# **Original Research Article**

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# Pattern analysis of S. Haematobium infection and elimination in the area of Alsuki, Sudan

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#### **ABSTRACT**

**Background:** The aim of this study was to determine the current conditions of children of the selected area, for the purpose of measuring the new effective health program for schistosomiasis disease eliminations and obtain the prevalence intensity and risk factors of S. haematobium among school children in the study area.

**Methods:** A descriptive cross-sectional study was used to screen school going children of all the ages from five randomly selected schools from Alsuki region. A statistical analysis derived from data formulated based on 1062 samples aged between 6 and 15 years attending the selected schools during the period testing within 6 months were enrolled.

**Results:** The impact of health awareness program was measured usefully and the responded factor for reducing the Schistosomiasis diseases was significantly became less than (0.05). Therefore, the actual qualified fitting degree and applicability was significantly becoming (p value=0.001).

**Conclusions:** This research concluded that the prediction of Schistosomiasis diseases due to the risk Ratio of the collected data for those who did not attended awareness over the people who attended program became (0.248).

Keywords: S. haematobium, Health awareness program, Alsuki

# INTRODUCTION

Schistosomiasis is the second most prevalent and socioeconomically devastating parasitic disease in tropical countries after malaria. Recently, Schistosomiasis prevention and control became one of the important study areas in public health. Successful public health interventions require a detailed understanding of how health and wellbeing are affected by biological factors, based on research methods such as socio-cultural factors, environmental conditions.

Among these important studies, the head quarter of Alsuki region has placed a high priority on the control of schistosomiasis and has carried out many control programs. National surveys of schistosomiasis in the area showed that the prevalence of schistosomiasis infection in population are yearly increasing.<sup>2</sup> Schistosomiasis diagnosis as one of an old water borne disease that create a major problem in public health for many developing countries (WHO, 2002). Approximately 85% of infected people are located in Africa region. This dangerous disease has a major effect on many people in endemic areas including Sudan and is usually observed in school going children and young adults' (WHO, 2010 and 2013).

Most of the school children in Alsuki province were exposed to schistosomiasis infection due to the nature of their life style, which exposes them to schistosomiasis disease and making it easily transferable. The children who live in the province are in constant contact with the schistosome parasite freshwater, such as ponds and

stagnant Blue Nile River, the canals and in empty surfaces among the farms in Alsuki region irrigation scheme. One of the most important issues is to reduce the rates of infection or prevalence schistosomiasis, which could be possible through special health education programs.

Using Internet information to clarify and predict numbers of research has been popular among researchers regarding health awareness program. After reviewing the existing studies on effects and control of schistosomiasis within the main health care organizations, we analyzed their outcomes and privilege. Paul Bizimana, et. al (2019) Schistosomiasis characterized a long-lasting disease related to shortage of care and clean water, which has extensively endemic mainly in sub-Saharan Africa.<sup>3</sup>

Schistosomiasis is a parasitic disease acquired through contact with contaminated water, with debilitating and chronic problems.<sup>4</sup> It was reported that Sub-Saharan Africa is the most affected paces and contributes to more than 90% of the total burden.<sup>5</sup> With exact approximations specify that 207 million people are infected and more than 800 million are at risk.<sup>6,7</sup> In addition, schistosomiasis is responsible for an annual loss of 4.5 million disability-adjusted life years (DALYs) and 200,000 deaths every year.<sup>8-10</sup> School-age children are the most vulnerable group, with severe consequences for physical and cognitive development.<sup>11,12</sup>

Qutoof et al confirmed that Schistosoma infection is a one of the main infections in the tropics and sub tropics, from a global public perspective Schistosoma is the most important water-based disease, only second to malaria among the parasitic diseases with regard to the number of people infected and those at risk. The reported incidence of *S. Haematobium* in Sudan is between 0-20%. <sup>13</sup>

Schistosoma is widely distributed in Sudan; estimated at around five million people requiring treatment whom are mostly children. Schistosomiasis greatly affects poor and rural communities, particularly agricultural populations. Inadequate hygiene and contact with infected water make children especially vulnerable to infection.<sup>14</sup>

The total prevalence rate of *S. Haematobium* infection is 8.7 %, lower than the majority of the previous studies.<sup>15</sup> A Study by Ismaiel et al, in the White Nile state had showed a 45% prevalence of *S. Haematobium* whereas a study by Ahmed et al, in the River Nile state showed a prevalence of 51.4% of *S. Haematobium* infection.<sup>16,17</sup>

#### **METHODS**

There is evidence that Schistosoma haematobium disease infection in Sudan and information search have a strong impact on individuals' due to less know knowledge about the disease and may became chronic in the future. Findings suggest that the health awareness program will help children's and families by variety ways to inspire

them about the disease and risk factor with their selfimage perception.

