Balen, J; Zhao, ZY; Williams, GM; McManus, DP; Raso, G; Utzinger, J; Zhou, J; LI, YS (2007) Prevalence, intensity and associated morbidity of Schistosoma japonicum infection in the Dongting Lake region, China. Bulletin of the World Health Organization, 85 (7). pp. 519-26. ISSN 0042-9686 DOI: https://doi.org/10.2471/BLT.06.034033

Downloaded from: http://researchonline.lshtm.ac.uk/3072/

DOI: 10.2471/BLT.06.034033

Usage Guidelines

Please refer to usage guidelines at http://researchonline.lshtm.ac.uk/policies.html or alternatively contact researchonline@lshtm.ac.uk.

Available under license: http://creativecommons.org/licenses/by-nc-nd/2.5/
Prevalence, intensity and associated morbidity of Schistosoma japonicum infection in the Dongting Lake region, China

Julie Balen, Zheng-Yuan Zhao, Gail M Williams, Donald P McManus, Giovanna Raso, Jürg Utzinger, Jie Zhou & Yue-Sheng Li

Objective To determine the prevalence and intensity of Schistosoma japonicum infection and associated morbidity, and to estimate the infected human and buffalo populations in the Dongting Lake region, Hunan province, China.

Methods We used data from the third national schistosomiasis periodic epidemiological survey (PES) of 2004. These included 47 144 human serological and 7205 stool examinations, 3893 clinical examinations and questionnaire surveys, and 874 buffalo stool examinations, carried out in 47 villages in Hunan province. Serological examinations were performed using the enzyme linked immunosorbent assay technique and human stool samples were examined by the Kato-Katz method. Stools from buffaloes and other domestic animals were examined for schistosome infection by the miracidial hatching test.

Findings Sero-prevalence was 11.9% (range: 1.3–34.9% at the village level), and the rate of egg-positive stools was estimated at 1.9% (0–10.9%) for the same population. The prevalence of infection among buffaloes was 9.5% (0–66.7%). Extrapolating to the entire population of the Dongting Lake region, an estimated 73 225 people and 13 973 buffaloes were infected. Most frequently reported symptoms were abdominal pain (6.2%) and bloody stools (2.7%). More than half of the clinically examined people reported having had at least one prior antischistosomal treatment.

Conclusion There was a significant reduction in the number of humans infected with S. japonicum since the previous national PES carried out in 1995, partially explained by large-scale chemotherapy campaigns. However, a near-stable number of buffalo infections suggest continuing human re-infection, which may lead to future increases in human prevalence.

Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español.

Introduction

Schistosomiasis japonica remains endemic in seven provinces in China.1,2 Human infection is acquired during the course of domestic or occupational activities, in particular fishing and farming.3,4 Acute infection may result in fever, weakness, diarrhoea, abdominal pain and hepatomegaly. Chronic disease involves granuloma formation, tissue inflammation, liver lesions and fibrosis, which may persist after infection has been cleared.5,6 Schistosoma japonicum is also known to infect 45 species of animals, of which water buffaloes are especially important for transmission.7 The zoonotic nature of schistosomiasis japonica renders control particularly challenging. Despite 50 years of intensive control in China, the disease remains of considerable public health concern, with an estimated 843 000 people and 100 250 bovines infected in 2003.1 Major endemic foci occur in the marsh and lake areas of southern China, particularly the Dongting Lake region bordering Hubei and Hunan provinces, and the Poyang Lake region in Jiangxi province.2 In the 1990s, praziquantel-based morbidity control became the central feature of China’s national schistosomiasis control programme, supported through a 10-year World Bank Loan Project (WBLP).8,9 The estimated number of human infections was reduced by over 50%, from 1 471 000 in 1989 to 695 000 in 2000.9 Recent data indicate that schistosomiasis might be spreading, and re-emerging in settings where the disease had previously been controlled.10,11 The causes are multifactorial, including severe flooding,12 water-resource developments such as the construction of the Three Gorges Dam and the resulting ecological transformations,13 climate change,14,15 market and health sector reforms,16 increased population density and migration, as well as the termination of the WBLP.9,17

Concerns about the re-emergence of schistosomiasis, particularly in the densely populated lake regions, call for a re-estimation of the number of current infections in humans and domestic animals. Here we have determined the level and extent of schistosomiasis in the Dongting Lake region, including estimates of disease-associated morbidity, based on data from the third national schistosomiasis periodic epidemiological...
Survey (PES), carried out in 2004. The results are compared to the previous PES done in 1995 and the observed changes discussed.

