Schistosoma mansoni Associated Morbidity in Gezira: Determined by Clinical and Ultrasound Examination

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Abstract

Background: Schistosomiasis is the most common problem in Gezira area. The prevalence among school children could reach up to 90% in some villages. This study was conducted in a small village in the Gezira area in central Sudan. This part of the Gezira is well known for its high endemicity of Bilharzia.

Methods: A total of 428 individuals were included in the study. All were examined clinically and by Ultrasoundography for spleen and liver. Stool specimens were also taken from all the subjects and were examined for Schistosoma mansoni ova.

Results: The prevalence of schistosomiasis was found to be 72.8% in males and 68.5% in females. It was also observed that the overall prevalence of splenomegaly on the examined subjects was 35.8%. Males recorded higher prevalence of splenomegaly (38.8%) compared to females (32.7%) (p < 0.05). The observed prevalence of hepatomegaly was 17.6% with high prevalence among males (13.1%) compared to females (11.7%). Out of the 406 subjects examined by ultrasound, 266 (63.1%) were found to have evidence of periportal fibrosis. The prevalence of splenomegaly in grade 1, 2 and 3 was 3.1%, 46% and 50% respectively. The prevalence of hepatomegaly in the different grades 1, 2 and 3 are 12.6%, 3.8% and 0% respectively.

Conclusion: It is clear from the above data that the size of the spleen increases while the size of the liver decreases with the severity of periportal fibrosis.

Key words: S. mansoni, Sudan, Gezira, ultrasoundography, hepatosplenomegaly

Introduction

The Gezira province lies between the Blue Nile and the White Nile (Gezira in Arabic means Island). The Gezira Scheme, which is the biggest single farm in the world under same irrigation and administration system, is located in this area. Cotton, wheat and sorghum which form the backbone of the country’s economy, are mainly grown in this area. The most common health problems in this area are the waterborne diseases S. mansoni, malaria and diarrhoeal diseases.

The prevalence of Bilharziasis is very high and in certain areas, especially among school children, it could reach up to 90% [1]. Patients generally present with abdominal pain and blood in stools. Those with complications of periportal fibrosis present with hepatosplenomegaly and in severe advance cases present with haematemesis from oesophageal varices.

Abdel Wahab et al. [2] and Homeida MA [3] were the first to report that ultrasound images could be pathognomonic for periportal fibrosis of S. mansoni, especially for epidemiological studies and for evaluation of control programmes.

Materials and Methods

Study Area and Patients

This study was conducted in a small village – El Taweel in the Gezira province in 1994. The village is situated along a small canal some 250 Kilometers south of the capital Khartoum. The houses in the village lie about 10-20 meters from the canal and most are very close to the fields. The whole population belongs to three main tribes-Rawashda, Tana and the Messerta. All the villagers (men, women and children) work in the fields most days
of the year. The only source of water in the village is the canal water, which is used for drinking as well as for other domestic purposes.

The total population of the village was about 900 persons. A total of 428 subjects (214 males and 214 females) were randomly selected and included in the study. The average age for the population was 20.2 years (males 19.5 and females 20.9). The age range for both sexes was 2-95 years.

All the villagers were told about the study and well informed, their consent was obtained. A meeting between the authors and the local village leaders was held. A map of the village was drawn, the houses were identified and were given numbers. A house-to-house survey was carried out.

Clinical examination

A senior physician and two well-trained medical officers and a medical registrar in internal medicine performed the clinical examination. The left lobe of the liver and the spleen were palpated. A liver extending more than 3 cms below the sternum in the sternal line was regarded as enlarged. A palpable spleen was considered pathological in all cases.

Ultrasound Evaluation

Complete abdominal ultrasound examination was performed in each study patient using Aloka SSD 500 – ECHO camera and a 3.5 MHZ convex probe. Assessment of the liver and spleen, including sonomorphometrical evaluation as reported by Dittrick and others [3] was performed in defined sections along the sternal, mid-cavicular, and anterior axillary line. The spleen was scanned in longitudinal and transverse sections. Liver size, peripheral portal vein branches (PPVB) spleen size and splenic vein diameters were assessed according to Hameida et al [4] 1988 and the Cairo working group [5], 1992. The number of subjects who had ultrasound examination was 406. Periportal fibrosis was graded 0 to 3.

Grad 0: Corresponds to normal liver with no thickening of the wall of the peripheral portal vein branches. Diameter of PPVB is around 3 mm.

Grade 1: Corresponds to a pattern a small stretches of fibrosis around secondary portal vein branches. PPVB diameter around 4mm.

Grade 2: In addition to the above most second order branches appear as long segments of fibrosis. Peripheral portal vein branch (PPVB) diameter around 5-6mm. The gall Bladder wall thickness may be increased above 4mm.

Grade 3: Shows wall thickening in almost all peripheral portal vein branch. Fibrosis reaches the surface of the liver. In some branches the lumen was occluded. PPVB diameter was greater than 7 mm. Gall Bladder wall thickness above 4mm.

Results

Infection intensity by age and sex: The highest levels of eggs count were found in the adolescent males between 21-25 years with another two peaks in males 11-15 years and 30 to 40 years. Infection levels were on average higher in females than males in the age below 20 years. Above 20 years males were more infected than females. However, in all age groups difference in infection levels between males and females groups were not highly significant. Eggs counts were found to be higher in grade 2 fibrosis compared to grade 1 and grade 3.

