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Health Literacy and Associated Factors under One Health Approach in Selected Wards in Eastern Tanzania: A Multiple Regression Analysis

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Abstract: Understanding factors associated with health literacy remains important in scaling up health literacy initiatives towards attainment of good health. This article discusses health literacy and associated factors under One Health Approach from a cross sectional study in selected wards in Eastern Tanzania. A structured questionnaire was used to collect data from 1440 respondents obtained through multistage sampling procedure. Health Literacy assessment tool was developed to assess health literacy. IBM-SPSS v.20 analyzed quantitative data while qualitative data were organized into themes on specific objectives to back up findings. Multiple regression was employed to explore the correlation or relationship between health literacy (HL) and numerous continuous independent variables. The study revealed that HL score had a large correlation with HB r = -.631, p= .000, N= 1440), LGAs r = .617, p= 000, N=1440, Influence of politics score$r$ = .082, p= .001, N=1440; Prior knowledge score r =-.082, .001, N=1440; Scores on HRDE r =.347, .000, N=1440; Score on EoHRA r =.099, .000, N=1440; Years spent on studies r =.125, .000 and Attitudes towards HIB r =-.082, .001, N=1440. The strongest unique contribution associated to HL was found from Health Behaviour Score with beta coefficient of -.474, while Local Government Authorities initiatives on health (.294), Influence of politics on health score (.249), interactions with professionals score (.078), and scores on Health Related Discussion Engagement (HRDE) (.151) are making statistically significant unique contribution to the model in terms of prediction of HL. It can be noted that there are various factors that are associated/correlating with HL with differing magnitude but some having no unique contribution to the variable. Effective HL interventions towards attainment of good health has to take on board the extent to which such associated factors are likely to make contribution to HL hence capitalizing on such contributions.

Keywords: *Health Literacy, One Health Approach, Multiple Regression, Eastern Tanzania*

1.0 Background Information and Problem Statement

Attainment of good health, *inter alia,* relies on Health Literacy (HL) (Paasche-Orlow and Wolf, 2007; Muhanga and Malungo, 2017a; Muhanga and Malungo, 2018c), much as HL impacts health in numerous facets (Weiss *et al.*, 1992; Parker *et al.*, 1995; Baker *et al.*, 1996; Ratzan and Parker, 2000; Gazmararian *et al.*, 2003; Berkman *et al.*, 2004; Dewalt *et al.*,2004; Nielsen-Bohlman *et al.*,2004; Sudore *et al.*, 2006; AHRQ, 2007; Paasche-Orlow and Wolf, 2007; TARSC, 2009; WHO, 2009; Berkman *et al.*, 2010). Such impacts are notably on: - health care costs and utilization, person's ability to access and use health care, to interact with providers, and to care for oneself. Understanding factors associated with health literacy remains important in scaling up health literacy initiatives towards attainment of good health. Obviously, effective HL interventions towards attainment of good health depend on a number of attributes.

Context specificity and focusing on One Health Approach (OHEA) are among key attributes of effective health education and consequently HL interventions to efficiently lead to health behavioural change hence attainment of optimal health for humans, animals and the environment.

Important to note is the fact that currently the world has been experiencing numerous incidences which have sometimes resulted into transmission of infectious diseases originating from livestock production, intensive animal production practices, exploitation of wildlife, wildlife trade, increasing contact of wildlife and livestock, and environmental degradation (Jones *et al.*, 2008; Kayunze *et al.*, 2012; Mumba *et al.*, 2014). In the context of these incidences, it is apparent that effective HL interventions which could lead to attainment of good health have to take into account recognition of the existence of an inextricable link between human, animal and environmental health. It is against this that it is now being considered imperative for veterinarians, human health and professionals in some other related sectors to collaborate closely at the same time a higher level of HL under One Health Approach encouraged among people towards maintaining good health (Muhanga and Malungo, 2018a; 2018b). It can be observed that numerous efforts have been put in place by the government of Tanzania which aimed at improving health services and educating people to become more health literate i.e. to cultivate the knowledge and skills needed to access, understand and use health information, thus enabling and encouraging them to make healthier lifestyle choices (so as to achieve positive health outcomes for both humans and animals) (URT, 2003a).