Materials and methods
Study area and population

A nationwide cross-sectional epidemiological survey, using a cluster-randomized design, was carried out by the Chinese Ministry of Health in October/November 2004, with a total of 250,987 people examined for schistosomiasis in 239 villages. In Hunan province, the survey was conducted in 47 of the 2,832 villages from the Dongting Lake region where schistosomiasis is endemic. The region covers an area of approximately 15,000 km² and accounts for 7.2% of the total area and 6.1% (i.e. 4,133,137) of the total population of Hunan province. There were an estimated 124,265 buffaloes in the region at the time of the study.

Sampling procedures

Sampling followed the standard protocols of the national schistosomiasis PES. Briefly, in China there are eight distinct schistosome-endemic settings within three topological areas, namely (i) lake areas, (ii) water course network areas, and (iii) hilly areas. The Dongting Lake region comprises five of the eight endemic settings, i.e. (i) lake fork, (ii) grassy lake beach, (iii) lake embankment, (iv) inside embankment (lake areas), and (v) hills (hilly areas). Within each endemic setting, villages were grouped according to an estimated prevalence of *S. japonicum* among local residents as follows: (i) high (>11%), (ii) upper moderate (6–10.9%), (iii) lower moderate (1–5.9%), and (iv) low (<1%). Usually, one out of 100 villages from every endemic setting/prevalence group combination was selected at random; if there were less than 100 villages in any of the 20 combinations, one village was selected at random. All inhabitants of the selected villages aged between 5 and 65 years were invited to participate, but there were a few younger or older participants included in the final data set.

Within each sampled village, 100 domestic animals (comprising buffaloes, cattle, pigs and goats) were selected at random for faecal examination. If there were less than 100 animals in a village, all were included in the examination.

In addition to the standard study design of the first (1989) and second (1995) national schistosomiasis PES, the third PES (2004) consisted of a supplementary morbidity component, administered to one randomly re-selected village from each prevalence group within the lake-embankment endemic setting.

Serological, parasitological and clinical examinations

A two-pronged diagnostic approach, which has been widely and effectively applied in China over the past decades, was used to investigate *S. japonicum* infections among human participants. First, serum was extracted from 2 ml venous blood taken from each subject and examined by indirect enzyme linked immunosorbent assay (ELISA) for the occurrence of anti-soluble egg antigen (SEA) IgG antibodies. Second, SEA-ELISA-positive individuals were asked to provide a stool specimen from which three Kato-Katz thick smears were prepared and examined under a light microscope by experienced laboratory technicians who counted *S. japonicum* eggs per slide. A random sample of SEA-ELISA-negative individuals (<5%) was also subjected to the Kato-Katz technique. Infection intensity was expressed as the number of eggs per gram of faeces (epg). Individuals with watery stools were not included in the examination due to the dilutive effect of watery stools on schistosome eggs. For quality control, 10% of slides were randomly selected and re-examined by a senior microbiologist.

The miracidial hatching test was undertaken on single stool specimens taken from domestic animals as a marker of *S. japonicum* infection.

Human clinical examinations, involving liver and spleen palpations, were performed by a community nurse, examining liver tenderness. Then, a portable ultrasound (Sonolayer-L SAL-33B; Toshiba) was used for assessment of size, texture, fibrosis and other abnormalities of the liver, portal vein diameter, interior portal vein diameter, spleen size and biliary duct abnormalities. Standard positions, views, measurements and classification protocols were followed. Clinically examined subjects were also interviewed for the presence of symptoms (e.g. headache, diarrhoea and blood in stool) with a recall period of 2 weeks and whether they had previous antischistosomal treatment history.

Consent and anthelmintic treatment

Written informed consent was obtained from each individual or, for those below the age of 15 years, from their parents/legal guardians; verbal informed consent was obtained from the domestic animal owners. ELISA-positive individuals, apart from pregnant women, were treated with praziquantel (single oral dose of 40 mg/kg). All *S. japonicum*-positive animals were also treated with single oral doses of praziquantel (buffaloes at 25 mg/kg, cattle at 30 mg/kg, goats at 20 mg/kg and pigs at 60 mg/kg).

