

Traditional Herbal Medicines and the Outcomes of Severe Malaria in the Kalomo District, Zambia.

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Abstract

Background: In Zambia, about 70% of the population relies on traditional herbal medicine (THM) for the treatment of most of illnesses, including severe malaria. Few studies have been conducted in the Kalomo district to assess the effect of THM among people who use them for the treatment of severe malaria. The purpose of this quantitative study was to investigate how THM affects the outcome of severe malaria among the residents of 3 selected villages in the Kalomo District.

Methods: Using the socioecological model as a theoretical framework, a cross-sectional study was conducted to assess the effect of THM on the outcome of severe malaria among the 70 respondents (42 females and 28 males) from 3 villages.

Results: Descriptive statistics were performed to determine the characteristics of the respondents. Logistic regressions demonstrated that respondents who took THM first and then went to the health center had a longer length of morbidity than the respondents who went immediately to the health center, thus pointing to an association between THM use and the length of morbidity ($p = 0.00$). Logistic regression analyses found no relationship between the use of THM and malaria knowledge ($p = 0.180$).

Conclusion: Positive social change from the study is the possible reduction in morbidity length due to severe malaria among the vulnerable groups, namely children under the age of 5 years, pregnant women, and the elderly. The study results may help in developing policies that would target health-care-seeking behavior among the residents of the study area and may raise awareness about the prompt use of health centers when sick, which would improve the quality of life.

Background: Malaria is endemic in all parts of Zambia and remains one of the top major public health problems. Malaria accounts for 4 million clinical cases annually in Zambia, 36% of hospitalizations and outpatient visits, and 20% of maternal mortality (National Malaria Control Center, 2012). The poorest persons are the most vulnerable, and the burden of malaria takes a toll on the whole Zambian economy (National Malaria Control Center, 2012).

The objective of this observational, cross-sectional study was to assess the relationships between the use of traditional herbal medicines (THM) for the treatment of severe malaria and their effect on the length of morbidity among the users. THM are widely used in many parts of the world for the treatment of illnesses, including severe malaria. Over 80% of the population in the developing world, particularly in Africa, relies on THM for the treatment of most illnesses (World Health Organization, 2010). In Zambia, Nigeria, Mali, Ghana, and several other countries, more than 60% of the population relies on THM for the treatment of fevers and malaria, especially in children (The Fifty-Sixth World Health Assembly of World Health Organization, 2003). While it is important to acknowledge the importance and advantages of THM, such as low cost and easy access, the lack of proper and safe dosage constitutes a health hazard to the users (Okeke et al., 2009). Few studies have been conducted in Zambia to assess the effect of THM on the outcome of severe malaria. Therefore, this observational study was needed in order to assess the effect of THM on the outcome of severe malaria. Moreover, Zambia continues to face the challenge of malaria despite the progress gained since 2000 (PMI, 2012). Parasitemia among children under the age of 5 has increased from 10% in 2008 to 16% in 2010 (National Malaria Control Center, 2012). Severe anemia among children under the age of 5 has also increased from 4% in 2008 to 9% in 2010 (National Malaria Control Center, 2012). The increase of both parasitemia and anemia is attributed to the reduction in the use and ownership of insecticide treated mosquito nets during the period of 2008 to 2010 (National Malaria Control Center, 2012). One of the objectives of the World Health Organization that was adopted by the United States of America President's Malaria Initiative (PMI) was to target behavior change through communication in order to have children under the age of 5 receive treatment within the first 24 hours (PMI, 2012). This study was needed to contribute to initiatives aimed at reducing morbidity among the most vulnerable groups, especially children under the age of 5 and pregnant women. Applying the results from this study may help to reduce extended morbidity due to severe malaria among children under the age of 5, pregnant women, and the elderly. Furthermore, this study may help in implementing policies that will raise awareness in healthcare seeking behaviors among the residents of the Kalomo District.

Methods

Ethical Statement

The study was reviewed and approved by the Walden University Institutional Review Board, and the approval Number is 12-18-13-0169116.

