

A CLINICAL EPIDEMIOLOGIC STUDY IN A SCHISTOSOMIASIS MANSONI ENDEMIC AREA

(Tuparecê, Minas Gerais) (1)

Mark D. C. GUIMARAES (2), Hélio L. de BARROS (3) and Naftale KATZ (4)

S U M M A R Y

A population-based clinical epidemiologic study on schistosomiasis mansoni was carried out in Tuparecê, Minas Gerais. The patients were interviewed for symptoms, water contact, past history and examined for spleen and liver enlargement. From the 830 people registered in the census, 777 (93.6%) had their stools examined (Kato-Katz method) and 696 (83.9%) were clinically evaluated. The overall index of *Schistosoma mansoni* infection was 43.2%. Significant and increased infection risks could be detected in the young age group (2-14 years old) regarding occupation, time of residence in the area and frequency of water contact. Bloody stools were significantly more prevalent among positives, while diarrhea was significantly more prevalent among those negative. The area was shown to have a low morbidity as well as a low intensity of infection measured by the number of *S. mansoni* eggs per gram of feces. A close correlation was found between water contact pattern and the age prevalence curve. It has emphasized the importance of habits in determining prevalence rates, besides suggesting that schistosomiasis mansoni in the area is manifested as a light and somewhat harmless infection with little consequence for the population as a whole.

I N T R O D U C T I O N

Schistosomiasis mansoni has long been considered a world problem deserving much care and attention from public health workers. Its wide geographic distribution, the high number of infected people and the possibility of its development into a severe form emphasize its importance as a public health problem. Many Authors throughout the world^{2,4,5,6,18,20,22,26,27,30} have pointed out the need of epidemiologic studies regarding schistosomiasis mansoni in endemic areas, in order to better evaluate its natural history and the real impact the disease might have on populations.

The present study aims to evaluate schistosomiasis mansoni in a small Brazilian community through a population-based approach, emphasizing relevant clinical and epidemiologic aspects and their impact in the community.

M A T E R I A L A N D M E T H O D S

The community, Tuparecê, is located within the northeast part of Minas Gerais State, Central region of Brazil. It has long been considered an endemic area for schistosomiasis presenting hyperendemicity characteristics^{4,16}. Tu-

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- (1) Sponsored by the CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico), Brazil
 - (2) Assistant Professor — Department of Preventive and Social Medicine, Faculty of Medicine-Federal University of Minas Gerais
 - (3) Medical Trainee — Department of Preventive and Social Medicine, Faculty of Medicine, Federal University of Minas Gerais
 - (4) "René Rachou" Research Center — FIOCRUZ, 30.000 — Belo Horizonte — MG, Brazil

parecê has 830 inhabitants and is located 800 km from the State capital, Belo Horizonte, where laboratory examinations were performed.

Stool Examination

The stool examination was performed using Kato as modified by KATZ et al.⁷ method. The *S. mansoni* eggs were counted and the mean of two thick smears considered the number of eggs per gram of feces. The intensity of *S. mansoni* infection was evaluated by the overall geometric mean number of eggs as well as by the proportion of low and high egg output (< 500 and > 500 eggs per gram of feces).

Medical Interview and Physical Examination

The patients were interviewed for symptoms, water contact and selected socio-economic characteristics such as family income, land property, presence of latrine, housing and time of residence in the area. The symptoms looked for were abdominal pain, diarrhea, blood-streaked-feces, hematemesis and enterorrhagia. Contact with natural water was evaluated as reasons of contact (bathing & swimming, fishing, playing, dishwashing and laundering) as well as its frequency (once a day as daily and the remaining ones as less than daily). Past history included previous treatment to schistosomiasis, hematemesis, splenectomy, alcohol drinking habits, convulsions and jaundice.

Both, interview and physical examination, were carried out without previous knowledge of the stool examination results.

All patients, except children under two years of age, were examined for liver and spleen enlargement. Liver right lobe size was measured in centimeters from the right costal margin at the hemiclavicular line, liver left lobe size from the left costal margin. Livers were considered palpable when measuring 1 centimeter or more without respiratory manoeuvre and their consistencies were evaluated as normal, hardened and hard. Those patients positive to schistosomiasis at the stool examination were classified in four clinical forms according to PESSOA & BARROS²⁷ as follows: intestinal form (palpable left and/or right liver lobes, spleen not palpable), hepatosplenic form (hardened or hard palpable liver and spleen) and

hepatosplenic decompensated (the same hepatosplenic form characteristics with portal hypertension signs such as ascites, jaundice, prominent abdominal veins). For the purpose of clinical classification, children under 5 years of age were excluded from the study²⁹.