Data management and statistical analyses

Data were double-entered into FoxPro (version 6.0), cross checked and subsequently analysed with SPSS version 13.0 (Chicago, USA). Separate analyses were carried out for the SEA-ELISA results and the combination of the SEA-ELISA plus the Kato-Katz thick smear examination. Infection intensities were categorised as light (1–100 epg), moderate (101–400 epg) or heavy (>400 epg). All variables including sex, age group and endemic setting were explored individually by χ² statistics. Infection intensity was explored by Student’s *t*-test and the Kruskal–Wallis test.

Estimates of the number of infected people and buffaloes were made using Microsoft Excel 2002. Population structure and numbers were obtained from the 2003 data. Data were stratified according to sampling procedure as follows: five schistosome-endemic settings, four endemic groups, sex and four age groups, giving a total of 160 separate estimations. The standard error (SE) of each estimate was converted to a variance; all variances were summed to provide an overall variance, SE and 95% confidence interval (CI). Buffalo numbers were obtained from the Department of Animal Husbandry, and were stratified according to endemic setting/group only.

Logistic and negative binomial regression models were fitted for *S. japonicum* infection status and intensity, respectively, to assess for significant associations with morbidity indicators.

Results

Study compliance and operational results

The five schistosome-endemic settings of the Dongting Lake region were
null
Infection intensity was also significantly associated with endemic setting (Kruskal–Wallis $H = 326.1$, d.f. = 4, $P<0.001$). At the village level, the geometric mean intensity of infection varied from 8.0 epg to 214.9 epg.

Fig. 2 shows that the buffalo infection prevalence also varied significantly according to endemic setting and village (range: 0–66.7%).

Estimates of people and buffaloes infected with *S. japonicum*

The estimated number of *S. japonicum*-infected people residing in the Dongting Lake region at the time of the study was 73,225 (95% CI: 61,679–84,772); more than three-quarters were male (78.0%). An estimated 55,238 (75.4%) lived in the lake embankment, 11,236 (15.3%) in the inside embankment, 5,051 (6.9%) in the lake fork, 1,496 (2.0%) in the grassy lake beach, and the remaining 204 (0.3%) in the hills.

The number of buffaloes infected was estimated at 13,973 (95% CI: 13,666–14,281). Of these, 12,889 (92.2%) were situated in the lake embankment, 457 (3.3%) in the lake fork, 419 (3.0%) in the inside embankment, and 208 (1.5%) in the grassy lake-beach; no infected buffaloes were present in the hills.

**Schistosome-associated symptoms and morbidity, and treatment history**

Table 2 summarizes the results from three bivariate regression models fitted on *S. japonicum* infection status (for SEA-ELISA alone and combined SEA-ELISA plus Kato-Katz) and intensity. Infected individuals were significantly more likely to report the presence of blood in stool and abdominal pain within 2 weeks preceding interview. Infection status determined by SEA-ELISA alone also showed a significant positive association with an increased portal vein diameter.

Similarly, infection intensity showed a significant positive association with abdominal pain, blood in stool, liver tenderness, increased portal vein diameter and increased interior portal vein diameter.

Of the 3,893 individuals examined clinically, 2,058 (52.9%) reported receiving praziquantel (one prior treatment: 26.3%, two prior treatments: 9.8%, at least three prior treatments: 16.8%). Prevalence, but not intensity, of infection was significantly associated with treatment history. The self-reported year of the most recent treatment ranged from 1958 to 2003, with more than half (53.7%) of the treatments having occurred in 2003.

**Discussion**

The third national schistosomiasis PES in 2004 revealed an overall *S. japonicum* prevalence in humans of 1.9% in the Dongting Lake region, or an estimated 73,225 infected people at the time of the survey. This is a 75.6% reduction since the second PES conducted in 1995. It is noteworthy that over the same timeframe the geometric mean infection intensity increased. We found a *S. japonicum* prevalence in buffaloes of 9.5%, translating to an estimated 13,973 infected buffaloes in the region, a slight increase (+1.1%) since 1995. Abdominal pain and blood in stool were the most common self-reported symptoms, while liver tenderness, increased portal vein diameter and increased interior portal vein diameter, revealed by clinical examination and ultrasonography, showed positive associations with human infection. Prior treatment histories with antischistosomal drugs were common.