Despite the efforts, there has been notable existence of health impairing behaviours (URT, 2007a:11-12; URT, 2007b:34) which sometimes resulted into a higher prevalence of infectious diseases (including zoonotic ones i.e. Tuberculosis, Rabies, *Taenia solium* infestation, Human Brucellosis etc) (see for example Kassuku *et al.*, 1999; Cleaveland *et al.*, 2002; Minja, 2002), and varying preferences for Tanzanians in terms of seeking healthcare services ranging from traditional healers, self-treatment, and no treatment instead of going to hospital (Good and Kimani, 1980; Atkinson *et al*., 1999; McCombie, 2002; URT, 2003b). Much as these efforts are reported to have failed to attain its intended targets (URT, 2003a, 2007a, 2007b); very little is empirically known on the factors associated with health literacy under OHEA. Definitely, understanding factors associated with health literacy has a significant contribution in scaling up health literacy initiatives towards attainment of good health.

Innumerable studies have measured HL (Baker *et al.*, 2002; Gazmararian *et al.*, 2003; Wolf *et al.*, 2010; Edwards *et al.*, 2012; Sørensen *et al.*, 2012; Sun*et al.*, 2013; Sørensen *et al.*,2015); though, most of these studies have been conducted on developed world; as it is obvious that HL is context specific (Nutbeam, 2000; Kickbusch and Maag, 2006; Pleasant and Kuruvilla, 2008; Freedman *et al*., 2009) so none of these studies present the Tanzanian reality; even very limited carried out in the developing world, Tanzania in particular (Stone *et al.*, 2011 and Freer, 2015) have not taken into consideration the reality that optimal health for animals, humans and the environment will only be achieved in the light of collaborative working efforts between humans, animals and the environmental professionals. A study by Stone *et al.* (2011) dealt with evaluation of the utility of information, education and communication (IEC) materials for increasing patient HL and how patients perceive such materials on HIV/AIDS. Freer (2015) conducted a Comparative Study of Health Literacy and

How Rural Communities Understand Hypertension Information in Uganda and Tanzania. Even those that studied HL under One Health Approach (OHEA) in Tanzania (Muhanga and Malungo, 2018a) had limited themselves into analyzing connections and realities existing on health literacy and some socio-demographic aspects under one health approach in Eastern Tanzania.

In realization on the need of context specificity on HL and the fact that optimal health attainment requires collaborative working efforts between humans, animals and the environmental professionals plus existence of little empirical information on the correlates of HL under OHEA in Tanzania; this article empirically examines the correlates of HL under OHEA in Tanzania beyond the socio-demographic aspects through exploration of the sophisticated interrelationship existing between HL and a set of variables using multiple regression in selected wards in Morogoro Municipality and Mvomero District in Tanzania.

2.0 Materials and Methods

This study was conducted in Morogoro municipality and Mvomero district, both located in Morogoro region in Tanzania. According to Tanzania-NBS (2013) the population of Morogoro municipality and Mvomero district are reported to stand at 315,866 and 312,109 people respectively. The National One Health Strategic Plan 2015 – 2020 locates Morogoro under potential routes of risks exposure due to identification of some incidences of zoonotic diseases in the area (URT-PMO, 2015:16). The choice of Morogoro Urban and Mvomero Districts in Morogoro region in Tanzania for the study is justified on the ground that there has been numerous incidences of interactions of humans and animals which have been reported in the area. This area is a home to a pastoral community of Maasai origin; as well bordered by the Mikumi National Park, hence higher level of interaction between human and animals which is likely to lead to higher risk due to possibility of prevalence of certain health behaviours. Studies (Karimuribo *et al.*, 2005; Mgode *et al*., 2014) have also identified health risks presence in the area. This area is also occupied by inhabitants of very diverse socio-cultural and economic backgrounds hence providing a very good opportunity to conduct a study of this nature. The presence of medical and veterinary staff at these two districts presents an opportunity of interaction to resolve issues under OHEA.

