



PREVALENCE AND FACTORS ASSOCIATED WITH HELMINTHIC INFECTIONS AMONG CHILDREN UNDER FIVE YEARS VISITING GIHUNDWE DISTRICT HOSPITAL, RWANDA

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CHAPTER ONE: GENERAL INTRODUCTION

1.1 Background of the study

Infection with soil-transmitted helminthic parasites (STHs) is a global disease threat (Gordon, *et al.*, 2017). Over a quarter of the nation's population is affected with helminthic illnesses spread by soil. Diseases are found in tropical and subtropical places over the world, with the highest concentrations in Sub-Saharan Africa, the Americas, China, and East Asia (WHO, 2020).

For instance, The Rusizi District was identified as having a low incidence and prevalence of *S. mansoni* infectious disease in the initiates a series modeling questionnaire in 2008, but a latest poll found an incidence of 62.1% among 311 children in schools aged 10–19 years on Nkombo Island, which is situated in this district (Ruberanziza, *et al.*, 2015). There

was a wide range in incidence among institutions, extending from 28.6 to 77.9% (Ruberanziza, *et al.*, 2015). Most of studies done on prevalence and risk factors associated with STH infections targeted school- aged kids and pre-school children. There is a paucity of studies targeting under five children.

1.2 Problem statement

STH diseases were expected to affect 1.9 million people worldwide in 2017. DALYs (GBD, 2018). Anemia, starvation, academic losses, and intellectual deficiencies are all linked to mild and high infection severity, as well as persistent STH diseases (Owada, *et al.*, 2017). Rwanda is among the nations where the healthcare system is indeed recuperating from years of devastation brought on by political strife. As a result, data on the geographic range and risks for a variety of infectious diseases, including STHs, is scarce (CDC [Rwanda], 2018).

In current history, official, non-governmental, and world community attempts have been devoted to understand better the prevalence of STH infections in Rwanda. Demographic data from previous and current surveys, on the other hand, is not freely available in the public realm, Furthermore, where data is communicated, it has not been upgraded, making it unsuitable for designing and organizing long-term management programs (CDC [Rwanda], 2018).

Regarding to this gap identified, the main objective of this study is to assess prevalence and risk factors associated with STH infections among children under five years attending Gihundwe District Hospital in Rusizi District of western province, Rwanda. This data is helpful for comprehending the current scenario in the study area in relation to STH infections, following trends throughout the Rusizi district and determining the influence of

control programs on the prevalence and severity of STH infections Furthermore, this data focuses on assessing the success of applied control strategies as well as the expense of initiatives.

1.3 Objectives of study

1.3.1 General objective

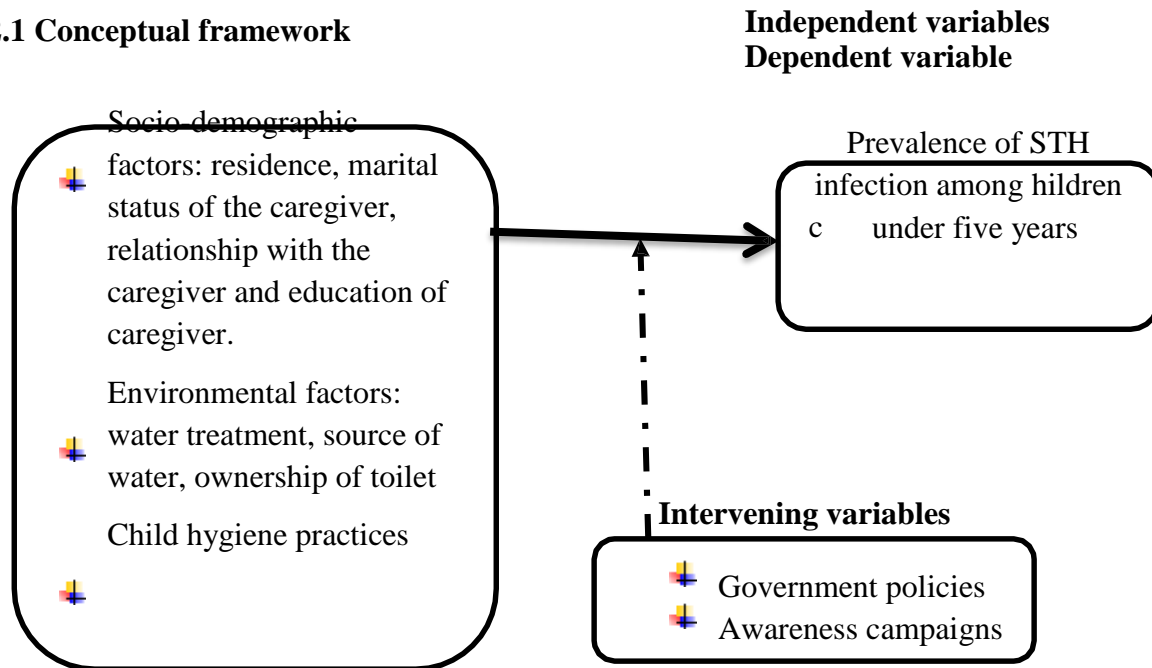
To determine the prevalence and factors associated with soil-transmitted helminthes (STH)