There are three factors that may have led to underestimations in the number of infections. First, an important epidemiological feature of schistosomiasis is its focal distribution; sampling only 1% of villages may have resulted in some highly-endemic villages being missed. Second, we found a significantly higher prevalence and intensity of infection in males, particularly those aged 25–30 years. Many of these were absent during the cross-sectional epidemiological survey (data not shown), possibly working in the fields, and hence at an elevated risk of infection. Third, day-to-day and intra-specimen variations in egg output can underestimate prevalence in the case of limited stool sampling and diagnostic effort. Although we examined three Kato-Katz thick smears, all were derived from a single stool specimen, producing a test-sensitivity ranging from 20–70%.

In previous PESs the miracidial hatching test was used to examine all individuals, while a Kato-Katz thick smear examination – three smears derived from a single stool specimen – provided intensity data on individuals who tested positive by miracidial hatching. While the study design remained the same for all PESs, in 2004 the diagnostic methods of the previous surveys were replaced by initial screening with an SEA-ELISA.
transmission followed by the Kato-Katz technique of SEA-ELISA positive individuals. Intra-survey comparisons are possible, however, due to the similar sensitivities and specificities of the methodologies used. In all three PESs, animal examinations were based on the miracidial hatching test undertaken on a single stool specimen. A recent study has investigated the use of a Bayesian modelling approach to further improve the accuracy of estimations based on the combined SEA-ELISA plus Kato-Katz results, taking into account the lack of sensitivity of either diagnostic test.

The reduced number of estimated human infections compared to the results from previous PESs is certainly a result of mass drug administration targeting villages with infection prevalences above 5% one year before our study. Overall, this may have reduced infection prevalence by up to 50%. Behavioural changes brought on by recent improvements in health awareness may also have reduced the prevalence, particularly in females. Approximately 90% of houses in the region have an adequate water supply, reducing the exposure of women to schistosome-contaminated lake and marshland areas. However, fishing and farming, the two most common male occupations in the region, require frequent lake-water exposure and close interaction with animal hosts. It is noteworthy that a study focusing on school children in the Dongting Lake region found a significantly higher _S. japonicum_ prevalence among girls than boys. Since 1998 there had been a marked reduction in the frequency of floods along the central parts of the Yangtze River, due in part to the construction of the Three Gorges Dam, further reducing the prevalence of infection. However, long-term consequences of the dam may negatively impact on the transmission of schistosomiasis.

The PES included the examination of animal populations because of the zoonotic nature of schistosomiasis japonica. We found a buffalo infection prevalence of 9.5%, ranging from 0% to 66.7% at the village level. In accordance with another recent study carried out in Anhui province, we found _S. japonicum_ infections in cattle (6.1%) and goats (4.9%). These data reflect the actual scenario, i.e. the estimated number of infected buffaloes remained remarkably stable since 1995, signifying continual schistosomiasis transmission in the Dongting Lake region. Animal infection intensities were not recorded, yet egg output from all hosts is a significant component in _S. japonicum_ transmission dynamics. Furthermore, our prediction, based on mathematical modelling, is that buffaloes can be responsible for up to 75% of human transmission in the lake and marshland areas. These results call for rigorous monitoring not only in the human population, but also in domestic animals, and perhaps in _oncomelanid_ intermediate host snails.

With regard to associated morbidity, a total of 3893 individuals were interviewed with a standardized questionnaire and examined by ultrasonography for schistosome-associated morbidity. Self-reported blood in stool and abdominal pain were associated with _S. japonicum_ infection status and intensity, while liver tenderness, an increased portal vein diameter and an increased interior portal vein diameter were associated with infection intensity only, a result of high egg burdens. Where control of schistosomiasis has been successful, the likelihood of a loss of immunity to infection necessitates, careful monitoring and surveillance of acute cases in relation to post-transmission control. Over 50% of those clinically examined had been treated with praziquantel at least once in their lifetime, with the majority of treatments administered within one year before the current survey. Importantly, our results showed a significant positive association between treatment history and infection, suggesting that treatments had been targeted to the at-risk population. This finding is confirmatory that people’s knowledge on prior anti-schistosomal treatment history can be used as a marker for rapid identification of individuals and/or communities at highest risk of _S. japonicum_.

In summary, the approach taken by the national schistosomiasis control programme, i.e. screening all participants by serology followed by stool examination of zero-positives, provided an effective means of analysing a large number of people, although the prevalence of infection was underestimated.

Over 10% of the buffalo population in the region have been treated in the past with praziquantel to prevent infection. Moreover, a recent study has investigated the use of a Bayesian combined SEA-ELISA plus Kato-Katz modelling approach to further improve the accuracy of estimations based on the combined SEA-ELISA plus Kato-Katz results, taking into account the lack of sensitivity of either diagnostic test. A horizontal line within the box indicates mean prevalence; outliers are represented by a dark circle.
Research

Schistosoma japonicum in the Dongting Lake region, China

Julie Balen et al.