Statistical Analysis

Selected statistics test used were: Student's t-test for the difference of means, Chi-square test for the difference of proportion, Odds Ratio based on Woolf's method³³ presenting 95% confidence limits for selected risk factors and Odds Ratio for multiple category table²³. The significance level considered was 0.05.

RESULTS

The census developed in the community presented 830 people eligible for the study (50.2% males and 49.8% females), 777 (93.6%) had their stools examined while in 696 (83.9%) a physical examination was carried out. The overall index of infection to *S. mansoni* was 43.2 and the geometric mean number of eggs was 85.9.

No significant difference was found with regard to selected risk factors such as sex, race, infection with other helminth, past treatment, land property, housing and absence of latrine when comparing positives and negatives (Table I). Increased infection risk (95% confidence limits) could be detected for the young age group (2-14 years old) regarding any occupation, time of residence in the area (> 10 years) daily frequency and any reasons of water contact while for the age group (15 years old and over) no significant risk was found (Table II).

There was a close correlation between water contact and the index of infection for both sexes, males and females, in all age groups (Fig. 1). The index of infection increased parallel to the number of water contact up to 10-14 age group, there was a fall for 20-24 years old and a somewhat stable figure thereafter.

The analysis of selected symptoms as well as the physical examination did not show a very significant morbidity due to schistosomiasis. There was neither hematemesis nor enterorrhagia in both negative and positive groups. Abdominal pain showed no statistically significant

T A B L E I

Percent distribution and mean value of selected characteristics according to *Schistosomiasis mansoni* positivity¹, in Tuparecê, Minas Gerais, 1981

CHARACTERISTICS	POSITIVE		NEGATIVE		SIGNIFICANCE LEVEL
	(n)	% or Mean	(n)	% or Mean	
1. Age	(311)	28.4	(385)	14.7	p < .05
2. Sex - Female	(159)	47.3	(231)	52.4	NS
- Male	(177)	52.7	(210)	47.6	
3. Daily water contact	(183)	63.3	(185)	53.5	p < .05
4. Reasons of contact					p < .05
No contact	(22)	4.6	(39)	7.8	
Swimming / Bathing	(113)	23.8	(102)	20.5	
Laundering	(99)	22.1	(71)	14.2	
Dishwashing	(105)	20.9	(90)	18.1	
Crossing	(92)	19.4	(103)	20.7	
Other	(43)	9.1	(93)	18.7	
5. Previous treatment	(41)	13.2	(70)	18.2	NS
6. Living > 10 years	(192)	57.1	(156)	35.4	p < .05
7. Latrine	(198)	60.6	(243)	58.1	NS
8. Occupation:					p < .05
Student	(74)	23.8	(83)	21.6	
Farm worker	(85)	27.3	(46)	11.9	
House worker	(86)	27.7	(59)	15.3	
Retired	(16)	5.1	(23)	6.0	
No occupation	(30)	9.6	(140)	36.4	
Other	(20)	6.4	(34)	8.8	
9. Land property	(31)	9.5	(56)	13.4	NS
10. Diarrhea	(75)	24.1	(132)	34.3	p < .05
Blood-streaked-feces	(109)	35.0	(93)	24.2	p < .05
Abdominal pain	(138)	44.4	(167)	43.3	
11. Palpation:					
Liver Right Lobe	(68)	21.9	(64)	21.0	NS
Liver Left Lobe	(72)	23.1	(77)	25.3	NS
Spleen	(16)	5.1	(13)	4.3	NS
12. Consistency ⁽²⁾					
Liver Right Lobe	(34)	50.0	(18)	28.1	p < .05
Liver Left Lobe	(49)	68.1	(35)	45.5	
Spleen	(11)	68.8	(8)	61.5	NS

(1) - Presence or absence of *Schistosoma mansoni* eggs in the stools.

(2) - Shown the percentage in relation to item 11, when the consistency was hard and/or hardened.

difference, while diarrhea was more prevalent among negatives and blood-streaked-feces among positives (Table I). Palpation of liver and spleen showed no significant difference when comparing positives and negatives. With regard to consistency, those with schistosomia-

T A B L E II

Schistosoma mansoni infection risks for selected characteristic according to age groups in Tuparecê — Minas Gerais, 1981

