



RELATIONSHIP CHARACTERISTICS AND COMMUNITY BEHAVIOR WITH THE INCIDENCE OF SCHISTOSOMIASIS IN THE WORK AREA OF WUASA COMMUNITY HEALTH CENTER IN 2022

Rosamey Elleke Langitan.

DIII Nursing Program in Poso, Poltekkes Kemenkes Palu, Poso, Indonesia

Correspondent Email : rosemeyelleke@gmail.com

ABSTRACT	Keywords
Schistosomiasis is a zoonotic disease and a public health problem. The cause is a type of worm parasite from the schistosomatidae family which has a habitat in the blood vessels around the intestines or bladder. Schistosomiasis is a parasitic disease caused by blood trematode worms of the genus Schistosoma. Chronic schistosomiasis can reduce the ability of sufferers to work, and in some cases cause death. This study aims to get an overview of the factors that cause recurrent schistosomiasis or reinfection that occurs in the community. Descriptive correlation with the analytic case control study approach, namely retrospective observational analytic research where effects or outcomes are traced back to identify relationships by comparing cases and controls. Sampling in this study were patients who were infected with schistosomiasis as case respondents and those who were not infected with schistosomiasis as control respondents. There is a relationship between the behavior of the community or respondents who are often active in rivers or ditches, often passing through conch focus areas and not utilizing health service facilities with the incidence of respondent schistosomiasis in the community in North Lore District, Poso Regency, Central Sulawesi Province. Conversely, there is no relationship between the characteristics of the respondents which include age, gender, education level, marital status and employment with the incidence of schistosomiasis. Conclusion, the habitual behavior of respondents who often move in the river is related to the incidence of disease schistosomiasis, so that it can be concluded that the main factor causing someone to suffer from schistosomiasis is not due to the characteristics of the respondents in the community in North Lore sub-district, Poso Regency, Central Sulawesi Province.	<i>Characteristics, Behavior, Risk factors, Schistosomiasis</i>

INTRODUCTION

A person's health status and quality of life are not only influenced by the health itself but also by the individual's lifestyle, so it is important to understand that health status is not only maintained and enhanced by advances in science and technology in the field of health sciences but through lifestyle,

environment and conditions. the surrounding community. There are two fundamental factors that affect a person's lifestyle, namely internal factors in the form of physical and psychological and external factors such as social culture, behavior, genetics and population which also influence the health status of individuals, families, groups and

communities. The interaction of individual life in the family and society which is so complex can cause various problems, both social and health or disease. There are so many diseases that arise due to contact with the environment, but sometimes individuals, families or communities do not realize that these conditions are common in society without understanding that the impact of diseases that arise can endanger life safety. One disease which is a complex phenomenon and is still a health problem that affects the life of a community is Schistosomiasis (Kadek et al, 2023; Rasiman & Sampali, 2019; Mahmud et al, 2016; Nurwidayati et al, 2018; Rosmini et al, 2016).

Schistosomiasis or Bilharziasis is a parasitic disease that is included in the Neglected Disease (disease of less attention) and is considered a disease related to poverty, especially in tropical areas, including Indonesia. Schistosomiasis is a parasitic disease caused by blood trematode worms of the genus *Schistosoma*. These worms live in the veins of humans and mammals in several tropical and sub-tropical regions. For its survival requires an intermediate snail. The larval form of the parasite is released from the intermediate snail, piercing the skin of the person in contact with the water. Chronic schistosomiasis can reduce the ability of sufferers to work, and in some cases cause death. In children, schistosomiasis causes stunting, anemia and decreased learning ability (Akbar, 2019); Veridiana & Chadijah, 2013).

According to WHO, schistosomiasis is spread throughout the world and transmission of the disease has been reported in 78 countries (WHO, 2017; WHO 2012). So far, schistosomiasis endemic areas in Indonesia have only been found in the Napu and Bada highlands in Poso Regency and the Lindu highlands in Sigi Regency, Central Sulawesi Province. The prevalence of Schistosomiasis cases in humans fluctuates every year, and

tends to increase every year even though the figure is not more than 2%. This fluctuation was due to Schistosomiasis reinfection, people who had been infected and given medication returned to their activities in the focus area of the snail spread (Delapriyanti et al, 2018).