Using a cross-sectional research design both qualitative and quantitative data were collected. The choice of this design is based on being economical in terms of time, financial resources and nature of the study objectives (Kothari, 2004). A structured questionnaire guide using a Computer Assisted Personal Interviewing (CAPI) electronic platform was used to collect primary data from the respondents. This study employed multi stage sampling procedure, which comprised of four stages (in choosing districts, wards, villages/streets, and HHs) which enabled one thousand four hundred and forty respondents to be obtained from four purposively selected wards, the next stage two villages/streets from four wards were chosen and finally respondents were selected through simple random sampling from each village/street where animal keeping and related activities plus evidence of selling livestock products are found. The local leaders were involved in preparing sampling frame. IBM-SPSS V20 and Gretl software were used for the purposes of computing frequencies, percentages, chi-square, mean and maximum scores. A multiple regression was employed to analyze the associates of HL in the study area after meeting the assumptions of the model.

For sample size estimation, a 95% confidence interval (CI), a margin of error of 5%, and a design effect of 1.5 were assumed. Design effect was used since the multistage sampling method was employed. A minimum adequate sample size was calculated based on the statistical estimation method of Kelsey *et al.,* (1996). A sample size of 1440 respondents was determined by using the formulae:-

$s=X^2 NP\ (1- P) \div d^2\ (N-1) + X^2\ P\ (1- P).$

Where:-
s = required sample size.
*X*2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).
N = the population size.
P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size).
d = the degree of accuracy expressed as a proportion (0.05).

Sample size for this study was calculated from the total population of each 2 purposive selected streets/ villages from a ward. After obtaining total sample for each ward, proportions of each streets/villages from the total sample was calculated. The sample size was then distributed in the identified study streets/ villages. The sample size allocated for each village/ street was considered adequate, since Bailey (1994) and Field (2009) claim that a sub sample of 30 respondents being the bare minimum for studies in which statistical data analysis is to be done regardless of the population size.

Multiple regression was employed to explore the correlation or relationship between health literacy and numerous continuous independent variables. The basic assumptions for multiple regression (Pallant, 2007:) were met which included having One continuous dependent variable (HL), two or more continuous variables from the dataset, the rest of the assumptions with respect to sample size (Stevens, 1996; Tabachnick and Fidell , 2007); multicollinearity and singularity (Pallant, 2007); outliers (Tabachnick and Fidell, 2007) plus normality, linearity, homoscedasticity, and independence of residuals (Pallant, 2007:149) were checked and found to be met.

2.1 Measurement of Health Literacy

For the purposes of measuring HL, methodological aspects from European HL Survey were adapted in this study (HLS-EU, 2012). To be able to measure HL, respondents were then asked: *On a scale from very easy to very difficult, how easy would you say it is to: i.e., (Find information on treatments of illnesses that concern you).* The questions comprised of items which reflected three health pertinent areas (health care, disease prevention, health promotion) and four information processing stages (access, understand, appraise, apply) in connection with health relevant decision-making and tasks on health and other closely related aspects under the interface of humans, animals and the environment. Using items related to health related areas and information processing stages a context specific HL assessment framework for assessing HL under OHEA was developed. It is a matrix measuring the perceived difficulty of performing a selected one health relevant tasks based on a four-point self-report scale (very easy, easy,

difficult, and very difficult). The way a respondent will find it easy or difficult to undertake a certain task reflects an individual's HL level under OHEA. To measure HL, an index of score was created by allocating four points to every "very easy" response, three points to "easy" response, two points to "difficult" response, and one point to "very difficult" response. Scores were calculated and classified into Inadequate Health Literacy (IHL), Marginal Health Literacy (MHL) and Adequate Health Literacy (AHL). A study by Gazmararian *et al.*, (2003) has also used a similar categorization. For the purposes of categorizing health literacy, scores were cut into three equal groups using SPSS functions to represent inadequate health literacy, marginal health literacy and adequate health literacy.

3.0 Results and Discussions

3.1 Socio-Demographic Characteristics of the Respondents

Socio-demographic characteristics of the respondents are found to be very important variables in most behavioral and attitudinal studies (Kaale and Muhanga, 2017; Muhanga and Malungo, 2017a; Muhanga, 2017b). Information on some socio-demographic characteristics namely age, sex, education level, marital status and household size were obtained.

Table 1 presents the summary of the socio-demographic characteristics of the respondents. The results reveal that 29.2% (95% CI: 23.3 to 35.0) of the interviewed respondents were aged between 30 to 39 and 3.8% (95% CI: 1.7 to 6.2) were above 70 years.