CHARACTERISTICS	2 - 14 ¹ O.R. ² (Confidence Interval)	15 ⁺ O.R. (Confidence Interval)
1. Frequency of water contact (daily contact)	2.52 (1.25 - 5.08)*	.93 (.49 - 1.78) ^{NS3}
2. Occupation:		
Student	4.96 (2.85 - 8.65)	2.60 (.46 - 14.83) ^{NS}
Farm worker	13.15 (2.76 - 62.60)*	1.38 (.47 - 4.09) ^{NS}
House worker	22.72 (5.26 - 98.10)*	1.03 (.35 - 3.03) ^{NS}
Retired	-	.54 (.16 - 1.78) ^{NS}
Other	-	.45 (.14 - 1.45) ^{NS}
3. Reasons of contact:		
Swimming / Bathing	5.22 (1.47 - 18.55)*	1.60 (.75 - 3.42) ^{NS}
Dishwashing	6.83 (1.88 - 24.74)*	1.25 (.60 - 2.63) ^{NS}
Laundering	9.80 (2.28 - 42.06)*	1.32 (.64 - 2.71) ^{NS}
Crossing	4.33 (1.18 - 15.90)*	1.03 (.49 - 2.13) ^{NS}
Other	1.14 (.30 - 4.36) ^{NS}	2.19 (.87 - 5.46) ^{NS}
4. Time of Residence (> 10 years)	4.01 (1.85 - 8.71)*	1.15 (.61 - 2.19) ^{NS}

(1) Years old

(2) Odds Ratio

(3) Non-statistically significant interval

(*) Statistically significant interval $p < 0.05$

sis presented more hard left and right lobes than those without schistosomiasis, while spleens showed no significant difference (Table I).

Mean age was significantly lower among those presenting high egg output, while most of the positive subjects (88.4%) had low egg output.

DISCUSSION

The need of studies which evaluate the consequences of schistosomiasis mansoni in a whole population has long been considered of outstanding importance, not only for a better understanding of the individual behaviour of the disease, but also for the development of an appropriate public health approach for its control. Two often used methods for this evaluation, namely, the number of infected people and the intensity of the infection in the community, have brought about a clear distinction between schistosomiasis-infection and schistosomiasis disease. Emphasis has been placed on the latter since most studies performed are clinical and/or hospital based, and some population-based surveys lack a negative control group, usually due to the high number of infected subjects. The present study tried to overcome these problems by developing a population-based approach as well as a control group for comparison with those infected people regarding selected risk factors and consequences of the *S. mansoni* infection.

Most variables measured in the present study showed no statistically significant difference when positives and negatives were compared. Several Authors have pointed out similar results regarding sex and/or race^{1,2,4,18,22}. While DIAS⁹ and FAROOQ & MALLAH¹⁰ found higher prevalence among males, although these differences were due mostly to social and religious practices. A fall in schistosomiasis prevalence shortly after treatment is usually found, but as time passes and the possibilities of exposure do not decrease high re-infection rates, specially among children are common^{3,6,7,18,19}.

In fact, in the present study no significant difference with respect to past treatment, when comparing positives with negatives, was found even though the time considered was up to ten years before interview.

Different patterns of exposure to water vary from place to place where schistosomiasis mansoni studies are carried out, because exposure depends upon socio-economic level and professional and leisure activities. JOBIN & RUIZ-TIBEN¹³ reported that most contacts were caused by play, bathing and laundering and that school children had the highest proportion of water contact among all groups. In Egypt,

male children up to 10 years old accounted for 50 percent of the total activity in water, and water contact was mostly due to bathing and SWIMMING¹⁰. In St. Lucia, JORDAN¹⁴ pointed out a close correlation between percentage of contact with natural water and percentage of schistosomiasis cases by age and sex.

In the present study, similar results have been obtained with regard to contact with water and index of infection (Fig. 1). The same rise in the index of infection was followed by a rise in the percentage of water contact. The most common reasons of contact were bathing, swimming, dishwashing and laundering. The age-prevalence curve presented in the study (Fig. 2) is in accord with most investigations to date^{4,11,14,22,25,26,28,30}. There is a steep rise from the first decade of life with a maximum peak in the second decade and a relatively constant prevalence thereafter. Age has actually been one of the most important factors in determining *S. mansoni* infection in the area as can be seen through the estimated risks reported in this investigation (Table II). Water contact patterns are determined by age, which is in accord with the above mentioned studies. The risk of becoming infected is greater for young people (less than 15 years old) than for adults, since the latter are, in most instances, already infected. PESSOA & AMORIM²⁸ have already mentioned that "schistosomiasis is a disease of young people and that adult schistosomiasis is generally the result of infections acquired in youth".

Despite the fact that ecology has played an important role in determining schistosome infection patterns in this area, immunological mechanisms might have influenced this and other endemic areas with regard to the age pattern herein presented. More epidemiologic investigations must be carried out in order to evaluate the real significance of immunological factors in a general population instead of analysing only individual factors⁸. Most probably the decrease of prevalence in older ages is due to a combination of both immunity ecology.