Etiologically, schistosomiasis in Indonesia, especially in the highlands of Napu, is a type of worm, namely *Schistosoma japonicum*, while the intermediate host as the vector of transmission is the snail *Oncomelania hupensis lindensis*. The survival of the *Oncomelania* snail is greatly supported by a habitat with a suitable climate and environment. In several habitats where *Oncomelania* snails are found, they are also influenced by temperature conditions, soil type, vegetation type, as well as the adequacy of water that supports the development of snails and also the movement of cercariae (Zhang et al. 2005). Epidemiologically, the transmission of schistosomiasis cannot be separated from human behavior or habits (Erlan et al, 2020).

In general, schistosomiasis sufferers are those who have a habit that cannot be separated from water. Frequent contact with waters or entering infected waters causes an increase in schistosomiasis sufferers in the community. Community behavior in supporting or preventing disease transmission is strongly influenced by various characteristics of the community itself such as knowledge, work, behavior, perceptions and attitudes.

The data obtained from the Central Sulawesi Provincial Health Office fluctuated. However, from 2016 to 2019 it has fallen below 0.5%. This happened because the Mass Administration of Medicines for the Prevention of Schistosomiasis (POPM) was carried out from April to October 2019 in 3 endemic areas namely Napu, Bada, and Lindu as a series of accelerated phase activities according to the ROADMAP for

schistosomiasis control which has been prepared together with cross ministries. . The management of Schistosomiasis in 2020 in humans with the Administration of Mass Prevention Drugs (POPM) for Schistosomiasis did not go according to plan due to the availability of the drug Praziquantel which was planned for 28 POPM villages which was realized in 24 villages. And in 2019 0% was not achieved because the source of transmission and vectors was not yet 0%. In 2021 there were 18 people with schistosomiasis. This data has increased because there are several problems that affect the fluctuating prevalence, including the fact that there are still many idle lands where oncomelania hupensis lindoensis snails develop, the focus area for oncomelania hupensis lindoensis snails has not been managed properly, mass treatment has not been carried out. The Schistosomiasis Control Integrated Team is not yet optimal and there is a Covid-19 pandemic so that agency programs related to the control and eradication of schistosomiasis are constrained to carry out (Nasional BPP, 2018).

Based on the description of the background above, the researcher is interested in conducting research on "the relationship between community characteristics and behavior with the incidence of schistosomiasis in the working area of the Wuasa Community Health Center in 2022".

METHOD

Design

The design of this study is descriptive correlation which aims to determine the relationship between two or more variables, with an analytic descriptive approach (case control study) namely retrospective observational analytic research in which effects or outcomes are traced back to identify relationships by comparing cases and controls. The independent variables in this study are the characteristics of the respondents

and the behavior of the respondents related to the incidence of schistosomiasis.

Samples and sampling techniques

The population in this study were respondents who suffered from schistosomiasis as a case group and those who did not suffer from schistosomiasis as a control group. The number of samples in this study were 18 respondents for the case group and 18 respondents for the control group by using a sampling technique accidental sampling.

instrument

The data collection instrument used a structured questionnaire consisting of questionnaire A, which is a question about the data on the characteristics of the respondents made by the researcher himself consisting of five questions including age, gender, marital status, education level, and occupation. Questionnaire B about the behavior of respondents: the habit of doing activities in rivers or ditches, the habit of passing through focus areas, the use of healthy latrines, the use of clean water sources, the raising of livestock and the utilization of health services.

Intervention

Respondents who agreed to be the research sample were asked to fill out a consent form to become respondents, namely inform consent. Then, respondents were asked to fill out a questionnaire sheet to find out the characteristics and behavior of the community in the working area of the Wuasa Community Health Center, North Lore District, Poso Regency, Central Sulawesi Province.

Analysis Data

The method of data analysis is Univariate to see the distribution of characteristics and behavior of respondents and Bivariate analysis to see the relationship between the variables studied using the non-parameter Chi Square test.

Ethical considerations

Researchers must first ask permission for research from the City Health Office to the research location of the Wuasa Community Health Center, North Lore District, Poso Regency, Central Sulawesi Province to carry out data collection and the research process. When conducting research, researchers need to pay attention to several considerations or ethical aspects, including: anonymity, confidentiality, autonomy, justice and beneficency. The researcher asked for consent to the participation of the respondents (informed consent) before the research is done.