## Study area

This study was conducted in Alsuki District, Sinnar Province, Sudan. This district is located in the state of Sennar, Sudan, on the eastern part of the Blue Nile River at an altitude of 428 meters (1,404.19 feet) above sea level. It is about 291 kilometers from the capital, Khartoum (180.81 miles), and the state capital, Sennar, 37 kilometers (22.9 miles). Its residents are professional in agriculture, especially cultivation of sugar cane, millet, and legumes. Agriculture varies from traditional cultivation to industrial irrigation, of which the Suki agricultural project is one of its main pillars. The region is also famous for fishing and handicrafts, including the manufacture of caps and ceramics.



Figure 1: Area of study (Alsuki region).

# Children's activities and health risk

Swimming in Canals, particularly dirty water, might put kids' children at higher risk for developing schistosomiasis infection disease and others related to the water. Untreated mess waste released into the water can expose swimmers to harmful pathogenic microorganisms.



Figure 2: Dirty Canal with nasty infections.

Microorganism's disease called pathogens. Childs Children swimming in a dirty water as the current practice is a routine practice in the area of study as shown in Figure 2.

Thus, exposing them to higher risks of infection with Schistosoma haematobium has a high risk of schistosomiasis haematobium infection (Figure 2).

This canal supports the local agriculture in the area of study, but unfortunately, there are certain risks to swim inside this canal, because the water may contain pathogens which can't ways be detected visually. We explored the frequency incident in the selected area (villages) of schistosomiasis and its association with the nature of their life, among school children. Some specific research was presented in varying methods for possible responses, with an indication to the disease to be efficient. In addition to the usual requirements such as health awareness program against all the diseases and the prevention needed to be studied for accurate infection prediction.

# Type of study

Cross sectional study

# Study population

The study involved five school in the selected area.

#### Study period

6 month

# Sample size

Assuming that 40% of students had sufficient knowledge about Schistosoma Haematobium, implication with an allowable of 95% confidence interval. Hence, the total sample was 1062, out of these samples 208 infected cases in the first diagnosis. After 6 months diagnosis in the same schools, it was found that 85 new cases infection recorded.

# Inclusion criteria

This research is interested in schoolchildren whom were infected by Schistosoma haematobium, implicated with various health awareness strategy in the program; consequently, the urine tests were conducted to classify the number of infected and no-infected students in the school.

The ultimate of the study planning in the selected schools offers the desired information to obtain the impact school children infection by Schistosoma Haematobium disease. The risk factor was measured and covers reliably of the intended area service for enough awareness and knowledge about the chronic disease. It is further using

statistical tools for accurate preparation and prediction for future risk probability.

Figure 3 represents the proposed details carried out on the element of data collection. It contains a series of process in brief descriptive in label describing the process being carried out on the data analysis to generate tables and graphs to measure hypotheses, research objectives and answer research questions through statistical tools.

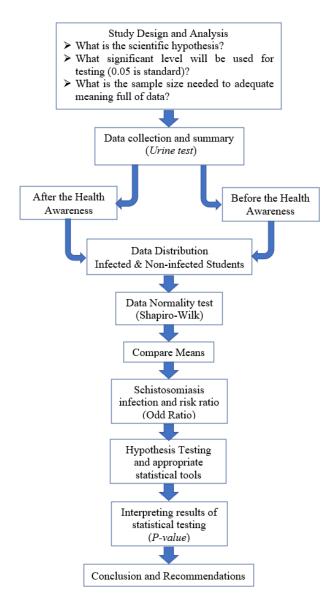


Figure 3: Research method flow.

#### Data collection

Prior to the beginning of the urine collection, the head of the school's permission has been taken. The schools were visited by a stated day and schedule. Schoolchildren motivation behind the data collection was clearly wellversed to the understudies and subsequent to acquiring educated verbal assent from the understudies, they were given the tool which was self-controlled by each student.

#### School health awareness program

School health awareness program in the area of study is directed to meet the health needs regarding Schistosomiasis disease and its risk factor of students to build a good basis for their future with the support of the schoolmate home, community, and government.

At the beginning of the study posters were hanged in all the class room and in the teachers' offices to inform them about Schistosomiasis disease risk factors and its consequences to the human body. Then we organized an introductory lecture on schistosomiasis causes and its transmission. Furthermore, a prevention tablet for schistosomiasis disease was distributed to all school children's and meet the imam of the masjid for informing all prayers awareness about the disease and aware their child to avoid the swimming in the canal which was fully groups of Snail.