Clinical severity of chronic schistosomiasis has often been evaluated by the stated symptomatology, spleen and liver size as well as their respective consistency. In the present study the only symptom found to be statistically significant different was blood-streaked-feces, but sin-

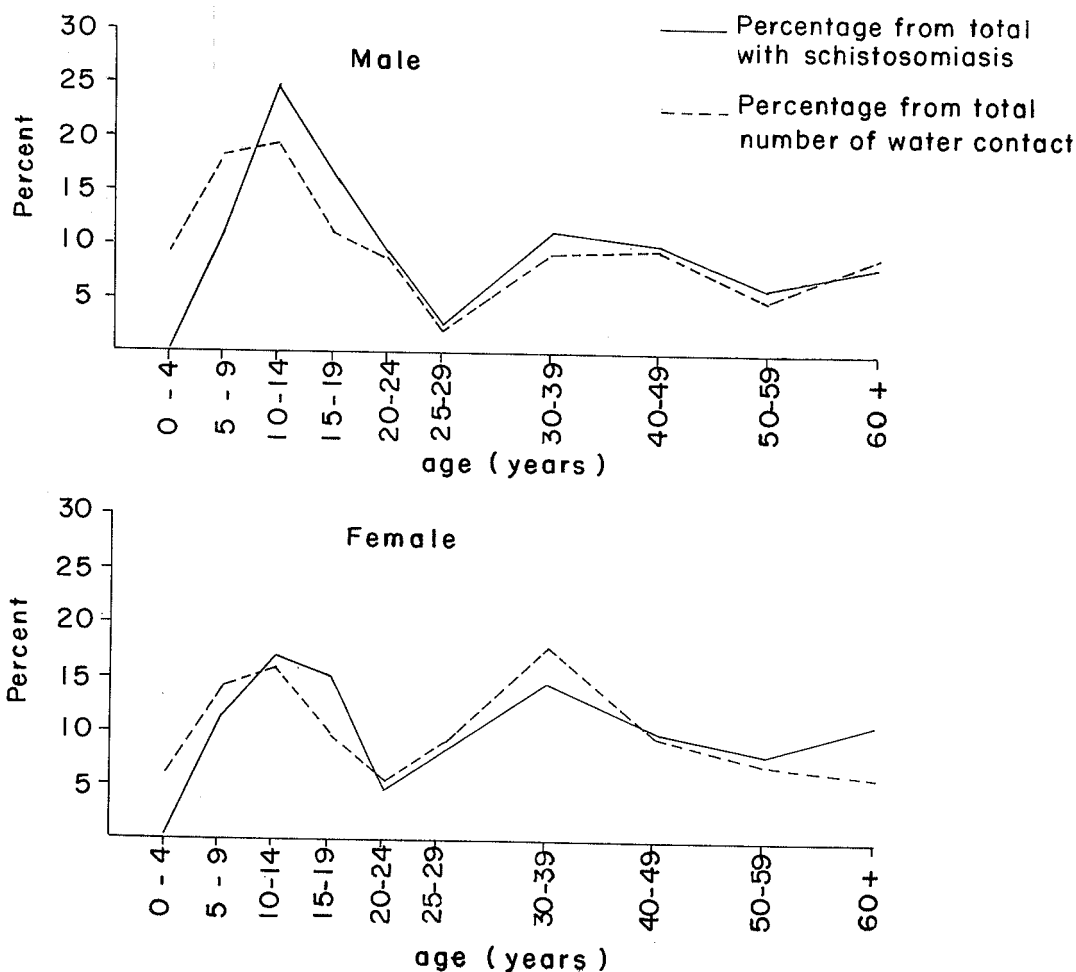


Fig. 1 — Correlation between stated water contact and *S. mansoni* infection by Age and Sex, in Tuparecê, Brazil, in 1981.

ce other helminth and protozoa infections are common in the region, it can not be said that this symptom was actually due to schistosomiasis. Similar results were found by HIATT¹¹ and OMER et al.²⁵, while BARBOSA¹ and COOK et al.⁵ found no difference in any of the symptoms analysed. With regard to spleen and liver size, some Authors^{6,30} have found a significant difference in splenomegaly and/or hepatomegaly when comparing a heavy-moderate group with those uninfected while CLINE et al.⁵ pointed out that palpable liver occurred more frequently among those infected 20 years old or more. In the present study no significant difference was found regarding spleen and liver palpation when comparing either positives with negatives, or low egg-output with high egg-

output. We have found that there is not a very clear clinical picture that could be attributed to schistosomiasis despite the evidence of some significant differences. This is in accord with many Authors who have shown that *S. mansoni* infection in some endemic areas is usually asymptomatic with low morbidity levels^{5,6,21,23}.