RESULTS

Wuasa Village, North Lore District, Poso Regency, Central Sulawesi Province is one of the areas located in the Napu Plateau. Wuasa Village is located at coordinates - 1.1781548625283147 South Latitude and 120.15680819867165 East Longitude. The condition of the North Lore Subdistrict is an area with hilly and valley topography and is located at 1000 – 1200 meters above sea level. The land area in this area is not only used as a place for residential residents, but also used as agricultural land and rice fields by the community. The rest of the land area is plains and wilderness. North Lore District has 7 villages namely Alitupu, Bumi Banyusari Village, Dodolo Village, Kaduwaa Village, Sedoa Village, Watumaeta Village, and Wuasa Village.



Figure 1. Map of the Research Location of North Lore District, Poso Regency

Table 1. Distribution of respondents based on characteristics with events disease schistosomiasis in the Work Area of the Wuasa Community Health Center in 2022

Variable	Incident Schistosomiasis			
	Yes		No	
	N	%	N	%
Age				
≥39 years	9	50	10	55.6
<39 years	9	50	8	44.4
Gender				
Women	4	22.2	8	44.4
Men	14	77.8	10	55.6
Marital Status				
Not married yet	3	16.7	2	11.1
Married	15	83.3	16	88.9
Education				
Elementary school	6	33.7	-	-
Junior High School	5	27.8	4	22.2
Senior High School	7	38.9	14	78.8
Work				
Farmer	16	88.9	16	88.9
Officer	-	-	1	5.6
School children	2	11.1	-	-
Self-employed	-	-	1	5.6

Primary data source 2022

Based on table 1 above, it shows that respondents aged >39 years and those aged <39 years were balanced by 9 (50%) for the case group, and respondents in the control

group aged >39 years were 10 (55.6%) and those aged <39 was 8 (33.3%). The sex of the respondents in the case group, mostly 14 (77.8%) were male and the control group 10 (55.6%). Marital status of respondents in the case group, mostly 15 (83.3%) were married and 16 (88.9%) in the control group. The education level of the respondents who suffer from Schistosomiasis is mostly 7 (38.9%) educational background is high school and those who do not suffer from schistosomiasis 14 (78.8%) have high school education level. The work of both respondents who suffer from Schistosomiasis and do not suffer from Schistosomiasis is the same, namely the majority of 16 (88.8%) are farmers.

Table 2. Distribution of respondents based on community behavior with disease incidencev schistosomiasis in the Work Area of the Wuasa Community Health Center in 2022

Variable	Incident Schistosomiasis			
	Yes		No	
	N	%	N	%
River/trench activity				
Yes	12	66.7	5	27.8
No	6	33.3	13	72.2
Past the focus area				
Yes	18	100		
No	-	-	18	100
Toilet use				
Yes	16	88.9	18	100
No	2	11.1	-	-
Use of clean water				
Yes	15	83.3	14	77.8
No	3	16.7	4	22.2
Livestock				
Yes	15	83.3	12	66.7
No	3	17.7	6	33.3
Yankes utilization				
Yes	9	50	17	94.4
No	9	50	1	5.6

Primary Data Source

Based on table 2 above, it shows that most of the respondents for the case group 12 (33%) said that they often carried out activities in the river or ditch and most of the respondents for the control group (72.2%) did not carry out activities in the river. The habit

of passing through the Schistosomiasis focus area for all 18 (100%) case group respondents passed through the focus area and 18 (100%) control group respondents did not pass through the Schistosomiasis focus area. Use of latrines Most of the respondents in the case group 16 (88.9%) used latrines for defecation activities as well as all 18 respondents in the control group (100%) used latrines. The use of clean water for case group respondents was 15 (83.3%) using clean water sources for drinking and MCK needs, and 14 (77.8%) for the control group using clean water as a source of drinking and MCK. Raising livestock for the case group there are 15 (83.3%) respondents who raise livestock and 12 (66.7%) the control group who raise livestock, and for the variable utilization of health services for the case group there are 9 (50%) respondents who do not utilizing health services as a place for health services in the village and for the control group there was only 1 (5.6%) of respondents who did not utilize health services.