Study Design

The study was a correlational design that used a cross-sectional method via a survey instrument to enroll respondents who had used THM in the treatment of severe malaria, but who remained

ill and went to seek modern treatment for the same event compared to the respondents who did not use THM but went to the health center to get treated using modern medicines. The following variables were examined: the use of traditional herbal medicines vs. modern medicine for the treatment of severe malaria were tested to determine if a relationship existed with the length of morbidity (the dependent variable) after controlling for the covariates age, gender, marital status, religion, level of education, income, and the distance to health center. Additionally, statistical tests were conducted to determine if there was a relationship between the use of THM (dependent variable) and malaria knowledge (independent variable) after controlling for covariates age, gender, marital status, religion, level of education, income, and the distance to the health center. Data collection took place during malaria peak season from January 25 to January 27, 2014.

Study Area and Participants

Study Area

The study area comprised of three villages: Andeleki, Matondo and Mukwela. The three villages are served by two rural health centers namely Mukwela Health Center and Kalomo District Hospital-Affiliated Health Center. The villages were selected based on their proximity to the health centers and their relative accessibility for this proposed study. Two research helpers (one environmental health technician and one registered nurse) were employed to help me in the coordination of data collection. The Mukwela Health Center which was used for the study is a government institution. It comprises an outpatient clinic, a two bed maternity room, and a teaching hall. It is supervised by a registered nurse who is assisted by another registered nurse. The immunizations, health education, and the epidemiological reports are conducted by an environmental technician. Choonga Health Center that was used for the pilot study is also a governmental institution. It is also staffed by three healthcare workers: two registered nurses and an environmental technician.

Population

The Kalomo District has a population of 264,635 (MOH, 2011). The annual population growth rate is 2.7%, and the expected births are estimated to be 5.2%. The Tonga tribe constitutes the majority of the total population (80%) with the Toka-Leya in the south, and the Ila in the north being the other two major tribes. Women account for the majority of the population with 51%. The population is mostly young (less than 18 years), and the youth constitutes about 80% of the population.

Study Participants

The inclusion criteria for recruiting respondents considered as cases were: being 18 years of age, having a confirmed diagnosis of severe malaria by a positive Rapid Diagnostic Testing (RDT), or having used THM before coming to the health center, and consenting to participate in the study. The comparison group comprised of respondents from 18 years of age, who had a confirmed diagnosis of severe malaria at the health center by RDT, but have not used traditional herbal medicines before coming to the health center. The respondents who accepted to participate, and willing to travel to the health center, were asked to come to Mukwela Health Center where the

survey was conducted. Thirty Zambian Kwacha was given as compensation for traveling to Mukwela Health Center. The respondents who were present at the health center and consented to participate in the study because they were eligible to be included in the study were given a thank you gift of 10 Zambian Kwacha, which is equivalent to 1.80 U.S. dollars. The thank you gift was mentioned during the announcement of the study, and on the invitation to participate in the study. The inclusion criteria were a safeguard for selection bias.

Statistical Analysis

The purpose of this quantitative study was to investigate how THM affect the outcome of severe malaria as well as quantify the length of morbidity among the respondents who suffered from severe malaria in the previous 3 months and were residents in one of the three selected villages: Andeleki, Matondo, and Mukwela in the Kalomo District located in the Republic of Zambia. The statistical analyses were conducted using SPSS 21 (IBM SPSS, USA) to find an association between the use of THM and the length of morbidity in the first research question and to test for a possible relationship between malaria knowledge and the use of THM in the second research question. The sociodemographic factors of gender, income, education attainment, religion, tribal beliefs, and distance to the rural health centers were also assessed for a possible association with the use of THM. The time to recover from confirmed severe malaria was recorded in both those that used THM and those that used western or modern medicines via the health center(s).

Two research questions were examined:

Research Question 1 (RQ1): Is there an association between the type of treatment used for severe malaria (THM versus modern medicines) and the outcome of the length of morbidity among those meeting the diagnosis criteria for severe malaria?

Research Question 2 (RQ2): Is there a relationship between the type of treatment used for severe malaria (THM vs. modern medicines) and malaria knowledge? For this study, the alpha level was set at 0.05 and the p-value at 0.05. The respondents were interviewed from January 25 to 27, 2014 in the order they arrived at the health center. The following are the characteristics and distribution of the respondents: Of the study participants, 60% were females, 92.9% had attended school, 100% were Christian, 70% were from Mukwela, 72.8% were between the ages of 18 and 39, 62.9% were married, 62.9% lived between 1 to 10 km from the health center, 78.6% had less than a high school education, 55.7% had an income level between ZK (Zambian Kwacha 500,000 and ZK999,999 per year, and 71.4% had a Tonga tribal affiliation. Table five below shows the demographic information of the study participants.

