Coinfection of Schistosoma species with Hepatitis B or Hepatitis C Viruses

Table 1.2 Studies Conducted on General Populations.

No.	Reference	Location (Years)	Study Design (Objective) and Study Population	Diagnosis of Disease	Prevalence	Findings on Coinfection
1	Serufo et al. 1998	Queixadinha and Cap~ao, Minas Gerais, Brazil (1994-1997)	*Cross-sectional* (prevalence, village comparison): Subjects: 693 residents of Queixadinah (93% of total pop), endemic area for Sm, aged 0-86 years, 49% male; 515 residents of Cap~ao (96% of total pop), non-endemic for Sm, aged 0-83 years, 52% male.	HBV: HBsAg, HBsAb, HBcAb; Sch(Sm): stool; PPF: ultrasound	Endemic villagers (n=693): 9% HbsAg+, 66% Sm+, *Coinfected*: *n.a.* Non-endemic villagers (n=515): 1% HbsAg+, <1% Sm+, C*oinfected*: *n.a.*	Although the prevalence of HBV markers was considerably higher in the Sm endemic village, within the endemic area there was no association between the HBsAg+ and Sm+, with or without PPF; There was a comparable prevalence of HBsAg carrier state among Sm+ and Sm- subjects (9% vs. 7%); The distribution for chronic HBsAg+ carriage was also comparable.
2	Li et al. 1997	Huie Long, Xia Shan, Shang Shan Farming/Fishing villages in Dongting lake region, Hunan, China (1992)	*Cross-sectional* (prevalence, severity): Subjects: 879 villagers (22% of total pops, village range 17-34%), aged 5-74 years	HBV: HBsAg, HBcAb, HBeAb; Sch(Sj): stool, abdominal exam	Subjects (n=879): , 18% HBsAg+, 42% any HBV+ marker, 19% Sj+ (village range: 13%-32%), *Coinfected:* 9% any HBV+ marker w/Sj+	On average, no association between Sj+ and HBV status; however, a higher frequency of HbsAg+ or HBV+ (any marker) was found among individuals with advanced Sj (43%, 77%) as well as those reinfected with Sj (23%, 52%), when compared with the non-Sj infected (16%, 35%), those newly infected with Sj (12%, 40%), or those with past treated Sj infection (17%, 43%).

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3	Hyams et al. 1986	Nile delta, Egypt (1981-1983)	*Cross-sectional* (prevalence, duration): Subjects: 324 villagers (~16% of total pop of farming village), 36% male, mean age 26 years; *Note:* 92% of sample in main analysis	HBV: HBsAg, HBsAb, HBcAb, HBeAg; Sch(Sm/Sh): stool, urine	Subjects (n=298): 3% HBsAg+, 37% any HBV+ marker, 50% Sm+, 2% Sh+, *Coinfected: 1% HBsAg+ w/Sm+, 20% any HBV+ w/Sm+*	No association between past or present HBV infection and Sm+; the frequency of HBsAg+ chronic carriage (≥ 6 months) was the same between Sm+ and Sm- groups (3 % vs. 3%); a non sig difference was noted between the frequency of any HBV+ marker status among Sm+ and Sm- groups (40% vs. 33%); Insufficient sample size to detect statistical significance noted.
4	Hyams et al. 1987	U.S. Naval Medical Research Unit, Cairo, Egypt (1982 -1983)	*Cross-sectional* (prevalence, severity, risk factors): Subjects: 1234 Egyptian males, aged 18-24 years, presenting for induction physical examination; Subjects were from lower and middle social classes, 50% rural/urban	HBV: HBsAg, HBcAb; Sch(Sm,Sh): stool, urine, Enlarged liver/spleen: physical exam	Subjects (n=899 to 1234): 7% HBsAG+,26% Sm+, 20% Sh+, 5% HSS, *Coinfected: 2% HBsAg+w/Sm+, 2% HBsAg+w/Sh+;* *Note:* not all subjects provided both stool and urine samples	Among those with Sm+, there was no difference in HBsAG status (7% HBsAg+ vs. 7% HBsAg-); A n.s. difference noted among those who were Sh+ (12% HBsAg+ vs. 8% HBsAg-); A prior history of PAT increased risk of HBsAG (11% HBsAg+ vs 6% HBsAg-); Coinfection was not associated with HSS or enlarged liver/spleen in this population.
5	Kamel et al. 1994	Saada, in Kafr El Sheikh governate, Egypt (1992)	*Cross-sectional* (prevalence, severity): Subjects: 1259+ villagers (GE 68% of total pop), mean age 20 years, 50% male	HBV: HBsAg, HBcAb; HCV: anti-HCV; Sch(Sm,Sh): stool, urine; PPF: ultrasound	Subjects (n=1259): 2% HBsAg+, 24% any HBV+ marker, 16% anti-HCV+, 49% Sm+, *Coinfected (n=1157): 12% any HBV marker+ w/Sm+, 7% anti-HCV+w/Sm+;*	Three was no association between Sm+ and HBV infection (any marker; age adjusted OR 1.13, 95% CI 0.87-1.48) or between Sm+ and anti-HCV+(OR 1.02, 95% CI: 0.7-1.37); The combined infection of HBV w/HCV was also not associated

