBsAg+ (resolved hepatitis), or among those who were Sm- w/chronic HBsAg+; Sm infected individuals with chronic HBV may be at especially high risk for

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			Note: Many patients and all of the controls were followed for an additional 2 years, until 1980.			development of severe LD, with morbid outcome.
13	Larouze et al. 1987	Three villages in Nile delta (Abou Goma, Aghour and Sanafir), about 20-30 miles north of Cairo, Egypt (1976-1981)	*Case Control* (risk factors): Cases: 67 subjects with heavy Sm infection (GE 50 EPG in 2 subsequent survey years); Controls: 67 subjects with no or low grade Sm, matched for age, sex and village of origin; subjects aged 10 to 29 years, 66% male	No subject sought medical care because of Sch; also: mass treatment (i.e., PAT) for Sch had not been administered in these villages	HBV: HBsAg,HBsAb, HBcAb; Sch(Sm,Sh): stool, urine.	The pattern of HBV markers was similar in subjects with heavy Sm infections and low grade or Sm free controls: any HBV marker (58% vs. 62%), HBcAb (5% vs. 8%), and HBsAb (54% vs. 55%); No one in the study tested HBsAg+; HBV status, based on any marker, was not associated with either Sm status or level of infection; Sm does not appear to be a risk factor for HBV.
14	Hassanein et al 1989	Theodor Bilharz Research Institute, Giza, Egypt (n.s.)	*Cross-sectional (prevalence, severity)* Subjects: 55 patients from endemic areas for Sch with hepatosplenic affection, n.o.s.; Controls: 44 healthy subjects comprised of medical staff of institute; all subjects 21 years of age or older used in some analyses.	No evidence of rheumatic disease; no abnormal kidney functions.	HBV: HBsAg, HBsAb, HBeAb, HBcAb; HSS (Sm,Sh): stool, urine, recto-sigmoidoscopic exam, liver biopsy; *Note*: No eggs detected in urine.	60% of patients were coinfected; HBV markers were found more frequently in patients with SLF (w/wo chronic hepatitis), than in controls; 95% of patients with SLF and chronic hepatitis had at least one positive HBV marker, compared to 67% of patients with SLF alone; the presence of HBV had no effect on the level of PIINP in patients with SLF.

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15	Madwar et al 1989	Tropical Medical Institute, Cairo (n.s.)	*Cross-sectional* (complications, risk factors): Subjects: 105 outpatients with uncomplicated Sm, Sh, or Sm w/Sh, aged 9 to 56 years, 98% male; Controls: 40 adult medical staff, n.o.s. used in some analyses.	No treatment for Sch infection for 6 months prior to study	HBV: HbsAg, anti-HbsAb, anti-HBcAb, HBeAg, HBeAB; Sch(Sm,Sh): stool, urine, rectal snip; *Note:* Live ova of Sm or Sh detected in all patients	Most patients (80%) were positive for one or more HBV markers, with 32% HBsAg+; Coinfected patients who were HBsAg+ had greater complaints of nausea and vomiting and higher mean serum bilirubin and aspartate aminotransferase levels, and fewer loose stools; Coinfected patients with any HBV marker, were older and more likely to have received prior PAT than those without coinfection, less likely to complain of blood in stools, and more likely to have higher serum total proteins, albumin, globulin and ALT.
16	Khalil et al. 1994	Ain Shams University, Cairo, Egypt (n.s.)	*Case Control* (comparative; complications)) Case groups: 20 ISS; 20 with HSS wo/ascites; 30 HSS w/ascites) patients; Controls: 30 non-Sch, all from Cairo and no past history of exposure; *Note:* No other subject data presented.	n.a.	HBV: HBsAg; Sch (Sm), stool, urine, rectal snip, SchAb; *Note:* Sm ova detected in stool of ISS and HSS wo/ascites; Sm ova detected by rectal snip in HSS w/ascites, not in stool.	Overall, patients with Sch had a greater proportion of HBsAg+ compared with the controls (37% vs. 3%); There was n.s. difference, however, in the frequency of HBsAg+ between different Sch groups representing different phases of the disease; the higher frequency of HBsAg across Sch patients may be explained by a greater exposure to iatrogenic exposure such as prior PAT treatment.