Infections among children under five years visiting a Gihundwe district hospital in Rwanda.

1.3.2 Specific objectives

- i. To determine the prevalence of STH infections among children under five years visiting Gihundwe DH.
- ii. To determine sociodemographic characteristics associated with STH at Gihundwe DH.
- iii. To analyze hygiene practices associated with STH infections at Gihundwe DH.
- iv. To assess environmental factors associated with STH infections at Gihundwe DH.

2.1 Conceptual framework



As presented in Figure 2.1, independent variables (socio-demographic and socio-economic factors, and environmental factors) stand alone. The value of them does not change due to the effect of any other variable. They can only be manipulated or changed by the researcher to measure its impact on the dependent variable. Thus, dependent variable (Prevalence of STH infection among children under 5 years) as the name suggests depends on other variables. A researcher measures the outcome of the-

study to see how other variables cause changes in the value of a dependent variable. Government policies and awareness campaigns might be considered as an intervening or confounding variables which may interfere or not between the independent and dependent variables.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research design

The cross sectional design is the most relevant design when assessing the prevalence of a disease (Kesmodel, 2018). This design was also helpful in determining factors associated with STH infections among children under 5 years attending Gihundwe District Hospital Health Management Information System (RHMIS), Gihundwe District Hospital receives an average of 106 children under 5 years per month (MOH [Rwanda], 2018).

The data from completed structured questionnaires of caregivers of children under five years was cleaned and entered into SPSS version21 for analysis. Additionally, bivariate and multivariate logistic regression analysis were computed to determine statistical association between the outcome and the independent variables, significant of statistical association was tested using 95% confidence interval and p-value (<0.05).

located in Rusizi District of western province, Rwanda

3.2 Target population

The researcher surveyed caregivers of children aged under 5 years who were attended Gihundwe DH during the data collection period between August and October 2021. According to Rwanda

CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSION

4.0 Introduction

This chapter affords research findings and its interpretations regarding to the study objectives. The total sample size was 424 caregivers and all have been reached but only 377 children gave their stool samples for laboratory analysis giving the response rate of 88.9%.

4.1 Participants' socio-demographic and socio economic characteristics

The socio- demographic and socioeconomic characteristics analyzed in this study are presented in Table 4.1. Among the 424 participants, sectors

targeted by this study were represented as follows: Bweyeye (21.4%), Giheke (20.7%), Gihundwe (27.5%), Kamembe (24.1%), and Nkombo (6.3%). More than a half (51.4%) of the children were male and 48.6% were female. Majority (82.4%) of caregivers were mothers to the children, 79.8% were married, 55.4% were aged between 35-55 years, 51.4% of caregivers had completed primary level education, and 53.7% were Catholics. The majority (97.4%) of caregivers reported they owned health insurance, 55.2% of caregivers stated being farmers and 62.3% of caregivers reported their monthly income were less than 50,000RWF (Table 4.1).