Table 1: Socio-Demographic Characteristics of the Respondents (n=1440)

Variable	Categories	Percentage
Age in Years	21-39	42.1
	40-49	26.3
	50-59	17.1
	60-69	10.7
	>70	3.8
Level of Education	Not gone to school at all	39.2
	Universal adult education	2.5
	Primary school	30.0
	Secondary school	8.8
	Post-secondary /vocational	10.4
	University	9.2
Sex	Male	47.9
	Female	52.1
Marital Status	Never married/Single Married	30.4
	Separated	57.5
	Widow	1.7
	Widower	5.4
	Cohabitating	2.5
	Too young to marry	0.8
Household Size	1-3	21.7
	4-7	65.9
	>8	12.4

The average age was 43.7 years (95% CI: 43.1 to 44.4 years), and the highest age and the lowest age were 21 and 72 respectively. The majority 52.1 % (95% CI: 49.6 to 54.7) of the respondents interviewed were women. Slightly more than one-third (39.2%; 95% CI: 36.6 to 41.7) of the respondents had not gone to school at all. Of the interviewed respondents, about 57.5% (95% CI: 50.9 to 63.8) of the respondents were married. In terms of household size (total number of household members) the average household size was 5 (95% CI: 5.08 to 5.28) members, lowest household size (minimum) had 1 member and the highest household size (maximum) with 10 members. About 62.9% of the interviewed households had 1 to 5 members.

3.2 Associates of HL

Health literacy is "key to not only health, but to human development at a population level, and to realizing human potential" (Levin-Zamir *et al.,* 2017: 133). Understanding factors associated with health literacy remains important in scaling up health literacy initiatives towards attainment of good health. In order to explore the factors that are associated with respondents HL, this study employed standard multiple regression; the interest was in exploring how well the variables in Table 2 are able to predict scores on HL.

Multiple regression indicates how much of the variance in a dependent variable can be explained by independent variables, it further provides an indication of the relative contribution of each independent variable. Additionally, the test allows determining the statistical significance of the results, in terms of both the model itself and the individual independent variables (Pallant, 2007). The predictors that were included in the regression were selected based on a sound theoretical rationale and some from well-conducted past researches which have demonstrated their importance. Since this article did not intend to duplicate what was previously discussed by Muhanga and Malungo (2018a) hence the article has excluded the socio-demographics characteristics related correlates of HL discussed in Muhanga and Malungo (2018a).

Information for all predictor variables included in the Standard Multiple Regression model along with their expected outcome is provided in Table 2. Access to information about health is likely to promote knowledge on health hence enhancing HL leading to exhibiting health related practices that are likely to lead to good health outcomes. Individuals' contacts/interactions with healthcare professional play roles towards maintaining or improving HL through health messages shared. Engagement in Health Related discussions (EiHRD) can contribute towards individuals understanding on health related aspects hence influencing health outcomes. Engagement in One Health Related Activities (EiOHERA) has chances of promoting individuals' awareness on health related aspects and on One Health in particular. It is reported that there is an influencing relationship (nexus) between HB and HL. Local government authorities have been mandated with numerous tasks in implementation of health policy in Tanzania, out of which some can significantly impact on HL, it is in this context that LGAs initiatives on health promotion, health care and diseases prevention is considered among predictors of HL.

There are a number of ways local politics can influence HL; including political leaders involvement in health promotion, health care and diseases prevention. Prior knowledge, beliefs, perceptions and attitudes towards diseases (PKBPAD scores) are considered to have predictive effects on HL. Obviously, what people know, what they do believe in, how they perceive

diseases and the kind of attitude they have towards diseases have always affected HL (URT, 2003; URT, 2007; MIT, 2010; Rauschenbach and Hertel, 2011; Marinaccio *et al.*, 2013; URT, 2017; Muhanga and Malungo, 2017a; Muhanga, 2017b; Muhanga and Malungo, 2018a).

