Female Genital Schistosomiasis (FGS) Prevalence and Distribution Across Three Endemic Countries, Timeline, and Age Groups

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ECTMIH 2023 UTRECHT

Code of submission: 87

ABSTRACT

Introduction: Schistosomiasis is the world's second-deadliest parasitic disease caused by a trematode parasite of the genus *Schistosoma*. Female Genital Schistosomiasis (FGS) is caused by *S. haematobium* and is predominant in young girls between 12-15 years old. In Lower Middle-Income Countries (LMIC), like Zambia, Ghana, and Tanzania where schistosomiasis is endemic, knowledge regarding FGS is incomplete and often confused with other sexually transmitted diseases. FGS remains largely overlooked within the national health systems and Neglected Tropical Diseases (NTDs) programs, which causes a chronic gynaecological condition that leads to substantial morbidity, infertility, cervical cancer, and syphilis disease.

Methods: We wanted to determine the prevalence of FGS based on the presence of parasite DNA and diagnostic tests in females across age groups from a database of field-acquired human samples from Zambia, Tanzania, and Ghana over multiple years.

Results: For Ghana, 39 out of 90 samples were females of which 31 (79.5%) were positives and 8 (20.5%) were negatives. In Zambia (2016), 80 out of 133 samples were females of which 46 (57.5%) tested positive and 34 (42.5%) were negative. For Zambia 2017, 60 out of 110 samples were females of which 45 (75%) tested positive and 15 (25%) tested negative. In Tanzania, out of 104 samples 70 females of which 43 (61.4%) tested positive and 27 (38.6%) negatives.

Conclusion: The outcome highlights that FGS is predominant among females in different endemic countries. This study will help determine and explore the burden of FGS to develop strategies to control FGS and improve current intervention measurements for Schistosomiasis.

INTRODUCTION

- **Schistosomiasis** is the second most prevalent and socio-economically devastating parasitic disease after Malaria in the world.
  - Affecting 220 million people.
  - It is caused by helminth parasites of the genus *Schistosoma* namely *Schistosoma mansoni* and ***S. haematobium***.

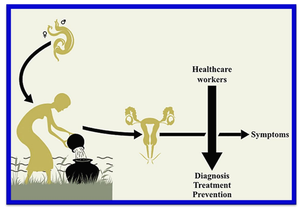

Figure 1. FGS parasitology[1].

WHAT IS FGS

- **Female genital schistosomiasis (FGS)**
  - Caused by: ***Schistosoma haematobium***.
  - Predominant in young age girls between 12 to 15 years old.
  - **Overlooked, Neglected,** and impact the health and well-being of females in affected countries.
- FGS is a **chronic gynecological condition** causing
  - Substantial morbidity
  - Infertility
  - Human papillomavirus Virus (HPV)
  - Genital itching/bleeding
  - Dyspareunia
- Human Immunodeficiency Virus (HIV)
  - FGS is responsible for up to a three- to four-fold increase in the horizontal transmission of HIV/AIDS
- Cervical Cancer
- Syphilis disease and other STIs

OBJECTIVE

To determine the prevalence and burden of FGS based on the presence of *S. haematobium*-specific DNA and diagnostic tests in females across age groups from multiple databases of our previously field-acquired human-filtered urine samples from Zambia, Tanzania, and Ghana over multiple years.

MATERIALS and METHODS

FGS presence

- Multiyear data scanning.
- Number of total samples vs. detected only for FGS.
- FGS – *S. haematobium* information among girls and women.

FGS Prevalence

- Infection prevalence in each year.
- Infection prevalence based on DNA concentration.
- Infection prevalence based on diagnostic test (common tests across years).

FGS distribution

- Geographic distribution (based on the country).
- Compared to male *S. haematobium* infection.
- Compared to overall *S. mansoni* infection in population.
- Compared to only S. *mansoni* infection among girls and women.

FGS across age groups

- Variability of infection among different age groups.
- Which age groups have more prevalence across years and geography?
- Compared to a similar age group of males.

Figure 2. The model of FGS data analysis determines the prevalence and burden in different geographic locations over multiple years.

Data source: 4 years of data from Zambia, Ghana, and Tanzania. Based on PCR data.
Statistical analysis: Retrospective data analysis by Excel and JMP 12.

RESULTS

Table 1. Prevalence of Female Genital Schistosomiasis (FGS) among total samples collected in Ghana, Zambia, and Tanzania.

Data source	Total samples	Total Females	Positive Females (*S. haematobium*)	Negative Females (*S. haematobium*)
Ghana 2013	90	39 (43%)	31 (79.5%)	8 (20.5%)
Zambia 2016	133	80 (60%)	46 (57.5%)	34 (42.5%)
Zambia 2017	110	60 (54.5%)	45 (75%)	15 (25%)
Tanzania 2018	104	70 (67.3%)	43 (61.4%)	27 (38.6%)

Out of total samples, all the duplicates and missing samples were discarded. Positive samples are based on PCR testing.

RESULTS CONTD.

Table 2. Prevalence of FGS based on DNA concentration in Ghana, Zambia, and Tanzania.

DNA concentration (ng/ul)	DNA concentration	Total females in Ghana 2013	Total females in Zambia 2016	Total females in Zambia 2017	Total Females in Tanzania 2018
Gr. A (0.5 – 3)	Low	13 (31.7%)	71 (88.6%)	50 (83.3%)	64 (91.4%)
Gr. B (4 – 10)	Medium	22 (53.7%)	5 (6.3%)	7 (11.7%)	3 (4.3%)
Gr. C (10 – above)	High	6 (14.6%)	4 (5%)	3 (5%)	3 (4.3%)

Duplicated/missing samples were discarded.

Table 3. Infection prevalence of FGS based on hematuria, urine filtration, and PCR diagnostic test.

Data source	Hematuria		Urine filtration		PCR	
	Positive	Negative	Positive	Negative	Positive	Negative
Ghana 2013	8 (18.6%)	35 (81.4%)	--	--	31 (79.5%)	8 (20.5%)
Zambia 2016	3 (3.7%)	79 (96.3%)	0	82 (100%)	46 (57.5%)	34 (42.5%)
Zambia 2017	7 (11.7%)	53 (88.3%)	3 (5%)	57 (95%)	45 (75%)	15 (25%)
Tanzania 2018	--	--	--	--	43 (61.4%)	27 (38.6%)

Table 4. Prevalence of Female Genital Schistosomiasis (FGS) among different age groups of females.

Location	Total Females	*S. haematobium* positive			
		Gr. A (0-10 yrs.)	Gr. B (11-20 yrs.)	Gr. C (21-30 yrs.)	Gr. D (> 31 yrs.)
Ghana 2013	39	9 (23.1%)	22 (56.4%)	--	--
Zambia 2016	80	18 (22.5%)	28 (35%)	--	--
Zambia 2017	60	13 (21.7%)	32 (53.3%)	--	--
Tanzania 2018	70	--	4 (5.7%)	8 (11.4%)	31 (44.3%)

FUTURE ENDEAVOR

- Determine the overall burden of FGS in endemic countries to develop strategies to improve the control of FGS.
- **Future work: improved diagnosis, epidemiological assessment, risk of co-infection, control, and intervention.**

REFERENCES

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