Following the points mentioned above and taking into consideration the nature of the present study, that is, a clinical-epidemiologic and population-based survey, two conclusions shall be regarded as important: (1) Age, as presented in this investigation is considered an outstanding risk factor for acquiring *S. mansoni* infection (with young subjects being at a higher risk), and emphasis is placed on the importance

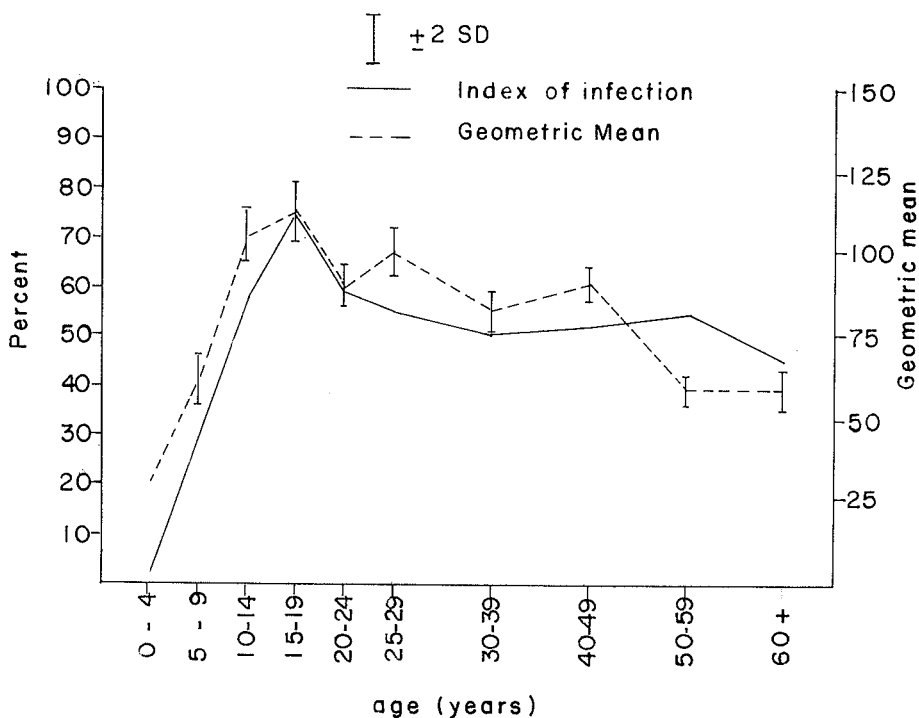


Fig. 2 — Percent Distribution of *S. mansoni* infection and Geometric Mean number of eggs per gram of feces by Age, in Tuparecê, Brazil, in 1981.

of population habits, and water contact patterns as one plausible explanation for this finding; (2) Schistosomiasis mansoni, in this investigation, is manifested with low morbidity and has no or little consequence for the population as a whole, emphasizing the distinction between infection and disease and their consequence to the community. More epidemiologic studies are needed for a better understanding of schistosomiasis mansoni's natural history and its consequences at the individual as well as the population level.

RESUMO

Estudo clínico-epidemiológico em uma área endêmica de esquistossomose mansoni (Tuparecê, Minas Gerais)

Foi feito um estudo clínico-epidemiológico da esquistossomose mansoni na população de Tuparecê, Minas Gerais. Foi realizado a entrevista com relação a sintomas, contato com águas naturais, história pregressa, tendo sido ainda examinados o baço e o fígado. Das 830

pessoas registradas no censo, 777 (93,6%) tiveram as fezes examinadas (método Kato-Katz) e 696 (83,9%) foram clinicamente avaliadas. O índice de infecção foi de 43,2% não tendo sido encontradas diferenças significativas quanto ao sexo, cor e a maior parte das variáveis sócio-econômicas. Foram encontrados maiores riscos de se adquirir a infecção no grupo etário mais jovem (2-14 anos) com relação a ocupação, tempo de residência na área e frequência de contatos com águas naturais. Fezes com estrias sangüíneas foram mais frequentes entre os positivos, enquanto que diarréia o foi entre os negativos. A morbidade e a intensidade da infecção, medida pelo número de ovos de *Schistosoma mansoni* por grama de fezes, foram baixas. Foi encontrada uma estreita correlação entre os padrões de contato com águas naturais e a curva de prevalência por idade. O presente trabalho enfatiza a importância dos hábitos na determinação dos índices de infecção além de apontar que a esquistossomose mansoni, nesta área, se manifestou sem graves consequências para a população como um todo.

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