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					Note: 5% of villagers were any HBV+ marker w/anti-HCV+	with Sm status; A greater proportion of HBV+, HCV+ or HBVw/HCV+ status was noted among individuals with Sch fibrosis than without, but not enough to reach statistical sig.
6	El-Sayed et al. 1997	Bitter lakes area, Sinai Peninsula, Egypt (September 1993)	*Cross-sectional* (prevalence, severity, risk factors): Subjects: 506 residents GE 1 year in area recently reclaimed from the desert and endemic for Sm, mean age of 20 years, 52% male	HBV: HBsAg, HBsAb, HBcAb; HCV: anti-HCV; Sch (Sm, Sh): stool, urine; ultrasound on sample, n.o.s.	Subjects (n=506): 3% HBaAg+, 20% HBV+, 10% anti-HCV+, 30% Sm+, 1% Sh+, *Coinfection*: *5% HBV+w/Sm+, 3% anti-HCV+w/Sm+ ;* *Note*: HBV+ = HBsAg+ and/or HBcAB+; Also, LT 1% of residents HBsAg+ w/anti-HCV+; 4% of residents were HBV+ w/anti-HCV+	In univariate model, no association between Sm+ and HBV+ (OR 0.68, 95% CI 0.4-1.2) or between Sm+ and anti-HCV+ (OR 0.92, 95% CI 0.5, 1.8); No association with Sch hepatic PPF with either HBV or HCV, adjusted for age and sex; PAT was strongly associated with anti-HCV+ (OR 7.86, 95% CI 2.8, 22.0), but not with HBV+ (OR 1.51, 95% CI 0.5-4.1); Of note, adults aged 40 and over were 4x more likely to be infected with HBV than children.
7	Darwish et al. 2001	Kalama, semi-urban, Nile Delta village, 19 km north of Cairo, Egypt (1994 - 1995)	*Cross-sectional* (prevalence, severity, risk factors): Subjects: 801 persons (88% of age-eligible residents), aged 10 years and over	HBV: HBsAg, HBcAb; HCV: anti-HCV; History of Sch: questionnaire; PPF: ultrasound, *Note:* History of Sch infection based solely on recall.	Subjects (n=796): 10% HBsAg+, 40% anti-HCV+, 3% History of Sch LE 1 year, 17 % History of Sch GT 1 yr, *Coinfected*: *2% anti-HCV+ w/History of Sch LE 1 year, 11% anti-HCV+ w. History of Sch GT 1 year;* *Note:* 4% of villagers	Recalled past history of Sch (GT 1 year) was associated with anti-HCV+ status (adj OR 1.75, 95% CI 1.14, 2.67), and may be related to prior PAT; This is consistent with the increased risk of Sch PPF observed among anti-HCV+ villagers (adj OR 1.75, 95% CI: 1.01, 3.05); Of note, HCV infection tends to reach its peak prevalence in a population at younger age (60% by age 30) than