# Research design

Prevalence data collection originates from school children conducted in the area of study. Infection incidence was assessed from carefully validated urine test in which schoolchildren were asked whether they have blood in urine or not. Schistosoma haematobium samples are examined by advance detection microscopy for blood and another symptom for Schistosoma haematobium diagnosis. The total sample of school children from 5 schools was 1062, out of these samples 208 infected cases in the first diagnosis. After 6 months diagnosis in the same schools, it was found that 85 new cases infection recorded. The research design consists in the infection response and skill of planning a health awareness processes used to carry a study. The appropriate technique to find the most reliable and relevant results is research objectives and hypothesis. The design of this research follows the steps planned by Saunder in 2011 in his idea of research design as shown in Figure 4.18 Knowing that, each data of the children infection and non-infection represents a stage of the research process, this concept demonstrates a structure of cause progression that allows figuring a research successfully and objectives achievement.

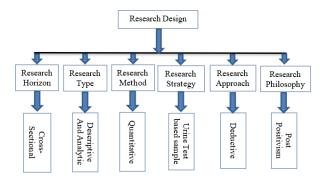


Figure 4: Research design.

The concept of the research design follows a deductive method with the post positivism idea. Certainly, it begins from a theory as a literature, then gathers data that support this theory and finally conducts a urine test which aims to measure and investigates catechistically the characteristics and behaviours of the tested sample. The objective of this analysis is to extend the results to an entire data analysis in the five-schools selected in the area of Alsuki region and to confront them to those found in the previous researches. However, the post positivism idea leads to a confident relativism according to the successful awareness program.

# Data analysis

Data was sorted out and analysed by utilizing SPSS programming package used for interactive factors and results. Measurable investigation was finished by rate of risk ratio and chi square test for critical data validation.

#### **RESULTS**

The data analysis has been completed by using the software SPSS (IBM SPSS Statistics 21) and Excel (Excel 2016), and it is concise in two main sectors. The first sectors gather the descriptive statistics analysis of the collection results of urine test (with cross tabulation). The second one involves in the analysis of the relationship of data group, using the Chi-square test, T-test, Box chart, Shapiro test analysis and Correlation, between the independent variables and the dependent variables.

Two groups of primary school's level infected by Schistosomiasis disease have been completely diagnosis through the large-scale of assessment. The cross-sectional assessment of the total number of those who have health awareness program and others without health awareness has been investigated, beginning to apply insights the research questions and hypotheses. For instance, the diagnosis of the Schistosomiasis disease in school ages observed some inconsistencies in the subsection of ages.

An evaluation of the typical data normality is an essential for some factual tests since ordinary information is a basic presumption in parametric testing. There are two primary strategies for surveying typicality: graphically and numerically. The shapiro-wilk method explored the testing of data normality in a dataset in one group to represent one or all groups. Table 1 the data height is normally distributed (exact significant of P = 0.755), and this is a lower bound of the true significance of height within both the measured data before and after the health awareness program effect.

Therefore, the assumption is met the research hypothesis using data for statistical tests.

# The impact of total health awareness

Lifestyle diseases could be prevented and controlled by distributing health knowledge awareness. <sup>19</sup> This research

in the area of Alsuki explored the impact factors of health knowledge awareness and validate with the non-health knowledge awareness program, and the way people conventional health knowledge in selected villages as shown in Table 2.

Table 1: Data normality test via Shapiro-Wilk.

	Kolmogo Smirnov <sup>a</sup>		Shapiro-	Shapiro-Wilk		
	Statistic	Sig.	Statistic	Sig.		
Before	0.140	$0.200^{*}$	0.926	0.443		
After	0.176	$0.200^{*}$	0.956	0.755		

Table 2: Awareness program status crosstabulation.

Details			General status		Total
			Effec ted	Non effect	
		Count	43	619	662
Program	Attended	% within program	6.5	93.5	100.0
		% of Total	5.0	72.5	77.5
	Not attended	Count	42	150	192
		% within program	21.9	78.1	100.0
		% of Total	4.9	17.6	22.5
Total		Count	85	769	854
		% within program	10.0 %	90.0	100.0
		% of Total	10.0 %	90.0	100.0

The impact of health awareness and non-awareness justification designed to provoke two varying of program levels of perceived cognitive Schistosomiasis disease suspicious on school children and the perceived data was examined.

# The effective of health awareness program

Due to the low education level in the villages at the area of Alsuki and typically used awareness health program received relatively via traditional ways such as school children and Teachers, Masjed in Jumaat Prayer, and the responses of this awareness as shown in Figure 5.

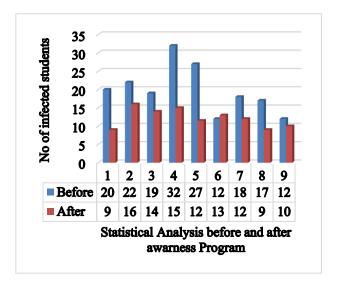


Figure 5: Effective of health awareness program among ages.