Table 1
Demographic Information of Study Participants, Matondo and Mukwela Villages in Zambia, 2014 (n = 70)

Variables	Frequency	Percent
Age (in Years)		
Between 18 and 29	25	35.7

Between 30 and 39	26	37.1
Between 40 and 49	15	21.4
Between 50 and 59	4	5.7
Total	70	100.0

Gender

Male	28	40
Female	42	60
Total	70	100.0

Marital status

Single, never married	22	31.4
Married	44	62.9
Divorced	3	4.3
Separated	1	1.4
Total	70	100.0

Attended school

Yes	65	92.9
No	5	7.1
Total	70	100.0

Education Level

Some Primary School	13	18.6 (table continued)
Primary School	23	32.9
Some High school	19	27.1
High School	6	8.6

Some College	1	1.4
College	3	4.3
Total	65	92.9
Missing	5	7.1
		100.0

Religious Affiliation

Christian	70	100.0
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Village of Origin

Matondo	21	30.0
Mukwela	49	70.0
Total	70	100.0

Distance From home to HC

Between 1 and 5 Km	24	34.3
Between 6 and 10 Km	20	28.6
Between 11 and 20 Km	14	20.0
More than 20 Km	12	17.1
Total	70	100.0

Level of Income

Between 10,000 and 99,999 (Kwacha)	7	10.0
Between 100,000 and 499,999 (Kwacha)	12	17.1 (table continued)
Between 500,00 and 999,999 (Kwacha)	39	55.7
1,000,000 (Kwacha) and above		

Total	12	17.1
	70	100.0
Tribal Affiliation		
Tonga	50	71.4
Toka-Leya	9	12.9
Other	11	15.7
Total	70	100.0

For the health and malaria knowledge, 55 (75.4%) respondents indicated that they knew what caused malaria and 53 (75.7%) respondents stated that convulsions is a common sign of high fever, especially in children, and can be due to malaria. Of the study participants, 27.1% of them had used THM. 67.1% did not trust THM. 62 did not believe THM could cure malaria, and 87.1% used the health center each time they were ill. All participants had used the health center in the past year. Of them, 87.1% have used the health center two times or more in the past year. Approximately 93 % stated they liked going to the health center and felt better after seeking care there. Approximately 51.4% of those that went to the health center did not like going because they felt it was too far from their residence. Table 2 is the frequency of health and malaria knowledge, and THM use in the study area.

Health and Knowledge of Malaria and THM use, Zambia, 2014 (n = 70)

Variable	Frequency	Percent
Response		
Used THM		
Yes	19	27.1
No	51	72.9
Total	70	100.0 (table continued)
Trust THM		
Trust it a Little	9	12.9
Moderately trust it	14	20.0

Do not trust it	47	67.1
Total	70	100

THM can cure Malaria

Agree	23	32.9
Strongly agree	3	4.3
Disagree	6	8.6
Strongly disagree	38	54.3
Total	70	100

Health Center use frequency

Each time I am ill	61	87.1
Once in a while	9	12.9
Total	70	100

Frequency of HC use in the past year

One time	9	12.9
Two times	27	38.6
Three times	22	31.4
More than three times	12	17.1
Total	70	100.0

Like HC

Better care	65	92.9 (table continued)
Get well faster	5	7.1
Total	70	100.0

Dislike HC

Too far	36	51.4
No medication	6	8.6
No Qualified personnel	4	5.7
Too slow	11	15.7
I do not have a problem with it	13	18.6
Total	70	100.0
Felt better after using THM		
Yes	4	5.7
No	15	21.4
Total	19	27.1
Did not use	51	

There were eight respondents in the 18 to 29 year old age group who used THM, six in the 30 and 39 year old age group, three in the 40 to 49 year age group and , and two respondents in the 50 and 59 year old age group. There was no relationship found between age and the use of THM ($p = 0.893$). Table Seven shows the crosstabulation between age and THM usage among the 70 respondents.