Table 4.1 Socio-demographic and socioeconomic characteristics

Variables		Frequency (n)	Percent (%)
Residence	Bweyeye	91	21.4
	Giheke	88	20.7
	Gihundwe	117	27.5
	Kamembe	102	24.1
	Nkombo	26	6.3
Children's gender	Male	218	51.4
	Female	206	48.6
Caregiver relationship to the child	Mother	349	82.4
	Father	17	3.9
	Sibling	19	4.5
	Grandmother	15	3.6
	Grandfather	8	1.9
	Aunt	7	1.7
Caregiver's marital status	Uncle	3	0.6
	Neighbour	6	1.4
	Single	62	14.7
	Married	338	79.8
	Separated/divorced	15	3.4
Caregiver's age category	Widowed	9	2.1
	≤ 35 years	172	40.5
	35-50 years	235	55.4
Caregiver's religion	> 50 years	17	4.1
	Christian	228	53.7
	Protestant	133	31.3
	Muslim	56	13.3
Caregiver's educational level	No religion	7	1.7
	No formal	102	24.0
	Primary	218	51.4
	Secondary	89	21.1
Caregiver's occupational status	Tertiary	15	3.5
	Farmer	234	55.2
	Self-employed	109	25.7
	Government server	21	4.9
Health insurance ownership	Unemployed	60	14.2
	Yes	413	97.4
Income per month [RWF]	No	11	2.6
	≤ 50,000	264	62.3
	> 50,000	121	28.5
	Do not know	39	9.2

Source: Primary data (2021)

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4.2 Presentation of research findings

This part presents the findings related to the prevalence of STHs and factors associated with STHs in Gihundwe District Hospital catchment area.

4.2.1 Prevalence of STH infections among children under 5 years at Gihundwe DH

The researcher has considered to determine the prevalence of STHs among children in the study catchment area. This prevalence helps to specify a proportion of a defined population with a specified health outcome of interest at a specified period of time. The overall prevalence of STHs was found to be of 29.7% in the 377 stool samples collected and tested (Figure 4.1).

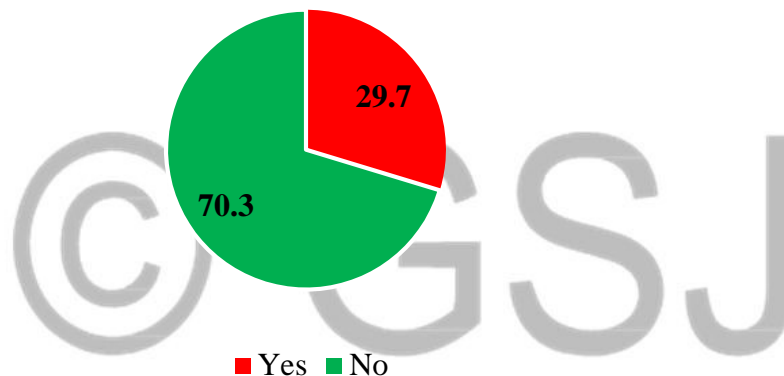


Figure 4.1 Presence of STHs among stool samples collected

Source: Primary data (2021)

The most frequent STHs by type of STHs in the study areas were *Ascaris lumbricoides* (43%) in Gihundwe sector, Hookworms (19%) in Giheke sector and 9% of *T. trichiura* in Bweyeye sector among the total prevalence (Figure 4.2).

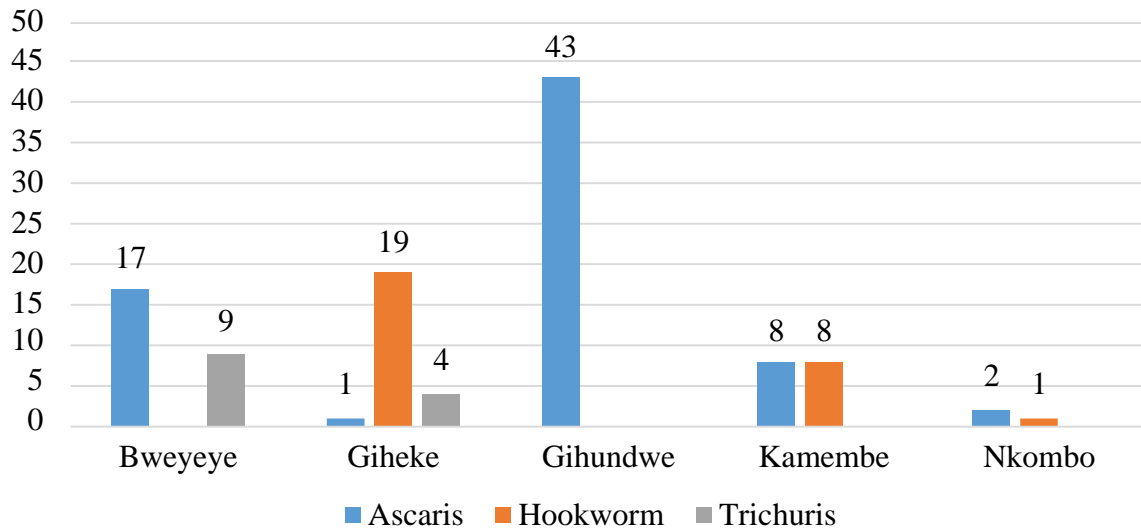


Figure 4. 2 Distribution of STHs prevalence by sector

Source: Primary data (2021)

