

Surgical Pathology of Schistosomiasis

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Schistosomiasis remains an important health problem in many tropical countries and is being seen with increasing frequency in immigrant populations and tourists in developed countries. The pattern of organ involvement and clinical presentation of schistosomiasis in 80 patients (male: female, 9:1) during a five-year period (2001–2005) was examined from archival histopathology records. The urinary bladder was the most common organ affected [50 (62.5%)]. Gastrointestinal, male and female genital schistosomiasis were detected in 12 (15%), eight (10%) and five (6.1%) cases, respectively. Hematuria was the most common presenting symptom [34 (42.5%)], and bladder cancer was the only malignancy found to be associated with the infection. A high clinical index of suspicion usually allows for a preoperative diagnosis where indicated and avoidance of radical surgery. While research for the development of an effective vaccine continues, a plea is made for the expansion of multinational control programs in sub-Saharan Africa.

Key words: schistosomiasis ■ bladder ■ cancer

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INTRODUCTION

Schistosomiasis comprises a group of infections caused by parasitic trematode worms of the genus *Schistosoma*. Of the 10 species that can infect humans, *Schistosoma mansoni*, *haematobium* and *japonicum* cause the vast majority of infections.¹ Schistosomiasis remains the second most important parasitic disease of humans after malaria, with about 600 million people mainly in tropical countries at risk.² Of the 200 million people infected worldwide, 120 million are symptomatic, and 20 million have severe disease.³

Sub-Saharan Africa bears 85% of the total burden of the disease, while the remainder occurs in South and

Central America, the Caribbean, and the far and Middle East.^{1,3,4,5} Travelers to endemic areas (particularly Africa) are at high risk of infection, and with increasing immigration globally, the chances of importing this disease to nonendemic areas are greatly increased.^{6–9}

Although mortality related to schistosomiasis has generally been considered to be low,⁴ considerable morbidity occurs and life-threatening complications may result with remarkable pathological changes in various organs and tissues depending on the infecting parasite species.^{10,11}

Some of the schistosoma-induced lesions could mimic malignant conditions, leading to unnecessary or radical surgery.^{12–14} The development of immunodiagnostic assays for serologic diagnosis of schistosomiasis and polymerase chain reaction (PCR) as highly sensitive and specific diagnostic methods have facilitated detection of the disease even though they are mainly utilized in reference laboratories.^{15,16} Direct visualization of the parasite ova, however, remains the “gold standard” for diagnosis.¹⁷ While urine, stool, semen and cervical swabs constitute some of the readily available specimens for ova identification, in some cases, ova are not shed even in the presence of active disease.^{9,11,18–20} Hence, biopsy of affected tissues or organs provides alternative samples for histologic diagnosis.

Schistosomiasis is endemic in the hot, dry northern region of Nigeria, where *S. haematobium* is the predominant parasite species, while *S. mansoni* is less prevalent.^{21,22} We therefore analyzed the cases of histologically confirmed schistosomiasis from our surgical pathology records in order to ascertain the pattern of organ involvement and clinical presentation of the disease.

MATERIALS AND METHODS

Eighty cases of schistosomiasis diagnosed in the histopathology department of Aminu Kano Teaching Hospital, Kano, Nigeria, between January 2001 and December 2005 constituted the materials for this study. The study was retrospective, and most of the samples were obtained by endoscopic biopsy or during surgical operations.

Information regarding the age, sex, anatomical distribution of lesions, pertinent clinical features and histopathological diagnosis was collated from the surgical pathology register and histology request forms. Analysis was done using SPSS® version 10.

RESULTS

Over the five-year period, 80 cases of schistosomiasis were diagnosed, comprising 72 males (90%) and eight females (10%) with a male:female ratio of 9:1. The age range was 7–80 years, with a mean of 38.1 years. The peak age was between 21–40 years (46.3%) (Figure 1).

The anatomical distribution of schistosoma-induced lesions is shown in Table 1. It reveals the urinary bladder to be the most common organ affected in 50 (62.6%) cases. Coexisting carcinoma of the bladder was found in 15 (30%) of them. Other parts of the urinary tract were involved in five (6.3%) cases. In 12 cases, the gastrointestinal organs were affected, with the vast majority affecting the appendix. The male and female genital organs were affected in eight (10%), and five (6.1%) cases, respectively.

Table 2 summarizes the salient clinical features at presentation, hematuria being the most common symptom.