Control of schistosomiasis, and other neglected tropical diseases, is a crucial step towards achieving several of the Millennium Development Goals (MDGs), and hence our results are of considerable public health relevance.

We recommend the large-scale treatment of domestic livestock, particularly buffaloes, and, perhaps, buffalo vaccination, in addition to smaller scale, selective human treatment, in concert with health education and environmental management interventions that are readily adapted to the local eco-epidemiological settings.

Acknowledgments

We thank all study participants, staff from Hunan province and colleagues from the Chinese Ministry of Health who were involved in the third national schistosomiasis PES in 2004.

Funding: We acknowledge financial support from the NHMRC (Australia)/Wellcome Trust (UK) (ICRG Award) (DPM, GMW and YSL) and the Swiss National Science Foundation through project nos. PBBSB–109011 (GR) and PPOOB–102883 (JU). JB is the holder of a Northcote Graduate Scholarship.

Competing interests: None declared.

Table 2. Bivariate models showing the relationship of Schistosoma japonicum infection status (logistic regression), and infection intensity (negative binomial regression), with demographic descriptors, self-reported morbidity indicators and clinical disease among 3893 study participants from the 2004 PES in four villages in the lake embankment endemic setting, Dongting Lake region.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>SEA-ELISA Adjusted OR (95% CI)</th>
<th>P-value*</th>
<th>Combined SEA-ELISA plus Kato-Katz Adjusted OR (95% CI)</th>
<th>P-value*</th>
<th>S. japonicum infection intensity (epg) Adjusted IRR (95% CI)</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1810</td>
<td>1.00</td>
<td>&lt; 0.001</td>
<td>1.00</td>
<td>&lt; 0.001</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2083</td>
<td>2.59 (2.10–3.20)</td>
<td></td>
<td>3.04 (1.88–4.90)</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Age category (in years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–19</td>
<td>1056</td>
<td>1.00</td>
<td>&lt; 0.001</td>
<td>1.00</td>
<td>&lt; 0.001</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>20–39</td>
<td>1205</td>
<td>3.94 (2.71–5.72)</td>
<td></td>
<td>2.67 (1.30–5.49)</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>40–59</td>
<td>1369</td>
<td>6.08 (2.24–8.72)</td>
<td></td>
<td>3.64 (1.83–7.24)</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>≥60</td>
<td>263</td>
<td>8.38 (5.39–13.00)</td>
<td></td>
<td>4.57 (1.92–10.87)</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Village</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gaoqi</td>
<td>962</td>
<td>1.00</td>
<td>&lt; 0.001</td>
<td>1.00</td>
<td>&lt; 0.001</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Lianhe</td>
<td>984</td>
<td>3.94 (2.95–5.26)</td>
<td></td>
<td>3.72 (1.79–5.75)</td>
<td></td>
<td>3.46 (2.08–5.23)</td>
<td></td>
</tr>
<tr>
<td>Qixin</td>
<td>930</td>
<td>0.03 (0.01–0.12)</td>
<td></td>
<td>3.94 (1.95–5.94)</td>
<td></td>
<td>2.56 (1.05–3.67)</td>
<td></td>
</tr>
<tr>
<td>Zensheng</td>
<td>1017</td>
<td>3.11 (2.32–4.17)</td>
<td></td>
<td>4.21 (1.73–6.25)</td>
<td></td>
<td>5.10 (4.86–7.01)</td>
<td></td>
</tr>
<tr>
<td>Prior treatment history</td>
<td>2058</td>
<td>6.04 (4.67–7.82)</td>
<td>&lt; 0.001</td>
<td>10.32 (4.99–21.34)</td>
<td>&lt; 0.001</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>243</td>
<td>1.35 (1.22–1.56)</td>
<td>&lt; 0.001</td>
<td>0.20 (0.03–1.45)</td>
<td>0.034</td>
<td>0.03 (0.01–1.15)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Blood in stool</td>
<td>124</td>
<td>3.36 (0.84–6.14)</td>
<td>&lt; 0.001</td>
<td>2.48 (1.57–3.81)</td>
<td>0.002</td>
<td>3.17 (2.88–3.98)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Liver tenderness</td>
<td>153</td>
<td>n.s.</td>
<td></td>
<td>n.s.</td>
<td></td>
<td>6.67 (4.08–9.02)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Portal vein diameter (cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤8</td>
<td>194</td>
<td>1.00</td>
<td>&lt; 0.001</td>
<td>n.s.</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>9–10</td>
<td>916</td>
<td>4.07 (1.26–7.14)</td>
<td></td>
<td>4.12 (1.23–6.80)</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>11–12</td>
<td>2131</td>
<td>5.11 (2.89–8.72)</td>
<td></td>
<td>3.21 (2.85–4.48)</td>
<td></td>
<td>4.12 (1.23–6.80)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>452</td>
<td>5.61 (4.86–9.98)</td>
<td></td>
<td>5.57 (4.02–7.33)</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>180</td>
<td>7.75 (5.60–9.83)</td>
<td></td>
<td>6.37 (4.13–8.68)</td>
<td></td>
<td>4.51 (1.89–9.71)</td>
<td></td>
</tr>
<tr>
<td>≥15</td>
<td>20</td>
<td>7.00 (5.47–8.87)</td>
<td></td>
<td>7.75 (5.69–9.13)</td>
<td></td>
<td>4.51 (1.89–9.71)</td>
<td></td>
</tr>
<tr>
<td>Interior portal vein diameter (cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤8–8</td>
<td>1051</td>
<td>n.s.</td>
<td></td>
<td>n.s.</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>9–11</td>
<td>2429</td>
<td>4.77 (2.22–6.51)</td>
<td></td>
<td>6.07 (4.01–8.88)</td>
<td></td>
<td>4.51 (1.89–9.71)</td>
<td></td>
</tr>
</tbody>
</table>