Table 3. The relationship between the characteristics of respondents and the incidence of schistosomiasis in the Work Area of the Wuasa Community Health Center in 2022

Variable	Schistosomiasis				Total	P Value	OR (95% CI)
	Yes		No				
	N	%	N	%			
Age							
≥39 years	9	50	9	50	18	1.00	1.000
<39 years	9	50	9	50	18	0	(0.271 -3.694)
Gender							2.800
Men	1	58.	1	41.	24	0.28	(0.658 -
Women	4	3	0	7	12	9	-
	4	33.	8	66.			11.92
		3		7			3)
Marital status							
Married	1	48.	1	51.	31	1.00	0.658
Not married yet	5	4	6	6	5	0	(0.091 -
	3	60.	2	40.			-
		0		0			4.275)

Educational	6	10	0	0	6	0.01	8.444
Elementary	5	0	4	44.	9	5	(10.80
school	7	55.	1	4	21		8-
Junior		5	4	66.			7.918)
High		33.		7			
School		3					
Senior							
High							
School							
Work							
Farmer	1	50	1	50	32	0.26	4.000
Officer	6	0	6	10	1	1	(5.545
School	0	10	1	0	2		-
children	2	0	0	0	1		0.000)
Self-employe	0	0	1	50			
d							

Primary data source 2022

Based on table 3 above, it shows that the relationship between the age of the respondents and the incidence of schistosomiasis can be seen that the respondents in the case group aged ≤ 39 years were all 9 (50%) and those aged ≥ 39 years is also the same, namely 9 (50%) with p value is 1.000 and OR = 1.000 (0.271-3.694). This shows that the age of the respondent is not related to the incidence of schistosomiasis. The relationship between gender and the incidence of schistosomiasis shows that 14 (58.3%) of the respondents for the case group suffering from schistosomiasis were men with p value 0.289 stated that gender was not related to the incidence of schistosomiasis where OR=2.800 (0.658-11.923). The relationship between the marital status of the respondents and Schistosomiasis in the case group respondents were mostly married 15 (48.4%) p value 1.000 so that it can be concluded that marital status is not related to schistosomiasis where OR = 0.658 (0.091-4.275). The relationship between the education level of respondents and schistosomiasis shows that the education level of respondents in the case group 7 (33.3%) and the control group 14 (66.7%) is high school. There are differences in proportions where p value 0.015 concluded that the level of education is not associated with the incidence of schistosomiasis. The relationship between the work of the respondents and

schistosomiasis showed that most of the respondents in the case group and the control group were the same, namely 16 (50%) farmers p value 0.261 so it can be concluded that work is not related to the incidence of schistosomiasis.

Table 4. Relationship between respondent's behavior and disease incidence schistosomiasis in the working area of the Wuasa Community Health Center in 2022

Wassa Community Health Center in 2022							
Variable	Schistosomiasis				Total	P Value	OR (95% CI)
	Yes		No				
	N	%	N	%			
Activity							
Yes	1	76.	5	23.	21	0.00	20.800
No	6	2	1	8	15	0	(3.453-125.295)
	2	13.	3	86.			
		3		7			
Focus							
Pass	1	64.	1	35.	28	0.00	0.357
Did not pass	8	3	0	7	8	3	(0.217-0.587)
	0	0	8	10			
				0			
Toilet							
Own	1	47.	1	52.	31	0.48	0.471
Do not have	6	1	8	9	5	6	(0.329-0.672)
	2	10	0	0			
		0					
Clean water							
Have	1	51.	1	48.	29	1.00	1.429
Do not have	5	7	4	3	7	0	(0.270-7.549)
	3	42.	4	57.			
		9		1			
Cattle							
There is	1	51.	1	48.	31	1.00	1.600
There isn't any	6	6	5	4	5	0	(0.234-10.945)
	2	40	3	60			
Health service							
Utilise	4	19	1	81	21	0.00	12.143
No	1	93.	7	6.7	15	0	(1.807-81.579)
	3	3	1				

Primary data source 2022

Based on table 4 above, it shows that there is a relationship between activity habits in rivers or ditches with the incidence of disease schistosomiasis it can be seen that 16 respondents (64.3%) in the case group had activities in the river or ditch and the control group 13 (86.7%) did not carry out activities in the river or ditch. The difference in this proportion is very significant as can be seen from p value 0.000 so that it can be concluded

that the habitual behavior of respondents who often do activities in the river is related to the incidence of disease schistosomiasis where $OR = 20,800$. Relation of habitual behavior through the focus area with the incidence of disease schistosomiasis It can be seen that 18 (76.2%) of the case group respondents and 10 (35.7%) of the control group respondents have a habit of passing through the focus area, the difference in this proportion is significant, as can be seen from p value 0.003 so that it can be concluded that the behavior of respondents who often pass through the focus area has a high chance of suffering from disease schistosomiasis with $OR = 10.286 (-)$. The relationship between behavior has latrines with the incidence of disease schistosomiasis it can be seen that 16 (47.1%) of the case group respondents had a latrine at home and 18 (52.9%) of the control group had a latrine at home. The difference in this proportion is very significant as can be seen from p value 0.486 so that it can be concluded that the availability of healthy latrines at home is not related to the incidence of disease schistosomiasis where $OR = 0.417$.