Table 3
Age (in Years) and Used THM Crosstabulation, Kalomo District 2014 (n = 70)

Age in years	Used THM	Not Used THM	Total
Between 18 and 29	8	17	25
Between 30 and 39	6	20	26
Between 40 and 49	3	12	15
Between 50 and 59	2	2	4
Total	19	51	70

Table 4
Symmetric Measures for Age (in years) and Used THM

		Value	Asymp. Std. Error ^a	Approx. T ^b	<i>p</i> value.
Interval by Interval	Pearson's R	0.016	0.129	0.135	0.893 ^c
Ordinal by Ordinal	Spearman Correlation	0.043	0.125	0.354	0.724 ^c
N of Valid Cases		70			

Note: a. Not assuming the null hypothesis, b. Using the asymptotic standard error assuming the null hypothesis, c. Based on normal approximation

THM Use by Gender: Nineteen respondents stated that they used THM, eight males and 11 females. The correlation shows no relationship between gender and the use of THM ($p = 0.829$).

Table 5 shows the crosstabulation between THM usage and gender among the respondents of Matondo and Mukwela.

Table 5
THM Usage by Gender; Villages of Matondo and Mukwela, Zambia, 2014 (n = 70)

Variable: Gender	Used THM (yes)	Not used THM (no)	Total
Male	8	20	28
Female	11	31	42
Total	19	51	70

Table 6 shows the symmetric measures for the crosstabulation between gender and THM usage.

Table 6
Symmetric Measures for Gender and Used THM

		Value	Asymp. Std. Error ^a	Approx. T ^b	(<i>p</i> value)
Interval by Interval	Pearson's R	0.026	0.120	0.216	0.829 ^c
Ordinal by Ordinal	Spearman Correlation	0.026	0.120	0.216	0.829 ^c

Number of Cases	70
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Notes: a. Not assuming the null hypothesis, b. Using the asymptotic standard error, c. Based on normal approximation.

THM Usage and Village of Origin: Among the respondents who used THM, four were from Matondo Village and 15 were from Mukwela village. There was no relationship between the use of THM and the village of origin ($p = 0.326$).

Table 7 shows the crosstabulation of the use of THM by the village of origin.

Table 7

THM Use by the Village of Origin, Zambia, 2014 (n = 70)

Village of origin	Used THM		Total
	Yes	No	
Matondo	4	17	21
Mukwela	15	34	49
Total	19	51	70

Table 8 shows symmetric measures for THM use by village of origin in the study area.

Table 8

Symmetric Measures for THM Use by Village of Origin, Zambia, 2014

		Value	Asymp. Std. Error ^a	Approx. T ^b	p value.
Interval by Interval	Pearson's R	-0.119	0.111	-0.990	0.326 ^c
Ordinal by Ordinal	Spearman Correlation	-0.119	0.111	-0.990	0.326 ^c
Number of Cases		70			

Note: not assuming the null hypothesis, using the asymptotic standard error assuming the null hypothesis, and based on normal approximation

The use of THM, distance to health center, and education: Among those who used THM, 18 went to school, and one did not go to school. Table 9 shows the crosstabulation summary of the

level of education and the use of THM. There is no relationship between the level of education and use of THM ($p = 0.714$, 95% CI: 0.150, 14.646). Table 10 shows the symmetric measures for the crosstabulation between education and the THM usage, and table 11 shows the model summary of the Multiple Logistic Regression between the dependent variable THM use and the covariate level of education. The covariate from home to the health center was not a factor for using THM, because there were equal numbers for those who lived near the health center, six respondents and those who lived far away. Table 12 depicts the crosstabulation of the distance from home to health center, and Table 13 is the correlation between the two variables. Among those who used THM, four felt better after using them, and 15 did not feel better. Table 14 is the summary of Crosstabulation of THM use and feeling better after using THM. The Crosstabulation between THM can cure malaria and gender shows that 10 males and 13 females agreed that THM can cure malaria, three female respondents strongly agreed that THM could treat malaria, six females disagreed, 20 females respondents strongly disagreed, and 18 males respondents disagreed that THM can be used treat malaria. Tables 15 and 16 depict the symmetric measures for THM can cure malaria by gender. There was no relationship between gender and the belief that THM can cure malaria.