4.2.2 Respondents’ hygiene practices towards STHs

According to the findings in Table 4.2, less than a half (49.9%) of the children reported washing their hands regularly after defecation and 36.4% did not wash their hands after toilet. Among those who regularly washed their hands after defecation, 57.3% used pure water and soap while 40.9% used plain water. Children who used soil were 1.8%. Children who always washed their hands before meals were 84.7% while those who did not wash their hands were reported to be 4.9%. However, 10.4% of children reported washing their hands occasionally before meals. More than a half (53.2%) of children did not wear shoes when/to on grounded areas, only 27.7% reported always wear shoes while 19.1% wearing shoes occasionally when/to on grounded areas.

Table 4. 2 Distribution of respondents’ hygiene practices towards STHs

Variables		Frequency (n)	Percent (%)
Children regularly washing hands after defecation	Yes	212	49.9
	No	154	36.4
	Sometimes	58	13.7
Mode of children’s hands washing	Pure water and soap	121	57.3
	Plain water	87	40.9
	Soil	4	1.8
Always washing hands before meals among the children	Yes	359	84.7
	No	21	4.9
	Sometimes	44	10.4
Wearing shoes when/to on soil grounded areas among the children	Yes	117	27.7
	No	226	53.2
	Sometimes	81	19.1

Source: Primary data (2021)

4.2.3 Environmental facilities in the study area

Findings in Table 4.3 revealed that the majority (70.5%) of households’ source of water was piped water, followed by surface water (21.7%) and dug well (7.8%). Of the total 61.9% of the households reported not treat water before drinking while 38.1% did it.

Most (82.6%) of the households boiling water, 14.7% chlorinating water and 2.1% distillate or filter it before drinking.

Households that had toilet facility were 96.9% while 3.1% did not have toilet facility. The majority (93.1%) of households had pit latrines and 3.8% of household had flush toilet. Majority (85.9%) of households did not share their toilet facility with other households. However, some 14.1% of the households shared toilet facility with others

Table 4. 3 Distribution of environmental facilities among participants

Variables		Frequency (n)	Percent (%)
Household water source	Piped water	299	70.5
	Surface water	92	21.7
	Dug well	33	7.8
Treatment of water before drinking	Yes	161	38.1
	No	263	61.9
Mode of water treatment	Boiling water	133	82.6
	Water chlorination	24	14.7
	Distillation/Filtering	4	2.1
Ownership of toilet facility	Yes	411	96.9
	No	13	3.1
Kind of toilet facility	Pit latrine	395	93.1
	Flush or pour flush toilet	16	3.8
	No latrine	13	3.1
Sharing toilet with other households	Yes	58	14.1
	No	353	85.9

Source: Primary data (2021)

4.2.4 Factors associated with STHs among children under 5 years at

Gihundwe DH Different factors contributing to STH infections in Gihundwe district hospital catchment area were analyzed and the study findings. As presented in Table 4.4, a bivariate analysis using Chi-square test on the socio-demographic and socio-economic characteristics of participants disclosed that only caregiver’s educational level ($p < 0.001$) and

caregiver’s occupational status ($p < 0.001$) were statistically associated with the prevalence infection by any of the three STHs among children.

Table 4.4 Relationship between sociodemographic, socioeconomic factors and prevalence of STHs among children at Gihundwe DH