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17	Omran et al. 1994	Theodor Bilharz Research Insitute, Giza, Egypt (n.s.)	*Case Control* (complications, comparative): Case groups: 17 patients with HSS, aged 12-60 and 13 patients with HSS and Sch, aged 12 to 55 years, 100% male; Controls: 14 healthy subjects with no history of Sch, thrombosis or haematemesis, aged 28-36 years; *Note*: all patients were admitted to hospital.	No alcohol or drug intake which may have interfered with blood coagulation; all patients had adequate dietary intake.	HBV: HBsAg, Sch(Sm,Sh): stool, urine, rectosigmoidoscopy, rectal biopsy, liver biopsy	There was no difference between patients with HSS alone or coinfected with HBV with respect to vitamin K dependent coagulation proteins; Prothrobin time and partial thromboplastin time were reduced in all Sch patients compared with controls; Sch coagulopathy is not necessarily aggravated by chronic hep B virus infection.
18	Mabrouk et al. 1996	Ain Shams University Hospital, Cairo, Egypt (1993-1996)	*Case Control* (complications): Cases: 20 Sch patients, aged 24-60, 80% male; Controls: 27 subjects on hemodialysis awaiting kidney transplantation, aged 25-56, 78% male and 105 subjects from the general population, coming for routine check-up, aged 20-50, 70% male; *Note*: All subjects referred to Oncology Diagnostic Unit.	n.a.	HCV: anti-HCV, HCV-RNA; Sch: SchAb, liver biopsy when available	A greater proportion of Sch patients were HCV-RNA+ (35%) than in the hemodialysis (30%) or routine check-up controls (20%); Coinfected patients had normal liver enzymes, and represent a carrier group who may transmit the disease silently to others.

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19	Fahim et al. 2000	Ain Shams University Hospital, Cairo, Egypt (n.s.)	*Case Control* (comparative, complications): Case groups: 30 chronic Sch divided by stage; 30 chronic Sch w/chronic HCV; all patients aged 35-50 years, 100% male; Controls: 10 healthy subjects from same population, n.o.s.	No HBV, as measured by HBsAg+ or HBcAb+ status	HCV: anti-HCV; Chronic Sch(Sm,Sh): stool, urine, SchAb, ultrasound	Coinfected patients had the highest elevated serum levels of ALT and AST activities; coinfection with HCV appears to aggravate liver dysfunction more than infection with chronic Sch alone.
20	Makhlouf et al. 2006	Suez Canal University, Ismailia, Egypt (n.a.)	*Case Control* (comparative, complications, immunology) Case groups: 25 ISS; 15 HSS; 40 HSS w/HCV patients, aged 6 -80 years; Controls: 15 healthy individuals from same population, n.o.s.	No other hepatitis, alcoholism w/chronic renal failure, diabetes mellitus, autoimmune, chest or cardiac diseases; no immunosuppressive drugs	HCV: anti-HCV; INS(Sm) stool; HSS(Sm, Sh): SchAb, stool/rectal snip, urine, ultrasound	Coinfected had higher mean IL-5 and IgE serum levels than all other groups including those with HSS alone; Serum IFN-gamma was also elevated among coinfected patients, but less than in patients with INS alone; the Th-0 and Th-2 cytokine pattern and associated depression of Th-1 response observed in coinfected patients appears to favor the chronic form of both S and HCV, and may play a role in their persistence and severity.

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21	El-Moamly et al. 2013	Suez Canal University and Al-Azhar University, Egypt (n.a.)	*Case Control* (genetics, severity): Cases: 190 chronic Sm w/HCV patients; Controls: 220 chronic Sm patients wo/HCV; All aged 18-65, 71% male, 90% rural residence; No other controls used.	No HBV, HIV, liver transplantation, autoimmune LD, thyroid disease, diabetes mellitus, malaria or other known causes of LD; no history of drug abuse, alcohol consumption, or IFN-alpha or immunosuppressive therapy.	HCV: anti-HCV w/HCV-RNA; Chronic Sm: stool, SchAb, ultrasound; *Note*: only 30% of patients had eggs in stool; all were SchAb+.	There was no association between the CCR5Δ32 mutation and HCV disease susceptibility in patients with Sm; the presence of the mutation, had a favorable effect on hepatic fibrosis, with less severe disease observed in patients with the mutation than with no mutant allele; most of the HCV+ patients were genotype Type 4a.
22	Uemura et al. 1992	Kofu City Hospital, Japan (1989-1990)	*Cross-sectional* (immunology, complications): Subjects: 96 chronic Sch patients, in two groups based on serum ALT level, and 137 confirmed CLD patients (chronic hepatitis, cirrhosis or HCC) without chronic Sj ; all patients were admitted to hospital; Controls: 649 voluntary blood donors used in some analyses.	No LD caused by autoimmune disorders, alcohol, drug or metabolic disorders, no congestive heart failure.	HBV: HBsAg; HCV: anti-HCV; Chronic Sch: SchAb, ultrasound/CT, liver biopsy, rectal biopsy; *Note:* Normal ALT= ALT consistently LT 30 IU for GE 6 mo; elevated ALT = ALT GE 30 IU at least once during 6 mo.;	Sch patients with elevated ALT levels were more likely to be HBsAg+ (14%) or anti-HCV+ (53%) than Sch patients with normal ALT levels (2%, 0%, respectively); a high proportion of CLD patients wo/Sch were also HBsAg+ (15%) and anti-HCV+ (49%); Less than 1% of blood donors were HBsAg+ or anti-HCV+; Among patients coinfected with Sj and HCV, greater liver cirrhosis and HCC was found than fibrosis; these patients also had consistently high ALT levels; data suggests that coinfection with HCV may accelerate the derangement of liver function.