Table 9 shows the crosstabulation between THM usage and school attendance in the study area.

Table 9
Attended School and Usage of THM (n = 70)

Attended school	Used THM	No THM use	Total
Yes	18	47	65
No	1	4	5
Total	19	51	70

Table 10 shows the symmetric measures for education and the use of THM in the study area.

Table 10
Symmetric Measures of Education and Use of THM

		Value	Asymp. Std. Error ^a	Approx. T ^b	p value.
Interval by	Pearson's R	0.045	0.109	0.368	0.714 ^c

Interval					
Ordinal by Ordinal	Spearman Correlation	0.045	0.109	0.368	0.714 ^c
N of Valid Cases		70			

Note: Not assuming the null hypothesis, using the asymptotic standard error assuming the null hypothesis, and based on normal approximation

Table 11 shows the model summary for Multiple Logistic Regression of Used THM and school attendance.

Table 11

Model Summary for Multiple Logistic Regression Used THM and School Attendance (Went to School)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% CI for expected	
							Lower	Upper
Step 1 THM use	0.427	1.152	0.137	1	0.711	1.532	0.160	14.646
Constant	-3.317	2.120	2.448	1	0.118	0.036		

Table 12 shows crosstabulation between the use of THM, and the distance from home to the health centers in the study area.

Table 12

Distance from Home to the Health Center by Usage of THM

Used THM	Between 1 and 5 Km	Between 6 and 10 Km	Between 11 and 20 Km	More than 20 Km	Total
Yes	6	4	6	3	19
No	18	16	8	9	51
Total	24	20	14	12	70

Table 13 shows the symmetric measures for distance from home to health center and usage of THM among the respondents in the study area.

Table 13

Symmetric Measures for distance from Home to the Health Center and usage of THM

		Value	Asymp. Std. Error ^a	Approx. T ^b	p value.
Interval by Interval	Pearson's R	-0.065	0.119	-0.536	0.594 ^c
Ordinal by Ordinal	Spearman Correlation	-0.068	0.120	-0.561	0.577 ^c
N of Valid Cases		70			

Note: Not assuming the null hypothesis, using the asymptotic standard error assuming the null hypothesis, and based on normal approximation

Table 14 shows the crosstabulation between used THM and felt better among the 19 respondents who used THM.

Table 14

Used THM and Felt Better after Using THM, Matondo & Mukwela Villages in Kalomo District, Zambia 2014 (n = 19).

Variable		Felt better after using THM		Total
		Yes	No	
Used THM	Yes	4	15	19
Total		4	15	19

Table 15 shows the crosstabulation between THM can cure malaria and gender among the respondents of Matondo and Mukwela.

Table 15

Crosstab THM can cure Malaria by Gender, Matondo and Mukwela Villages in Kalomo District, Zambia 2014 (n = 70)

Gender	Agree	Strongly agree	Disagree	Strongly Disagree	Total
Male	10	0	0	18	28
Female	13	3	6	20	42

Total	23	3	6	28	70
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Table 16 shows the symmetric measures for THM can cure malaria by gender.

Table 16
Symmetric Measures for THM can Cure Malaria by Gender

		Value	Asymp. Std. Error ^a	Approx. T ^b	<i>p</i> value.
Nominal by Nominal	Phi	0.316			.073
	Cramer's V	0.316			.073
Interval by Interval	Pearson's R	-0.051	0.122	-0.422	0.674 ^c
Ordinal by Ordinal	Spearman Correlation	-0.085	0.123	-0.706	0.483 ^c
Number of Cases		70			

Note: Not assuming the null hypothesis, using the asymptotic standard error assuming the null hypothesis, and based on normal approximation.

Analysis of Primary Research Questions: The first research question asked whether there was an association between the type of treatment used (THM versus modern medicines) and the outcome of the length of morbidity. The hypotheses for this question were that there was no association between the type of medicines used and the outcomes of the length of morbidity, and alternatively that there was an association between the type of treatment used (modern versus THM) and the outcome of the length of morbidity. The second research question asked whether there was a relationship between malaria knowledge and the type of treatment used for the treatment of malaria (THM versus modern medicines). The hypothesis for the second research question were that there was no relationship between the type of treatment used (THM versus modern medicines) and malaria knowledge, and that there were a relationship between malaria knowledge and the type of treatment (THM versus modern medicines) used for malaria.