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					HBsAg+ w/anti-HCV+; Data on coinfection of Sch w/HBV n.a.;	HBV (75% by age 40).
8	Blanton et al. 2002	Shamarka, Nile Delta, Egypt and Katheka, Kenya (1999-2000)	*Cross-sectional* (prevalence, severity, country comparison): <u>Subject groups:</u> 2038 Egyptians and 2120 Kenyans, aged 11 years or more, 54% and 42% male, respectively	<u>HBV</u>: HbsAg, HBsAb; <u>HCV</u>: anti-HCV, HCV-RNA; <u>Sch (Sm)</u>: stool, ultrasound	<u>Egyptian subjects (n=2038)</u>: 20% Sm+; serosample (n=112): 31% HBsAg+, 39% anti-HCV+ , 23% Sm+; *Coinfected*: *n.a.;* <u>Kenyan subjects (n=2120)</u>: 64% Sm+; serosample (n=237): 39% HbsAg+, 11% anti-HCV+. 71% Sm+, *Coinfected: n.a.;* <u>Note</u>: serosample= individuals with Sch fibrosis and their first degree relatives; Data on coinfection with HBV n.a.	Among those with hepatocelluar damage, Sm intensity was comparable between anti-HCV+ and anti-HCV- groups in both Egypt (mean EPG: 3 +/- 7 vs 3 +/- 6) and Kenya (mean EPG: 27 +/- 4 vs 27 +/- 11), respectively; Coinfection does not appear to be associated with the geographical variation in fibrosis observed between Egyptians and Kenyans; No interaction was found between Sm+ infection or disease and anti-HCV+ status in multivariate model.
9	Abdelwahab et al. 2012	National Liver Institute, Menoufiya University, Egypt (2008-2010)	*Cross-sectional* (prevalence, risk factors, occupation): <u>Subjects:</u> 842 Health care workers (60% of all National Liver Institute employees), mean age 32 years (range 17-59 years), 45%	<u>HBV</u>: HBsAg, HBsAb, HBcAb, <u>HCV</u>: anti-HCV, HCV RNA, <u>Sch</u>: SchAb; <u>*Note:*</u> Almost 2/3 of subjects had been vaccinated against HBV.	<u>Subjects</u> (n=842): , LT 1% HBsAg+, 17% anti-HCV+, 35% SchAb+, *Coinfected: 24% anti-HCV+ w/ScAb+ ;* <u>*Note:*</u> No data on HBV-Sch coinfection; also, 0.2% HbSAg+ w/anti	In multivariate model, SchAb+ status was not associated with anti-HCV+ status, after adjusting for age and rural status. (estimates not reported)