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23	Hayashi et al. 2000	Tokyo Metropolitan Komagome hospita, Japan (n.a.)	*Case Series* (progression of disease): Cases: 9 chronic Sj patients, aged 52 - 68 years, 4 of whom were heavy drinkers *Note:* Follow up varied; Patients were followed for up to 4 months to over 12 years	No HBV (HBsAg)	HCV: anti-HCV; Chronic Sj: liver biopsy, ultrasound, stool, SchAb; *Note:* no eggs in any stool; not all patients were SchAb+	Case review of 9 chronic Sj patients, followed for various lengths of time; Among these, 44% were anti-HCV+ coinfected; Only patients who were coinfected with HCV developed HCC (n=2), suggesting that hepatic viral infection is more important than Sj in promoting the development of HCC.
24	Koshy et al. 1993	Kuwait University, Kuwait (1990-1991)	*Case Series* (severity): Cases: 12 consecutive male Sm patients with cirrhosis; all with mild to moderate portal and lobular activity and mild to severe fibrosis	No patients wee HBsAg+	HCV: anti-HCV ; Sm: SchAb; Cirrhosis/LD: liver biopsy, ultrasound; *Note:* All patients had origins in Egypt w/past history of ova in stools and current high titers of SchAb+	The majority of patients (83%) in this case report were anti-HCV+ on repeated tests, suggesting that HCV may be an important cause of cirrhosis in patients with Sm; The coinfected tended to have greatest severity of liver disease as indicated by Child-Pugh score.
25	Koshy et al. 1995	Al Amiri Hospital, Kuwait University, Kuwait (1993)	*Case Control* (immunology, complications): Cases: 13 male, Egyptian urinary Sch patients, aged 24-56 years; Controls: 13 males wo urinary Sch, aged 24-80 years, reporting to same hospital; controls were from various countries including Egypt; *Note:* all subjects, including controls, were patients referred for cystoscopy.	No clinical signs of liver disease, normal blood counts	HBV: HBsAg; HCV: anti-HCV; Sch(Sh): bladder biopsy w/SchAb; *Note:* no patient had ova found in urine or stool; all had high titres of SchAb.	Patients with active urinary Sch (i.e., ova in bladder) were more likely to be anti-HCV+ than non-Sch controls (70% vs. 0%); An equal number of subjects were HBsAg+ in both the patient group and the controls (10% vs. 10%); Elevated serum ALT levels were noted in 22% of coinfected subjects, while all subjects who were anti-HCV- had normal liver function tests.