Research Question 1: Multiple Logistic Regression was performed to test the association between the use of THM and the length of morbidity. There was an association between the length of morbidity and the use of THM ($p = 0.000$), see table 22. People who used traditional herbal medicines had extended morbidity compared to the people who used modern medicines. Most of the respondents who used modern medicines stated that they felt better between 3 and 5 days, while the ones who used THM, five stated they felt better between 3 and 5 days, and seven stated that they felt better between 6 and 11 days. Table 17 is the summary of the logistic regression for THM use and the length of morbidity.

Table 17 shows the case processing summary for Multiple Logistic Regression Used THM and how long it took to feel better (length of morbidity).

Table 17

Case Processing Summary Used THM and How Long it Took To Feel Better (n = 70)

How long did it take to fell better	N	Marginal Percentage
Between 3 and 5 days	5	41.7%
Between 6 and 10 days	4	33.3.%
Between 11 and 15 days	3	25%
Used THM: Yes	12	100%
Valid	12	100%
Missing	58	
Total	70	

Table 18 shows the model fitting information for Multiple Logistic Regression for used THM and how long it took to feel better.

Table 18

Model Fitting Information for Multiple Logistic Regression Used THM and How Long it Took to Feel Better (n =70)

Table 23

ANOVA Table for dependent variable Used THM and Malaria cause/transmission

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.364	1	0,364	1.837	0.180 ^b
Residual	13.479	68	0.198		
Total	13.843	69			

Note: a. Dependent Variable: Used THM, b. Predictors: (Constant), Malaria cause/transmission

The regression performed to assess the relation between malaria knowledge and THM use found no significant relationship ($p = 0.732$) between the two variables.

Table 24 is case processing summary for Multiple Logistic Regression for THM usage and malaria knowledge among the 70 respondents.

Table 24

Case Processing Summary Regression THM Use and Malaria Knowledge (n =70)

	Response	N	Marginal Percentage
Used THM	Yes	18	27.7%
	No	47	72.3%
Malaria Cause/Transmission	Yes	55	84.6%
	No	10	15.4%
Valid		65	100.0%
Missing		5	
Total		70	

Table 25 is the model fitting information for Multiple Logistic Regression of THM Usage and malaria knowledge.

Table 25

Model Fitting Information of Regression THM Usage and Malaria Knowledge

Model	-2 Log Likelihood	df	Sig.
Intercept only	73.120		

Interpretation of the Findings

Type of treatment used for the treatment of malaria (THM versus Modern Medicines) and the outcomes of severe malaria

The first research question asked whether there was an association between the type of treatment used and the outcomes of severe malaria. During the survey, 19 respondents out of 70 stated that they used THM and 51 stated that they used modern medicines. The length of morbidity for the 12 (of 19) respondents who used THM and did not feel better was quantified from the time they took the medicines to the times they felt better after getting treated at the health center. For seven respondents, the time was longer than the time it took to get better for those who went to the health center and got treated. The seven respondents who used THM had an extended morbidity due to the use of THM ($p: 0.00$, see Table 20). The null hypothesis stating that there is no association between the types of treatment used (THM versus modern medicines) and the outcome of the length of morbidity was rejected. Female respondents (11) were more likely to use THM than male respondents (8). This finding is shedding light on the magnitude of the problem of self-treatment using THM.

In this study, all the respondents (100%) believed that modern medicines are better than THM, which disagrees with a previous cross-sectional research that was conducted by Mengistu and Wakgari (2009) in the rural highlands of central Ethiopia to assess how local populations perceived the effectiveness of THM on malaria. In their study, Mengistu and Wakgari stated that 34% of the local population believed that THM was more effective than modern medicines for the treatment of malaria. The present study quantified the length of morbidity. Tabuti (2006) stated in his study that several herbal plants could be used to treat malaria, but he did not quantify the length of morbidity among the people who used herbal medicines for the treatment of malaria. Challand and Wilcox (2009) conducted a clinical trial study in Kabarole, Uganda to assess the effectiveness of *Vernonia amygdalina* on nonsevere malaria. The length of morbidity was documented, but there was a need for an observational study that would quantify the length of morbidity among the respondents who used THM for the treatment of severe malaria. This dissertation study quantified the length of morbidity, and the results showed that seven respondents who used THM had extended morbidity (between 6 and 10 days for some and 10 to 15 days for others) in comparison to the respondents who went to the health center and stated that they felt better between 3 and 5 days after treatment. There was no association between the use of THM and age, marital status, village of origin, income, and tribe. The findings from this study contradict previous research studies in which the researchers found a relationship between the use of THM and sociodemographic factors age, gender, and distance to health facilities (Baume et al., 2000, Chuma et al., 2009; Oladele & Kauna, 2005; Stekelenburg et al. 2005;).