Variables	Presence of STH among children		Chi-Square (X ²)	P-value
	Yes n(%)	No n(%)		
Residence [Sector]				
Bweyeye	20(22.2)	70(77.8)	1.579	0.411
Giheke	1(1.4)	70(98.6)		
Gihundwe	18(15.8)	96(84.2)		
Kamembe	71(79.8)	18(20.2)		
Nkombo	2(15.4)	11(84.6)		
Child's gender				
Male	21(10.7)	176(89.3)	7.169	1.831
Female	91(50.6)	89(49.4)		
Caregiver relationship to the child				
Parent	103(32.3)	216(67.7)	6.840	0.075
Relative	7(14.3)	42(85.7)		
Other/Neighbour	2(22.2)	7(77.8)		
Caregiver's marital status				
Single	21(25.3)	62(74.7)	0.990	0.320
Married	91(31.0)	203(69.0)		
Caregiver's age				
≤ 35 years	70(45.5)	84(54.5)	3.403	0.704
35-50 years	41(20.4)	164(79.6)		
> 50 years	1(5.6)	17(94.4)		
Caregiver's religion				
Christian	94(41.9)	130(58.1)	1.354	0.245
Protestant	11(12.8)	75(87.2)		
Muslim	3(5.4)	53(94.6)		
No religion	4(36.4)	7(63.6)		
Caregiver's education				
Primary	96(34.5)	182(65.5)	4.498	<0.001
Secondary	12(14.5)	71(85.5)		
Tertiary	4(25.0)	12(75.0)		
Caregiver's occupation				
Government server	2(25.0)	6(75.0)	146.305	<0.001
Farmer	35(16.6)	176(83.4)		
Self-employd	65(73.9)	23(26.1)		
Unemployed	10(14.3)	60(85.7)		
Health insurance ownership				
Yes	109(30.1)	254(69.9)	3.435	0.064
No	3(21.4)	11(78.6)		
Income per month [RWF]				
≤ 50,000	21(8.6)	222(61.4)	2.098	0.068
> 50,000	87(82.1)	19(17.9)		

Do not know 4(14.3) 24(85.7)

Source: Primary data (2021)

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Study findings from a bivariate analysis as labelled in Table 4.5 indicated that children’s hands washing after defecation ($p<0.001$), mode of children’s hands washing ($p<0.001$) and washing hands before meals among children ($p<0.001$) were significantly associated with

infection by any of the three STHs among children. Although, wearing shoes when/to on soil grounded areas among children ($p=0.081$) did not have significant association with infection by any of the three STHs among children.

Table 4.5 Child hygiene practices and prevalence of STHs

Variables	Presence of STH among children		Chi-Square (X^2)	P-value
	Yes n(%)	No n(%)		
Children’s hands washing after defecation regularly				
Yes [Regularly]	18(9.4)	173(90.6)	161.357	<0.001
No	91(71.1)	37(28.9)		
Sometimes	3(5.2)	55(94.8)		
Mode of children’s hands washing				
Pure water and soap	21(18.8)	91(81.2)	142.355	<0.001
Plain water	87(93.6)	6(6.4)		
Soil	4(57.1)	3(42.9)		
Washing hands before meals among the children				
Yes [Regularly]	109(32.5)	226(67.5)	18.385	<0.001
No	1(9.1)	10(90.9)		
Sometimes	2(6.4)	29(93.6)		
Wearing shoes when/to on soil grounded areas among children				
Yes [Regularly]	107(95.5)	5(4.5)	3.540	0.081
No	1(0.5)	197(99.5)		
Sometimes	4(5.9)	63(94.1)		

Source: Primary data (2021)

As indicated in Table 4.6, household water source ($p<0.001$), treating water before drinking ($p<0.001$) and ownership of toilet

facility of the households ($p=0.013$) and sharing toilet with other households ($p<0.001$) have been found to be

statistically associated with the prevalence of STHs among children. Other factors with regard to environmental sanitation like kind of toilet facility ($p=0.061$) were not found to be significantly associated with the prevalence of STHs among children

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Table 4.6 Relationship between environmental sanitation and prevalence of STHs

Variables	Presence of STH among children		Chi-Square (X ²)	P-value
	Yes n(%)	No n(%)		
Household water source				
Piped water	52(18.7)	226(81.3)	133.519	<0.001
Surface water	48(82.8)	10(17.2)		
Dug well	12(29.3)	29(70.7)		
Treatment of water before drinking				
Yes	2(1.2)	158(98.8)	114.955	<0.001
No	110(50.7)	107(49.3)		
Ownership of toilet facility				
Yes	107(29.8)	252(70.2)	5.691	0.013
No	5(27.8)	13(72.2)		
Kind of toilet facility				
Pit latrine	109(31.6)	236(68.4)	7.438	0.061
Flush or pour flush toilet	3(15.8)	16(84.2)		
Sharing toilet with other households				
Yes	11(15.9)	58(84.1)	30.664	<0.001
No	101(34.2)	194(65.8)		

Source: Primary data (2021)

During the analysis, variables found to be statistically significant in the bivariate analysis were submitted to the multivariate analysis to determine to which extent variables are associated each other.