The estimate of the combined effect of a single factor (before and after awareness) and control relevant factors effectively, the statistical analysis was used to explore the influencing factors of health awareness knowledge score stratification as shown in in table 3 with highly significant value (P=0.00) based on paired samples statistics and confident with internal differences to obtain the effective program of those who obligate the health awareness program.

Table 3: Significant of health awareness program.

	Paired Differences						
Factor		Mean Std.		Std. Error	95% Confidence Interval of the Difference		Sig. (2-tailed)
			Deviation	Mean	Lower	Upper	
Pair 1	Before - After	14.55556	7.03760	2.3458	9.14598	19.96513	0.000

# **DISCUSSION**

To validate and measure the hypothesis of the research for means and proportions ages factor via chi-square to determine the level of significance after the data substitution (observed frequencies) into the statistical analysis to identify the actual of fit test and is organized the computations in the following interval ages to illustrate the data layout in table 4. These table entries are the numbers of school children in each group responding to the Schistosomiasis disease infection category of the outcome variable and it is percentage. The most infected ages are between 6-11 years old which are active ages and mostly contact to the water by practicing swimming in the canal.

Table 4: Interval ages and its percentage of infection.

Age fa	ctor	Frequency	%	Cumulative Percent
Valid	6-8	82	39.4	39.4
	9-11	76	36.5	76.0
	12-15	50	24.0	100.0
	Total	208	100.0	

The Chi-Square test of independent factor of ages is utilized to decide whether there is a high significant connection between three variables of ostensible for children age factors in the school. The frequency of each classification for one ostensible variable is analyzed over the classes of the other variables.

#### The impact of health awareness program

The health awareness actions take place in the Alsuki villages in order to instruct the people to avoid Schistosomiasis diseases infection and its risk. It would be informative and educational for the school children, home to home round trip for parent advisory, used teachers, inform imams of the masjid to advice the prayers in the selected villages to know the impact of these events, even though such information could be hard to measure. Table 5 investigated the specified events to attract the public consideration for the chronic disease by increasing the search frequencies of convinced method.

Table 5: Paired samples statistics for health awareness case.

Factor		Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Doin 1	Before	20.3889	4.71181	1.57060	4.875	0.001
Pair 1	After	13.6400	3.09215	1.03072	4.873	0.001

Statistical t-test method has been used to measure the impact of health awareness program and it was found out the overall trained program for the three villages was measured usefully and the responded factor for reducing the Schistosomiasis diseases was significantly became less than (0.05). Therefore, the actual qualified fitting degree and applicability was significantly becoming (0.001).

#### Risk estimation using odd ratio

Odds ratio and risk ratio are two factors measures of association used to define the effectiveness of interventions and disease justification; nevertheless, they are not identical measures of suggestion.<sup>20</sup> However the method is used for data to assessment and the impact of disease awareness program and non-awareness as a percentage value, which considers two ways of being justified the successful rate of the aware of diseases, one of which was people's sustain without awareness program and the other was by health awareness events. The actual Schistosomiasis disease investigated in the first round was counted as high percentage of infection in all the level of ages and provided different case studies. The odd ration used to measure the risk behind this infection. The result found that the prediction of Schistosomiasis diseases due to the Odds Ratio of the collected data in this research for those who did not attended awareness over the people who attended program became (0.248).

This odds ratio value shown in Table 6 indicates that the risk of the children in the school who did not receive any kind of awareness is high and almost (0.248), which consider more than those who attended the awareness program. Accordingly, it could be predictive for future chronic disease in the area increasing risk factor for Schistosomiasis diseases during coming decades.

Table 6: Schistosomiasis disease risk estimation.

Factors	Value	95% Confidence Interval Lower Upper		
		Lower	Upper	
Odds Ratio for program (attended / not attended)	0.248	0.156	0.393	
For cohort status =effected	0.297	0.200	0.440	
For cohort Status =non effect	1.197	1.108	1.293	
N of valid cases	854			

#### **CONCLUSION**

According to the data collected with sample size, Shapiro-test through SPSS Statistics was used to define the normality of the data in both situations before and after health awareness diagnosis. Shapiro-Wilk test shows strong evidence of normality distribution. For the approximately normally distributed data, (p value=0.443 and p value=0.755 respectively), so the significant hypothesis is retained more than the 0.05 level of significance.

School children's in various ages were particularly targeted in informing the awareness and allocation of Schistosoma disease infecting area. A cross-sectional method used for descriptive analysis and used to assess the problem of a Schistosoma disease in a selected area. Therefore, an appropriate parametric test for descriptive statistical tools (Chi-square, T-test, Box chart, Shapiro test and odd analysis) has been used to achieve the study objectives by assessing the research hypothesis and answer the research questions.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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