Types of Treatment Used (THM versus Modern Medicines) and Malaria Knowledge

The second research question asked whether there was an association between the types of treatment used (THM versus modern medicines) and malaria knowledge. There was no relationship between the types of treatment used to treat malaria and malaria knowledge because most of the respondents stated that they knew what causes malaria, malaria symptoms, and transmission ($p: 0.732$, Table 25). The null hypothesis that posited that there was no relationship between the types of treatment used and malaria knowledge was retained. Another finding that is worth mentioning is that most of the respondents (44) did not trust that THM could treat malaria and only 26 agreed that THM could treat malaria. The majority of the respondents stated that

they used the health center each time they were sick, and that they used it at least once in the previous year. Among the 19 respondents who used THM, four indicated that they felt better after using THM (see Table 14). All the respondents stated that the modern healthcare system is better than THM, and that they used the health centers for two reasons: better care and getting well faster. The respondents' responses demonstrated that THM is used for the treatment of malaria, but modern medicines are more trusted and more reliable. This finding contradicted the previous findings in the research conducted by Nuwaha (2002) in Mbarara, Southern Uganda. In this present study, most of the respondents stated that they knew what causes malaria. Furthermore, most of the respondents stated that convulsions were likely to be caused by severe malaria rather than evil spirits or witchcraft. All the respondents could at least mention one malaria symptom they had when they suffered from severe malaria, which demonstrated that they had good knowledge about malaria. The findings of this study shed light on what needs to be done to maintain and improve the development attained by Zambia in malaria reduction and possible eradication. Most of the respondents had a good knowledge about the etiology of malaria and its treatment, and most of them stated that they trusted modern medicine more than traditional medicine for the treatment of malaria.

Findings and the Relationship with the Social Ecological Model

The socioecological model applies to this study because people who have severe malaria can be influenced by their personal behavior, the economic status, and educational level to seek healthcare (Dahlberg & Krug, 2002). The constructs of the socio ecological model that are pertaining to the results of the study are mainly individual and interrelationship. The respondents who used THM stated that they got them from the neighboring bush by themselves or from their neighbors. The societal and community level are implicated at the health center level. The respondents indicated that they used the health center when they were sick, but most of them (51.4 %) did not like that it was too far from them and often too slow (15.7%) in providing care. Others indicated that they were satisfied with the health center (18.6%).

The relationship of the SEM to the research questions is as follows: in Research Question 1, the independent variable was the type of treatment used (THM vs modern medicines) and the dependent variable was the length of morbidity which pertained to the individual level; it was found that the respondents who decided to go to the health center to be treated felt better between 3 and 5 days, thus having a shorter period of being ill as opposed to the respondents who decided to take THM first and who did not feel better and went to the health center to get treated and felt better between 6 and 10 days for some, and between 11 and 20 days for others, consequently having a longer period of illness. The SEM applies here at the individual level, by the fact that the people who decided to take THM first and then go to the health center because they felt that it was the first action to take to satisfy the biological needs of their health at that time. As it was previously stated, the finding from Research Question 1 that seven respondents who took THM and did not get better and who went to the health center had their illness prolonged compared to the respondents who did take THM. Personal behavior was a factor here, as it is explained by SEM. The respondents who decided to go to the health center first stated that they felt better within 3 to 5 days, and their behavior is also explained at the individual level of SEM. The findings here are valid in the context of SEM.