Table 2: Predictor Variables for HL in the Multiple Regression Models

Predictor variable	Coding	Category	Expected Outcome
Years of schooling	years spent studying	Continuous	+/-
EiHRD	Scores	Continuous	+/-
EiOHERA	Scores	Continuous	+/-
Scores in Health Behaviour (HB)	Scores	Continuous	+/-
Access to Health Information	Scores on AHI	Continuous	+/-
Attitudinal score	Scores	Continuous	+/-
CMIWP scores	Scores	Continuous	+/-
PKBPAD Scores	Score	Continuous	+/-
Influence of politics on health	Scores	Continuous	+/-
LGAs IOHP	Scores	Continuous	+/-

Where:

PKBPAD - Prior Knowledge, Beliefs, perceptions and attitudes towards diseases score
BEOHAS - Belief in the effectiveness on humans and animals health services
CMIWP - Community members' interaction with professionals
EiHRD - Engagement in Health Related discussions
EiOHERA - Engagement in OHE related activities
LGAs –IOH - Local government authorities' initiatives on health
AHI - Access to health information

The model uesed was specified as follows:

$HL = b_0 + b_1 + b_2 + b_3 \ldots\ldots + b_{11}$

3.3 Assumptions for multiple regression

Assumptions for multiple regression were met. These included having one continuous dependent variable (HL), TWO or more continuous variables independent variables (see Table 2). For a reliable multiple regression equation Stevens (1996) recommends that number of samples required for social science research should be about 15 subjects per predictor, while Tabachnick and Fidell (2007) give a formula for calculating sample size requirements, taking into account the number of independent variables that you wish to use; which states N >50 +8m (where m =number of independent variables); given eleven independent variables employed in this analysis this formulae simply translates into recommended sample of 138. In this study the number of samples was 1440 over and above of what both Stevens (1996:72) and Tabachnick and Fidell (2007) have recommended.

Multicollinearity and singularity were checked in order to meet another assumption for multiple regression. Multicollinearity exists when the independent variables are highly correlated (r=.9 and above). Singularity occurs when one independent variable is actually a combination of other independent variables (e.g when both subscale scores and the total score of a scale are included) (Pallant, 2007). Table 3 shows the value of Pearson's correlation coefficient between

every pair of variables, Table 3 indicates that none of the variables employed were correlated to reach (r=.9 and above), the highest correlation is observed to stand at r=.617.

Table 3: Correlations

		HL Score	LGAs score	Influence of politics score	Prior knowledge score	interactions with professionals score	HB Score	Scores on HRDE	Score on EoHRA	Years spent on studies	Attitudes towards HIB
Pearson Correlation	HL Score	1.000	.617	.082	-.082	.031	-.631	.347	.099	.125	-.082
	LGAs initiatives scores	.617	1.000	-.131	.060	.005	-.638	.359	.087	.050	.060
	Influence of politics score	.082	-.131	1.000	.352	.009	.252	-.005	.007	.077	.352
	Prior knowledge score	-.082	.060	.352	1.000	-.062	.348	.064	.109	.008	1.000
	interactions with Professionals score	.031	.005	.009	-.062	1.000	.120	.025	-.031	.072	-.062
	Health Behaviour Score	-.631	-.638	.252	.348	.120	1.000	-.192	-.138	-.135	.348
	Scores on HRD	.347	.359	-.005	.064	.025	-.192	1.000	.011	.076	.064
	Score on EoHA	.099	.087	.007	.109	-.031	-.138	.011	1.000	.149	.109
	Years spent on studies	.125	.050	.077	.008	.072	-.135	.076	.149	1.000	.008
	Attitudes towards HIB	-.082	.060	.352	1.000	-.062	.348	.064	.109	.008	1.000
Sig. (1-tailed)	HL Score	.	.000	.001	.001	.122	.000	.000	.000	.000	.001
	LGAs initiatives score	.000	.	.000	.012	.419	.000	.000	.000	.030	.012
	Influence of politics score	.001	.000	.	.000	.360	.000	.429	.391	.002	.000
	Prior knowledge score	.001	.012	.000	.	.009	.000	.008	.000	.384	.000
	interactions with Professionals score	.122	.419	.360	.009	.	.000	.172	.121	.003	.009
	Health Behaviour Score	.000	.000	.000	.000	.000	.	.000	.000	.000	.000
	Scores on HRDE	.000	.000	.429	.008	.172	.000	.	.339	.002	.008
	Total Score on EoHRA	.000	.000	.391	.000	.121	.000	.339	.	.000	.000
	Years spent on studies	.000	.030	.002	.384	.003	.000	.002	.000	.	.384
	Attitudes towards HIB	.001	.012	.000	.000	.009	.000	.008	.000	.384	.
N	HL Score	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
	LGAs initiatives score	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
	Influence of politics score	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
	Prior knowledge score	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
	interactions with Professionals score	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440