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26	Al-Freihi 1993	King Fahd Hospital of King Faisal University, Dammam, Saudi Arabia (n.a.)	*Case Control* (risk factors, complications): Cases: 70 consecutive eligible patients with confirmed diagnosis of Sm, patients, mean age 37, 81% male; Controls: 70 apparently healthy subjects, matched for age, sex, nationality and place of residence (Saudi patients only); Notes: in order to be eligible, patients had to have known HBsAg status; all subjects with HBsAg+ had test repeated after 4 to 6 months; Subjects were mainly Saudi, Yemeni, and Egyptian.	Exposure to any known risk factors for HBV/other liver disease.	HBV: HBsAg; Sch(Sm): ova in stool/rectal snip or granuloma on liver biopsy; *Note:* All patients had hepatomegaly and/or splenomegaly.	HBsAg+ was more common among patients with Sm+ than among non Sm+ controls (26% vs. 4%); Neither sex nor nationality was associated with HBsAb+ in Sch patients; Coinfected patients had greater derangement of hepatic enzymes as indicated by abnormal liver function tests than mono Sm+ patients (78% vs. 42%, OR 4.77, 95% CI 1.22-20.11); Serum albumin levels were also lower among coinfected patients than among mono Sm+ patients (61% vs. 43%).
27	Mohamed et al. 1998	Armed Forces Hospital, Riyadh, Saudi Arabia (1990-1995)	*Case Control* (comparative, complications): Cases: 30 HSS w/anti-HCV+ patients; Controls: 30 HSS patients wo/HCV; All patents aged 25-78 years, 77% male; No other control groups used in analysis.	No HBV viral markers, no history of alcohol; all patients had negative autoimmune screen and normal ferritin levels	HCV: anti-HCV; HSS (Sm): SchAb, stool, ultrasound, gastroscopy; rectal biopsy on some; *Note:* Ova in stool LT 50% of the time; all HSS patients had evidence of portal hypertension	A greater proportion of coinfected patients had elevated ALT levels compared with those with mono HSS (83% vs 23%), which ranged between two to five times the upper limit of normal; Coinfected patients also had greater cirrhosis (58%) and HCC (10%) compared to mono infected subjects (19% and 0%, respectively); The mean age of anti-HCV+ patients was less than that for HCV-

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						patients, which may indicate that HCV leads to decompensated liver functions earlier in coinfected HSS patients.
28	Khano et al. 2004	Viral Diagnostic and Parasitology Department in Dammam, Saudi Arabia (1999-2000)	*Cross-sectional* (prevalence): Subjects: 405 patients with clinical suspicion of Sch, aged 15-55 years, 77% male, 88% Saudi nationals; Controls: 300 healthy blood donors used in some analyses.	n.a.	HCV: anti-HCV, RNA-HCV; Sch(Sm): stool, SchAb	Only a small proportion of patients with a clinical suspicion of Sch were SchAb+ based on the IHA test; Of those who were SchAb+ (n=39), 18% were found to be coinfected with HCV; Infection with SchAb alone as well as coinfection with HCV was more common among non-Saudis than among Saudis; Among the coinfected (n=7), 27% were Egyptian vs 12% Saudi; all blood donors were negative for both SchAb as well as HCV.
29	Daneshmend et al. 1984	Khartoum Civil Hospital and University Hospital, Soba, Sudan (n.a.)	*Case Series* (complications, prevalence) Cases: 20 HSS patients w/PPF; Controls: 41 "normal" subjects comprised of medical staff from same geographic area as patients; None had schistosomiasis or jaundice.	No cirrhosis or chronic active hepatitis	HVB: HBsAg, HBcAb, HBsAB; Sch(Sm): liver biopsy; *Note:* liver biopsy performed as part of routine management on patients; liver biopsy not performed on controls.	Evidence of past and present HBV infection based on seromarker profile, indicates that HBV was found twice as often in Sch patients as in non-Sch controls; HBsAg+ was 30% in Sch patients vs. 15% in controls; The largest proportion of Sch patients (40%) were HBsAg- HBcAb+ HBsAB+, compared 10% of controls; where as 15% Sch patients were HBsAg- HBcAb- HBsAb-, compared with 58% of controls; HBV may be unusually common in Sudanese patients with Sch.

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30	Itoshima et al 1989	Ibn Sina Hospital, Khartoum, Sudan (1987)	*Case Series* (comparative, prevalence): Case groups: 23 Sm patients, 13 liver cirrhosis patients, 6 HCC patients; Controls: 25 other hospitalized patients in otorhinolaryngology or urology; 21 blood donors; all subjects aged 15 years and over, 83% male.	n.a.	HBV: HBsAg/anti-HBc; Sch(Sm): prior diagnosis; some w/advanced disease) LD: liver biopsy, peritoneoscopy; *Note*: no testing/reporting of Sch in liver cirrhosis and HCC patients	No sig. difference between incidence of HBV markers between hospital controls (4% HBsAg+, 60% HBcAb+), blood donors (24% HBsAg+, 57% HBcAB+), and the Sch patients (22% HBsAg+, 65% HBcAg+), HBV markers occurred most often between those with liver cirrhosis (31% HBsAg+ , 77% HBcAb%) or HCC (67% HBsAg+, 83% HBcAg+)