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			male		HCV+;	
10	Berhe et al. 2007	Worke-Mado, Cheretee, Chekorso and Silo-Elgo villages, Ethiopia (2000)	*Cross-sectional* (prevalence, severity, village comparison): Subjects: 2451 persons (50% random sample), in Sm endemic villages, mean age 18.8, +/- 15.3 years, 52% male, of which 70% available for serology; Controls: 349 students from non-Sm endemic villages	HBV: HBsAg, HBcAb; HCV: anti-HCV; Sch (Sm): stool; PPF/PPT: ultrasound.	Subjects (HBV/HCV: n=1707; Sm: n=2451): 5% HBsAg+, (village range 3-8%), 43% any HBV marker+ (village range 41-55%), 5% HBsAg+ (village range: 3-8%), 1% Anti-HCV+(village range: 1-3%), 66% Sm+(village range 50-85%), *Coinfected*: *n.a.;* Controls: Controls lacked Sm infection and had lower proportions of HBV and HCV markers than Sm endemic villagers.	Sm+ was not associated with markers of HBV or HCV status in endemic villagers; However, in multivariate analysis, HVB was associated with greater risk of Sch PPF/PPT, measured using either any HBV+ marker (adj. OR 2.1, 95% CI 1.4-3.3) or as HBsAg+ (adj. OR 3.5, 95% CI 1.9-6.7); Patients with heavier Sm infections (EPG count > 100) with any HBV+ marker had the highest risk: adjusted OR 2.5, 95% CI 1.4-4.5; HBV appears to be associated with poorer health outcome in Sm infected patients.
11	Domingo et al. 1983	Santa Rosa, endemic area for Sj, in Barugo, Leyte, Philippines (n.d.)	*Cross-sectional* (prevalence, severity): Subjects: 561 residents (56% random sample of total pop), aged 1-40+ years, 52% male, plus 22 additional HSS patients, aged 12-66 years, 86% male	HBV: HBsAg, HBsAb, HBcAg; Sch(Sj): stool	Subjects (n=561): 14% HBsAg+, 32% Sj+, *Coinfected: 5% HBsAb+ w/Sj+*	HBV, measured by HBsAg or by any other HBV marker, was not associated with Sj status; The frequency of HBsAg+ was largely comparable between Sj+ and SJ- groups (15% vs. 13%); Similarly, 15% of HSS patients were HBsAg+; N.S. tendency for HBsAG+ status to increase with severity of Sj parasitism noted: light 14%, moderate 17%, heavy 21%.

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12	Eltoum et al. 1991	Gezira, Sudan (n.d.)	*Cross-sectional* (prevalence, severity): Subjects: 242 villagers (25% random sample of total pop) mean age 18 years, 58% male; *Note:* serology conducted on 85% of sample	HBV: HBsAg, HBsAb, HBcAb, HBeAg; Sch(Sm): stool; PPF: sonography	Subject serosample (n=207): 9% HBsAg+, 54% any HBV+ marker, 37% Sm+, *Coinfected*: *2% HBsAg+ w/Sm+, 18% any HBV+ marker w/Sm+.*	No association was found between past or present HBV infection and current infection with Sm, with or without PPF; Both HBsAg+, as well as any HBV+ marker, were less common among the Sm+ (5%, 48%) than among those who were Sm- (12%, 58%).
13	Mudawi et al. 2007	Um Zukra Village, Managil province, Gezira state, Central Sudan (2000)	*Cross-sectional* (prevalence, risk factors): Subjects: 410 villagers, mean age of 35 years, 45% male	HCV: anti-HCV, HCV RNA; History of Sch(Sm): past stool sample, questionnaire; *Note:* all repeat reactive anti-HCV+ samples were HCV-RNA-.	Subjects (n=410): 2% anti-HCV+, 91% history of Sm+, C*oinfected*: *n.a.*	There was no difference among anti-HCV+ villagers with respect to past recalled history of Sch (2% yes vs . 3% no); Similarly, anti-HCV+ was not associated with a past history of PAT (3% PAT+ vs. 2% PAT-).
14	Al-Shamiri et al. 2011	32 schools in 5 Sch endemic districts in Taiz Governate, Yemen (2007-2009)	*Cross-sectional* (prevalence, village comparison): Subjects: 1484 children, ages 5-16 years	HBV: HBsAg; HCV: anti-HCV; Sch (Sm/Sh): stool, urine.	Subjects (n=1484): HBsAg+: n.a., anti-HCV+: n.a., 21% Sm+ (district range: 0% - 29%), 7% Sh+ (district range: 0%-20%), *Coinfected: n.a.;* *Note*: HBV and HCV status determined in 12% serosample of study population.	Among Sm tested children (n=187), coinfection of Sm+ with HBsAg+ occurred less often than HBsAg+ alone (4% vs 10%); Among Sh+ tested children (n=195), coinfection of Sh+ w/HBsAg+ was much more common (17%) than HBsAg+ alone (6%), mainly due to Al-Barh village; Anti-HCV+ was relatively rare among children and no association was found with either Sm or Sh.

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