Furthermore, the relationship between the behavior of using clean water and the incidence of disease schistosomiasis it can be seen that 15 (51.7%) case group respondents used clean water as a source for food and drink at home and the control group 14 (48.3%) used clean water at home. Mark p value 1,000 so that it can be concluded that the use of clean water sources is not related to the incidence of disease schistosomiasis where $OR = 1.429$. The relationship between the behavior of raising livestock and the incidence of disease schistosomiasis 16 (51.6%) case group respondents had livestock at home and the control group 15 (48.4%) had livestock at home as seen from p value 1,000 so that it can be concluded that keeping livestock at home is not related to the incidence of disease schistosomiasis where $OR = 1,600$. Relationship between health service

utilization behavior and disease incidence schistosomiasis it can be seen that 13 (93.3%) case group respondents did not utilize health services and the control group 17 (81%) utilized health services. The difference in this proportion is very significant as can be seen from the p value of 0.000 so that it can be concluded that respondents who do not use health services are at greater risk of suffering from disease schistosomiasis.

DISCUSSION

The respondent's characteristic factors which include age, gender, education level, marital status and occupation all illustrate the results that there is no relationship between the characteristic factors and the incidence of schistosomiasis. The main factor for disease transmission is water, which is the environmental medium needed for the development of *Schistosoma japonicum* worms, starting at the time the eggs hatch into miracidia and their cercariae, which infect humans in various age groups, sex, work and education.

Community behavior factors illustrate that there is a relationship between the habit of doing activities in rivers or ditches with the incidence of schistosomiasis. People who have habitual contact with sources of transmission (river/ditch water) are at high risk of infection and have a greater chance of suffering from Schistosomiasis compared to those who have never had contact with river/ditch water. Contact activities with river/ditch water such as bathing, washing, fishing, defecating and so on.

The risk factor for the behavior of people who have a habit of passing through focus areas shows that there is a relationship between the habit of passing through focus areas and the incidence of schistosomiasis. Someone who always passes through the focus area of the snail for activities or transportation on foot can cause someone to be infected with Schistosomiasis. Most of the

focus is around rice fields and plantations of the population and this focus is a source of transmission of Schistosomiasis.

The third factor related to the incidence of schistosomiasis is the behavior of people who do not use health services. Community behavior that causes Schistosomiasis infection in rural areas is the lack of rural communities participating in community service in eradicating focus areas due to busy work in the fields. The counseling about the dangers of Schistosomiasis aims to provide information and understanding on how to prevent Schistosomiasis, so that the number of sufferers of this disease does not continue to increase. The level of public awareness about the dangers of Schistosomiasis will affect the willingness of the community to eradicate the disease such as environmental sanitation, using personal protective equipment if you want to make contact with focus areas and eradicating Schistosomiasis vectors.

Community behavior factors which include the use of healthy latrines, utilization of clean water sources and raising livestock are not related to the incidence of schistosomiasis. This shows that most of the respondents in both the case group and the control group had healthy latrines and had used clean water sources for their daily needs and even though the community raised livestock, the method of raising livestock had followed good work procedures, namely making cages away from the location of the focus of the snail and when feeding livestock wear gaiters.

CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that there is no relationship between the characteristics of the respondents which include age, gender, education level, marital status and employment with the incidence of schistosomiasis, so it can be concluded that the main factor causing a person to suffer from

schistosomiasis is schistosomiasis not because of the characteristics of the respondents. On the other hand, there is a relationship between the behavior of people or respondents who often move in rivers or ditches, often pass through the conch focus area and do not use health care facilities with the incidence of disease schistosomiasis respondents in the community in the working area of the Wuasa Community Health Center, North Lore District, Poso Regency, Central Sulawesi Province. The factors of using healthy latrines, using clean water sources and raising animals are not related to the incidence of disease schistosomiasis so it is not an indicator of the incidence of schistosomiasis. It is hoped that this research can be a reference and information in assisting the handling of disease cases schistosomiasis and when found there are people who are infected with the disease schistosomiasis prevention and eradication of the disease can be done more quickly so that it can be prevented from being infected with schistosomiasis again.