DISCUSSION

The present study provides useful information on the pattern of organ involvement in schistosomiasis. While autopsy studies usually document observations in asymptomatic individuals, this study recognized the clinical

presentation in relation to anatomical distribution of lesions. The pathological features of schistosomiasis arise from the host’s immune response to eggs deposited in various organs and tissues and the granulomatous inflammatory reaction to soluble egg antigens deposited at these sites.^{2,5,11} The mechanism for granuloma formation is through a delayed type hypersensitivity reaction.²³

S. haematobium primarily affects the genitourinary tract where it leads to hematuria, chronic cystitis, pyelonephritis, obstructive uropathy and increased risk of bladder cancer.^{5,9,11,24-28} The ureters, urethra and genital organs of both males and females may also be involved.²⁴ It is therefore not surprising that the bladder recorded the greatest proportion of cases in this study. Bladder affection was in the form of pathognomonic sandy patches and polyps that clinically presented as painless hematuria. In 30% of cases with bladder lesions, there were associated tumors that were histologically confirmed to be carcinomas, the majority (60%) of which were squamous cell carcinomas. This is in accordance with the firmly established link between this species with bladder cancer.²⁷⁻³⁰ The striking male preponderance may be explained by the greater predisposition of young boys to infection due to frequent contact with water bodies and also the majority of the farmers in the community tend to be males.²¹

Obstructive uropathy has been recognized to be a common and dangerous sequel of *S. haematobium* infection of the interstitial and juxtavesical portions of the ureter due to the common blood supply with the blad-

Table 1. Anatomical distribution of lesions

Organs	Males	Females	Total (%)
Urinary Tract (n=55)			
Bladder	49	1	50 (62.6)
Ureter	3	–	3 (3.8)
Urethra	1	1	2 (2.5)
Male Genital Organs (n=8)			
Prostate	4	–	4 (5)
Testis	3	–	3 (3.8)
Epididymis	1	–	1 (1.2)
Female Genital Organs (n=5)			
Ovary	–	2	2 (2.5)
Ovary + fallopian tube	–	1	1 (1.2)
Fallopian tube	–	1	1 (1.2)
Vulva	–	1	1 (1.2)
Gastrointestinal Tract (n=12)			
Appendix	6	1	7 (8.8)
Colon	2	–	2 (2.5)
Rectum	1	–	1 (1.2)
Liver	2	–	2 (2.5)
Total	72	8	80 (100)

der.⁹ Three patients with hydroureter and hydronephrosis presented with this complication, and excision of the site of ureteric stricture demonstrated mural fibrosis with accompanying schistosomal granuloma. The urethra, although rarely involved,²⁴ was found to be affected in an elderly male with urethral stricture and a female with a small polyp protruding from the urethral orifice.

The problem of male genital schistosomiasis, though previously neglected, has been receiving renewed interest because of its association with hemospermia, particularly in travelers to endemic areas from nonendemic areas.^{18,31,32} The prostate and seminal vesicles have been shown by postmortem studies to be as frequently involved by egg-induced lesions as the urinary bladder.^{10,33} The four cases of prostatic involvement in this study were incidental findings in men who had prostatectomy for benign nodular hyperplasia. An earlier study from our center has previously documented the paucity of prostatic involvement by the disease.³⁴ Although schistosomiasis is rarely associated with male infertility,³⁵ testicular or epididymal lesions can occur, where they may simulate malignancy¹⁴ or infarction,³⁶ or cause acute scrotal pain.³⁷ Diagnosis, therefore, requires a high index of suspicion, as in our cases, where incision biopsy aided in confirmation of diagnosis, allowing for a conservative approach in management and avoidance of unnecessary radical surgery.

Female genital schistosomiasis (FGS) has been regarded as a common complication of *S. haematobium* infection, occurring in 50–80% of parasitized females.³⁸ Its significance in *S. mansoni* infection is not precisely known but is also considered not to be uncommon.³⁸ Only five of our patients demonstrated lesions in fe-

male genital organs, the ovary being most commonly involved. Considerable research on FGS has focused on its effect on fertility and pregnancy,³⁹⁻⁴² but renewed interest now lies in its role in facilitating transmission of sexually transmitted infections, including human immunodeficiency virus (HIV) and human papilloma virus (HPV).^{32,43,44} This is of immense concern in sub-Saharan Africa considering the high rates of HIV and HPV-associated cervical cancer even though a clear link with cervical cancer and HIV is yet to be established.^{17,38}

The appendix was the organ mainly affected in the gastrointestinal tract. In four of the cases, there was significant deposition of ova, granulomatous reaction, congestion and edema to suggest that schistosomiasis was the primary event that led to appendicitis. In the remainder, acute inflammation was associated with scant ova and granulomas. In the colon and rectum, polyps or inflammatory masses are frequent manifestations, and *S. mansoni* is the most common parasite associated.^{2,5,10} Some investigators have proposed a link between colorectal cancer and schistosomiasis,^{13,45} but none of our cases had coexistent bowel cancer. Recognition of pertinent clinical information again prompted incision biopsy and permitted a suitable surgical approach for one of the patients who presented with intestinal obstruction, while the others were treated conservatively.