Research findings in Table 4.7 indicated that caregivers with primary education were 1.9 times (AOR=1.9; 95%CI: [1.14–5.73]; p=0.031) more likely having children with STH infections than caregivers with tertiary education. The odds of having children with STH infections were 2.2 times (AOR=2.2; 95%CI: [1.40-5.95]; p=0.026) among children who did not regularly wash their hands after defecation compared to those who did it regularly, and 3.4 times (AOR=3.4; 95%CI: [1.06-13.32]; p=0.030) among children who did not wash their hands before meals compared to those who did it before meals. Households that used surface water were 2.7 times (AOR=2.7, 95CI: [1.22-8.57]; p=0.027) more likely having children with STH

infections than households using piped water Not treating water before drinking were 2.4 times (AOR=2.4; 95%CI: [1.20-9.28]; p=0.031) more likely to be associated with STH infections among children than treating water before drinking. Also, the odds of having children with STH infections were 1.3 times (AOR=1.3; 95%CI: [1.14-4.61]; p=0.017) among households did not own toilet facilities compared to those owned it.

Table 4.7 Predictors of prevalence of STHs among children

Variables	COR (95%CI)	P- value	AOR (95%CI)	P- value
Caregiver’s educational level				
Primary	1.6(1.03-4.82)	0.028	1.9(1.14–5.73)	0.031
Secondary	0.2(0.165-0.502)	0.997	0.4(0.17–1.84)	0.782
Tertiary	Ref.		Ref.	
Caregiver’s occupational status				
Farmer	Ref.		Ref.	
Self-employd	0.6(0.47-0.85)	0.463	0.4(0.15–1.74)	0.452
Unemployed	1.4(1.01-1.87)	0.715	0.9(0.41–2.14)	0.637
Children’s hands washing after defecation regularly				
Yes [Regularly]	Ref.		Ref.	
No	2.01(1.41-8.06)	0.029	2.2(1.40-5.95)	0.026
Sometimes	0.04(0.02-0.08)	0.226	1.1 (0.31–1.47)	0.314
Washing hands before meals among the children				
Yes	Ref.		Ref.	
No	3.3(1.17-10.17)	0.014	3.4(1.06-13.32)	0.030
Household water source				
Piped water	Ref.		Ref.	
Surface water	2.4(1.21-6.32)	0.021	2.7(1.22-8.57)	0.027
Dug well	1.3(0.91-3.43)	0.187	0.9(0.29-2.12)	0.179
Treatment of water before drinking				
Yes	Ref.		Ref.	
No	2.2(1.36-7.15)	0.028	2.5(1.20-9.28)	0.031
Ownership of toilet facility				
Yes	Ref.		Ref.	
No	1.1(1.04-3.47)	0.013	1.3(1.14-4.61)	0.017
Sharing toilet with other households				
Yes	0.3(0.07-1.56)	0.987	0.4(0.23-2.98)	0.997
No	Ref.		Ref.	

Source: Primary Data (2022)

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1.1 Prevalence of STH infections among children under five years at Gihundwe DH

The overall prevalence of STHs was found to be of 29.7% in the 377 stool samples collected and tested. The most frequent STHs by type of STHs in the study areas were *Ascaris lumbricoides* (43%) in Gihundwe Sector, Hookworms (19%) in Giheke Sector and 9% of *T. trichiura* in Bweyeye Sector among the total prevalence.

5.1.2 Sociodemographic characteristics associated with STH at Gihundwe DH

Study results showed that caregivers with primary education were 1.9 times (AOR=1.9; 95%CI: [1.14–5.73]; p=0.031) more likely having children with STH infections than caregivers with tertiary education.

5.1.3 Hygiene practices associated with STH infections at Gihundwe DH

Research findings revealed that the odds of having children with STH infections were 2.2 times (AOR=2.2; 95%CI: [1.40-5.95]; p=0.026) among children who did not regularly wash their hands after defecation compared to those who did it regularly, and 3.4 times (AOR=3.4; 95%CI: [1.06-13.32]; p=0.030) among children who did not wash their hands before meals compared to those who did it before meals.

5.1.4 Environmental factors associated with STH infections at Gihundwe DH

Households that used surface water were 2.7 times (AOR=2.7, 95%CI: [1.22-8.57]; p=0.027) more likely having children with STH infections than households using piped water. Not treating water before drinking were 2.4 times (AOR=2.4; 95%CI: [1.20-9.28]; p=0.031) more likely to be associated with STH infections among children than treating water before drinking and the odds of having children with STH infections were 1.3 times (AOR=1.3; 95%CI: [1.14-4.61]; p=0.017) among households did not own toilet facilities compared to those owned it.

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