REFERENCES

- Akbar H. (2019). Indeks Prediktif Kejadian Schistosomiasis Berbasis Perilaku Masyarakat di Dataran Tinggi Lindu Kabupaten Sigi. *Ilm keperawatan stikes hangtuah surabaya*.
- Delapriyanti, F. G., Ratag, B. T., & Kaunang, W. P. J. (2018). Pengetahuan, Sikap Dan Tindakan Pencegahan Penyakit Schistosomiasis Masyarakat Di Desa Dodolo Kecamatan Lore Utara Kabupaten Poso | KESMAS: Jurnal Kesehatan Masyarakat Universitas Sam Ratulangi. *Kesmas: Jurnal Kesehatan Masyarakat Universitas SAM Ratulangi*, 7(4). <https://ejournal.unsrat.ac.id/index.php/kesmas/article/view/23136>
- Erlan, A., Widjaja, J., Widayati, A. N., Ningsi, Maksud, M., Tolistiawaty, I., Mustafa, H., Murni, Resmiwaty, Hapsa, Junaidi, M., Nur, A. M., Arif, M. H. (2020). Evaluasi Pengendalian Schistosomiasis

- Oleh Lintas Sektor dan Implementasi Bada Model di Daerah Endemis Schistosomiasis di Indonesia.
- Kadek Wartana, I., Gustini, G., Lilian Mua, E., Mornalita Kolupe, V., & A. Sekeon, R. (2023). Perilaku Masyarakat Dalam Pencegahan Penularan Schistosomiasis Di Desa Mekar Sari Kabupaten Poso. *Al-Tamimi Kesmas: Jurnal Ilmu Kesehatan Masyarakat (Journal of Public Health Sciences)*, 12(1), 32–40. <https://doi.org/10.35328/kesmas.v12i1.2426>
- Mahmud, V. Haskas dan Akmal. (2016). Hubungan Pengetahuan dan Sikap dengan Perilaku Kepala Keluarga Terhadap Pencegahan Penyakit Schistosomiasis di Desa Puroo Kecamatan Lindu Kabupaten Sigi. Volume 9 nomor 2. *Jurnal Ilmiah Kesehatan Diagnosis*. Makassar.
- Nurwidayati, A. Widjaja, J. Samarang. Nurjana, M. Tolistiawaty, I. Dan Phetisya. (2018). Kepadatan dan Tingkat Infeksi Serkaria *Schistosoma japonicum* pada Keong *Oncomelania hupensis lindoensis* dengan Kasus Schistosomiasis di Daerah Endemis Schistosomiasis, Sulawesi Tengah. Balai Litbang P2B2 Donggala. Sulawesi Tengah. Artikel Volume 46 No. 1:67-76
- Nasional BPP. (2018). Roadmap Eradikasi Penyakit Demam Keong (Schistosomiasis).
- Rasiman, N. B., & Sampali, L. S. (2019). Pengetahuan dan Sikap Masyarakat Dalam Upaya Pencegahan Penyakit Schistosomiasis di Puskesmas Wuasa Kabupaten Poso. *Husada Mahakam: Jurnal Kesehatan*, 4(7), 404. <https://doi.org/10.35963/hmjk.v4i7.142>
- Rosmini, Jastal dan Ningsi. (2016). Faktor Resiko Kejadian Schistosomiasis di Dataran Tinggi Bada Kabupaten Poso Sulawesi Tengah. Balai Litbang P2B2 Donggala. Sulawesi Tengah. Artikel Volume 8, Nomor 1:1-6.
- Veridiana dan Chadijah. (2013). Faktor-Faktor yang Berhubungan dengan Perilaku Masyarakat dalam Mencegah Penularan Schistosomiasis di Dua Desa Di Dataran Tinggi Napu Kapupaten Poso, Sulawesi Tengah Tahun 2010. Palu. Media Litbangkes. Artikel Volume 23 No. 3:130-136
- WHO. (2017). Schistosomiasis and soiltransmitted helminthiasis: number of people treated in 2016. World Health Organization. No 49:749-760.
- WHO. (2012). Research Priority For Helminth Infections. World Health Organization.