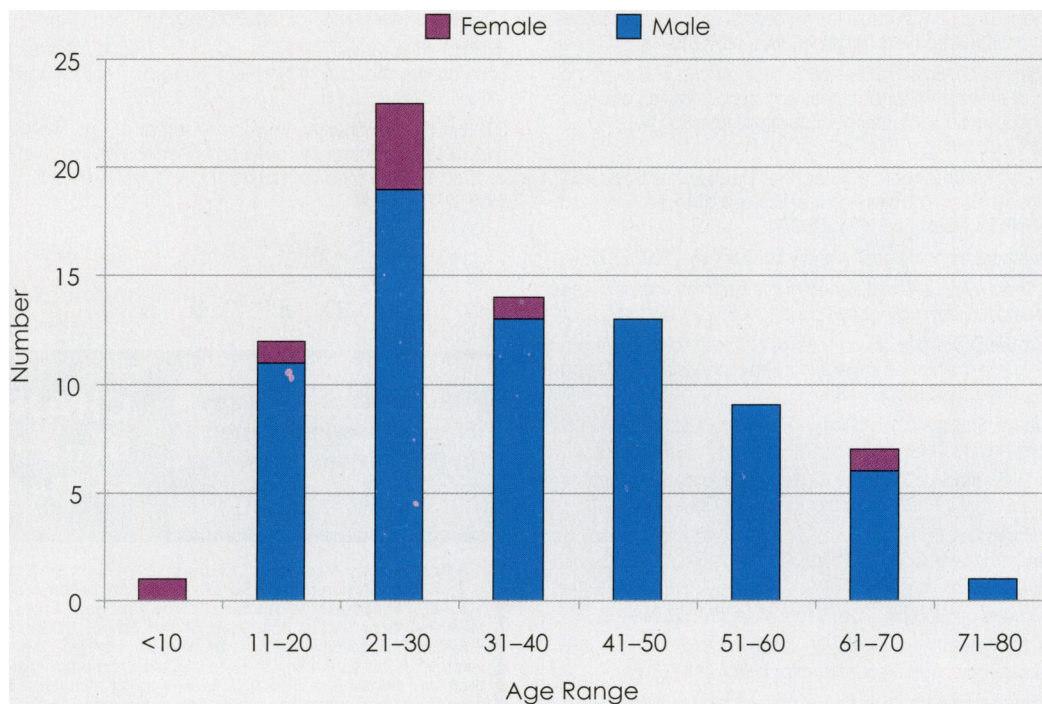
Hepatic disease, which was observed in two teenagers, was characterized by remarkable regression of the liver and spleen, which were significantly enlarged at presentation following administration of praziquantel and correction of anemia.

Our findings call for enhanced strategies to control the infection. In order to decrease morbidity associated

Table 2. Summary of clinical presentation

Anatomical Sites	Main Clinical Presentation	Number
Urinary bladder	Bladder mass	16
	Hematuria	34
Ureter	Hydronephrosis	3
Urethra	Urethral stricture	1
	Polyp	1
Prostate	Benign nodular hyperplasia	4
Testis	Scrotal mass	2
	Acute scrotal pain	1
	Chronic epididymo-orchitis	1
Epididymis	Chronic epididymo-orchitis	1
Ovary	Ovarian cyst	2
Tube/fallopian tube	Tubo-ovarian mass	1
Fallopian tube	Ruptured ectopic gestation	1
Vulva	Polyp	1
Appendix	Acute appendicitis	7
Colon	Intestinal obstruction	1
	Abdominal mass	1
Rectum	Bleeding per rectum	1
	Hepatosplenomegaly	2
Liver	Hepatosplenomegaly	2
Total		80

Figure 1. Age distribution of schistosomiasis according to gender



with schistosomiasis, the best approach to control may well be prevention. Even though the urinary and genital organs are most frequently affected, ecological changes in the future may conceivably alter the distribution of parasite species which may have public health implications.^{2,22,27} For an effective control program to achieve any success, modification of snail habitats and employment of molluscicides should complement current strategies utilizing large-scale, population-based chemotherapy even as ongoing research in development of an effective vaccine continues to show promise.^{5,46,47} Despite significant advances in chemotherapy of schistosomiasis over the last two decades, the emergence of resistance to praziquantel poses new challenges to the control of this infection.⁴⁸⁻⁵⁰ The expansion of the multinational control program in Africa funded by the Bill and Melinda Gates Foundation provides new hope for millions of affected individuals in sub-Saharan Africa.

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