Prevalence of S. mansoni by age and sex: The prevalence of S. mansoni was 72.8% in males and 68.3% in females. Below 20 years of age the prevalence was comparable, males (71.6%) and females (75.6) while above 20 years the prevalence was significantly higher (P = 0.001) in males (75.2%) while in females (40.7%). This difference was mostly accounted for by the observation made on the 21-30 years age group.

In females indeed the prevalence was at its peak (85%) among the 11-15 years group and decreased sharply after the age of 20 years to reach its lowest
levels (38%) among the 20-30 years group. However prevalence went up sharply to around 60% in older women. In contrast, to the case of females prevalence in males remained high until the age of 40 years, reaching 90% in the age group 21-25 years and then began to decrease among the elderly.

Since hepatosplenomegaly is the most important criteria to identify in patients with intestinal schistosomiasis we have analyzed the clinical data on 428 subjects examined (table 1).

| Table 1: Frequency of clinically detected hepatomegaly and splenomegaly |
|---------------------------|----|----|-----|
|                          | M  | F  | Total |
| Splenomegaly             | 83 | 70 | 153  |
| Hepatomegaly             | 29 | 25 | 54   |

It was observed that the overall prevalence of splenomegaly on the examined subjects was (35.8%): 38.8 for males and 32.7% for females. The prevalence of hepatomegaly was 12.6%; 13.1% for males and 11.2% for females. Of the 406 subjects who were examined by ultrasound, 266 were found to have evidence of periportal fibrosis (63.1%)-table 2.

| Table 2: Ultrasound situation of 406 subjects with frequency of different grades: |
|---------------------------|----|----|-----|
| Grade                    | Total | M  | F  |
| 0                        | 140  | 73 | 67 |
| 1                        | 230  | 101| 129|
| 2                        | 26   | 16 | 10 |
| 3                        | 10   | 10 | 0  |

In grade 0 where no evidence of PPF was found, the prevalence of splenomegaly was 35.7% and hepatomegaly 15%. The prevalence of splenomegaly in grade 1, 2 and 3 was 34%, 46% and 50% respectively. These results clearly indicate that the size of the spleen increases with the degree of severity of fibrosis. The prevalence of hepatomegaly in the different grades 1, 2 and 3 were 12.6%, 3.8% and 0% respectively showing that the liver size decreases severity of fibrosis – table 3.

| Table 3: Frequency of hepatosplenomegaly in different grades |
|---------------------------|-----|-----|-----|
| Grade                    | Splenomegaly | Hepatomegaly |
| 0                        | 50 (35.7%) | 21 (15.0%) |
| 1                        | 79 (34.3%) | 29 (12.6%) |
| 2                        | 12 (46.2%) | 2 (7.5%)   |
| 3                        | 5 (50.0%)  | 0          |

It is also clear from the above data that there is a significant correlation between the spleen size and liver ($r = 0.02283, P < 0.001$) in grade 1 while in grade 2 and 3 there is no significant correlation.

Discussion

The village of El Taweel was selected for this study because of several important criteria. All the population belongs to three tribes, which are very close ethnic group who moved from western Sudan, non-endemic area for Bilharzia, 15-20 years before the study. The source of water for the whole village was from one canal, where water for drinking and other domestic purposes was collected. The village had also never been included in a mass treatment program for schistosomiasis. Another important factor that the majority of the population had never been treated with antibilarzial drugs.

From the previous results the prevalence of S. mansoni infection assessed on 4-5 stool specimens was around 70%. Given the sensitivity of five Kato specimens, this indicates that some 80-90% of the population probably harboured living infection.

In contrast to the high prevalence, infection intensities were not high, most subjects excreted less than 100 eggs/gm with an average geometric mean of 34 eggs/gm in males and 38 eggs/gm in infected females respectively.

Another interesting finding is that, the prevalence of infection was high and stable among the 11-40 years male age groups. The intensity of infection in infected subjects did not vary markedly in those age groups. This suggests that a strong acquired immunity has not yet developed among the male population of this village. The most likely explanation of this finding is that 15-20 years of
exposure is probably not enough to develop strong immunity in an area of low intensity of infection, (Alain Dessein, personal communications). Another point of interest is that prevalence and infection intensity decreases sharply in females between 15-30 years of age. This could be explained by the fact that women at this age work less in the fields, and therefore, have less contact with water in irrigated areas. Another possibility could be due to hormonal factors in women.

A relationship between S. mansoni infected and hepatosplenomegaly had been well established in the literature [6]. However, previous investigations of organ enlargement included by S. mansoni have used different criteria to quantify liver enlargement. We have also shown that the spleen size increases with the degree of severity of fibrosis, while the liver decreases in size. It is beyond doubt that the validity of spleen palpation was still better than liver palpation as clinical splenomegaly was confirmed by Ultrasoundography more than hepatomegaly. This fact can probably be explained by the different definitions of organ enlargement. A spleen palpable is 2-3 times enlarged. Although the sensitivity of clinical findings hepatosplenoamgaly is low as an indicator of PPF (37%) compared with confirmed PPF by ultrasound (63%). Nevertheless, we consider hepatosplenoamgaly as a good indicator for S. mansoni. Indeed the work of other researchers (e.g. Houstan et al 1990, Richard et al. 1992) reported similar findings.

The findings in the paper support the clinical importance of splenomegaly in severe degrees of periportal fibrosis in endemic areas for S. mansoni. Yet other causes of hepatosplenoamgaly, splenomegaly e.g. malaria, viral hepatitis have to be considered.

In conclusion ultrasound examination is essential for the diagnosis of periportal fibrosis in endemic areas. As the overall morbidity related to this disease in the Gezira is very high, programs for prevention have to be fully supported.

References