In Research Question 2, the independent variable was malaria knowledge and the dependent variable was the type of treatment used (THM versus modern medicines). At the individual level,

the respondents demonstrated a good knowledge about malaria, and the decision to go to the health center or to use THM was not influenced by malaria knowledge. Some of the respondents who used THM stated that they used it as emergency care before going to the health center. The application of SEM to the research questions was more relevant at the individual level. At the community and societal level, the health center and modern medicines were trusted by most of the respondents, underscoring the need to build more health centers in the rural Kalomo District. The finding that there was no association between the type of treatment used and malaria knowledge is valid in the context of SEM because the respondents had knowledge about malaria, and their decision to use THM was not influenced by the lack of knowledge about malaria. There was no relationship between the type of treatment used and the covariates age, gender, level of income, and education. This finding is valid in the context of SEM, because sociodemographic factors were not a predictor in influencing the use of THM or going to the health center.

Limitations of the study

There were several limitations to this study. The design of the study was one of the major limitations: cross-sectional studies have the advantage of being quick because they are a snapshot of the problem being studied, but they are limited by the inability of providing cause and effect (Ashengreau & Sage III, 2008; Mann, 2003). It was not possible to encounter many cases of respondents who used THM and many of those that were contacted at the village level did not travel to the health centers because of the distance, and the timing of the study which was during the raining season and it was time for intense farming. Cross-sectional studies are conducted at one point in time, and cannot follow up the respondents. This study was conducted from December 20, 2013 to January 27, 2014. It was not possible to capture all the cases that used THM. Furthermore, all the respondents had to walk to Mukwela and Choonga Health Centers for the administration of the survey questionnaire. The fact that I could not go to administer the survey at the household-level was a major limitation placed on my original research proposal by Walden's IRB to avoid any possibility of the feeling of coercion by the participants. People who used THM and got better could have opted not to walk to the health centers thus limiting my access to that portion of the population. Another limitation of the study is the sampling method which was a convenience sample. The instrument that was used for this study was designed following the templates of the survey instruments that were used in population based surveys such as the one used in ACT Watch (2009) household surveys. The instrument was pilot tested but the Cronbach's alpha was in the fair range (0.50); therefore, the results of this study have to be interpreted with caution. Another major limitation was the size of the sample. 70 respondents participated in this study, and 19 respondents indicated that they used THM. A larger sample size would have yielded more significant results. The generalizability of the study results is also a limitation because there are 73 tribes in Zambia, who have different cultures. Although in this study, there was no association between tribe and the THM use. Another limitation is that some respondents were not able to understand English, and I had to rely on an interpreter for some items such as income level. Another possible limitation was the selection bias. The thank you monetary gift that were paid out may have caused some respondents to come to participate in the study.

Recommendations for Future Research

This was a cross-sectional study and it was limited to one point in time. Therefore, it was not possible to encounter all the persons who used THM in the previous three months. A longitudinal

study that widens the study area is needed in order to include more participants who used THM. Respondents mentioned that they used a plant named *Mulurwe* for the self-treatment of malaria. The *Mulurwe* description was consistent with *Vernonia amygdalina*, a plant widely used throughout Africa for the treatment of malaria (Challand & Wilcox, 2009; Tabuti, 2006). More observational and clinical trials are needed in order to document the effect of this plant on malaria (Challand & Willcox, 2009).

Conclusions

The results from this study may contribute to positive social change by demonstrating that there is still work to be undertaken in order to completely eliminate malaria by the end of this decade (Malaria Control Center, 2012). Malaria has been declining in Zambia, but it remains a major public health problem (Malaria Control Center, 2012; WHO, 2013). Improving the healthcare delivery system remains a priority in order to reach the goal of malaria elimination. If there were enough health centers in rural areas, it would be easier to improve the treatment seeking behavior of the populations living in rural areas, especially in the villages that were included in this study (Andeleki, Matondo, and Mukwela). Some of the respondents who used THM stated that they used it for emergency care before going to the health center. Therefore, the study results may be a catalyst to the designing of policies that would improve the quality of life among the residents of the study areas. Finally, this study has shed a light on the use of THM for self-treatment of severe malaria in Kalomo district, Zambia. It was a snapshot of the problem, and it has opened the door for larger studies, either longitudinal or cross-sectional that would enroll more respondents who used THM and those who did not in order to yield more significant results. It has filled a part of the gaps in the literature about the use of THM and the length of morbidity among those who used THM and those who used modern medicines.

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