CI, confidence interval; epg, eggs per gram; IRR, incidence risk ratio; OR, odds ratio; SEA-ELISA, soluble egg antigen - indirect enzyme linked immunosorbent assay. n.s. signifies variables not significant in the respective bivariate model. P-values based on the likelihood ratio test.
Prevalencia e intensidad de la infección por *Schistosoma japonicum* y morbilidad asociada en la región del lago Dongting, China

**Objetivo** Determinar la prevalencia e intensidad de la infección por *Schistosoma japonicum* y la morbilidad a ella asociada, y estimar las poblaciones humanas y de búfalos infectadas en la región del lago Dongting, en la provincia china de Hunan.

**Métodos** Usamos datos del tercer estudio epidemiológico nacional periódico sobre la esquistosomiasi (PES) de 2004. Como parte del mismo se hicieron 47 144 pruebas serológicas y 7205 análisis de heces en personas, 3893 exploraciones clínicas y encuestas a base de cuestionarios, y 874 análisis de heces en búfalos, en un total de 47 aldeas de la provincia de Hunan. Los análisis serológicos se realizaron mediante una técnica de inmunosorción enzimática y las muestras de heces humanas fueron examinadas mediante el método de Kato-Katz. La presencia de infección por esquistosomiasis en las heces de búfalos y otros animales domésticos se analizó mediante la prueba de incubación de miracidia.

**Resultados** La seroprevalencia fue del 11,9% (intervalo: 1,3–34,9%) para la misma población. La prevalencia de infección entre los búfalos fue del 9,5% (0%-66,7%). Extrapolando a la totalidad de la población de la región del lago Dongting, se estimó que estaban infectadas unas 73 225 personas y 13 973 búfalos. Los síntomas notificados con más frecuencia fueron el dolor abdominal (6,2%) y las heces sanguinolentas (2,7%). Más de la mitad de los participantes que habían sido examinados clínicamente declararon haber sido sometidos a tratamiento antiesquistosómico por lo menos una vez.

**Conclusion** Se observó una reducción importante del número de personas infectadas por *S. japonicum* desde el estudio nacional realizado en 1995, lo que puede atribuirse en parte a las campañas de antibióticoterapia emprendidas a gran escala. Sin embargo, el número prácticamente inalterado de infecciones detectadas en la población de búfalos lleva a pensar que persisten las reinfecciones humanas, susceptible de conducir a una recrudescencia de la prevalencia de la schistosomiasi en el hombre.
References
10. Li KI, Yang GH, Duan SS, Xia GH. [Re-emergence of schistosomiasis in Dali City after the criteria of transmission control were met]. Zhongguo Ji Sheng Chong Xue Yu Ji Sheng Chong Bing Za Zhi 2002;20:235-7.