	Health Behaviour Score	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
	Scores on HRDE	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
	Score on EonHRA	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
	Years spent on studies	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
	Attitudes towards HIB	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440

Multiple regression is very sensitive to outliers (very high or very low scores). Checking for extreme scores should be part of the initial data screening process. These are those with standardized residual values above about 3.3 (or less than -3.3) (Tabachnick and Fidell, 2007). Normality, linearity, homoscedasticity, independence of residuals was also checked. These all refer to various aspects of the distribution of scores and the nature of the underlying relationship between the variables. These assumptions were checked from the residuals scatterplots which were generated as part of multiple regression procedure; this procedure is elaborated by Pallant, (2007).

Under Table 4 is the model summary output which describes the overall model in terms of how successful the model has been in predicting HL. In the column labelled *R* are the values of the multiple correlation coefficient between the predictors and the outcome. The next column gives us a value of R^2, which we already know is a measure of how much of the variability in the outcome is accounted for by the predictors. The adjusted *R*2 gives us some idea of how well our model generalizes and ideally we would like its value to be the same as, or very close to, the value of R^2.

In this case the difference for the final model is small (in fact the difference between the values is .560 − 0.557 = .003 or 0.3%). This shrinkage means that if the model were derived from the population rather than a sample it would account for approximately 0.3% less variance in the outcome. This is an indication that the cross-validity of this model is very good.

Table 4: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.748	.560	.557	56.58085

ANOVA tests whether the model is significantly better at predicting the outcome than using the mean as a 'best guess'. For this model the *F*-ratio is 227.51, p = .000. It can be interpreted from the results in Table 5 that the model significantly improved our ability to predict the outcome variable compared to not fitting the model.

Using the beta values in Table 6 it is indicated that the largest beta coefficient is -.474 which is for Health Behaviour Score this signifies that this variable makes the strongest unique contribution to explain the dependent variable. In Table 6, other variables are found to have slightly lower beta values which signify a relative less contribution to the dependent variable, these are the cases for LGAs initiatives score (0.294), Influence of politics score (0.249), interactions with Professionals score (0.078), and Scores on HRDE (0.151).

Table 5: ANOVA Results on predictors of HL

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	5826771.796	8	728346.475	227.509	.000
	Residual	4581192.104	1431	3201.392		
	Total	10407963.900	1439			

It can be noted from Table 6 that score on Health Behaviour Score , Local Government Authorities initiatives on health (.294), Influence of politics on health score (.249), interactions with professionals score (.078), and scores on Health Related Discussion Engagement (HRDE) (.151) are making statistically significant unique contribution to model in terms of prediction of HL.

Table 6: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	104.924	31.265		3.356	.001					
	LGAs initiatives score	13.449	1.206	.294	11.148	.000	.617	.283	.196	.443	2.258
	Influence of politics score	3.970	.305	.249	13.030	.000	.082	.326	.229	.842	1.188
	interactions with Professionals score	7.905	1.843	.078	4.289	.000	.031	.113	.075	.935	1.070
	Health Behaviour Score	-8.709	.512	-.474	-17.014	.000	-.631	-.410	-.298	.396	2.527
	Scores on HRDE	1.434	.180	.151	7.974	.000	.347	.206	.140	.863	1.158
	Score on EoHRA	.170	.366	.008	.464	.643	.099	.012	.008	.932	1.072
	Years spent studying	.629	1.176	.010	.535	.593	.125	.014	.009	.934	1.071
	Attitudes towards HIB	-.347	.276	-.028	-1.259	.208	-.082	-.033	-022	.636	1.572

a. Dependent Variable: Health Literacy Total Score

The findings from this study are similar to what has been found by other studies. The linkage (association) between HL and HB has been a focus of discussion in countless studies (URT, 2003a; Dewalt *et al.*, 2004; URT, 2007a; 2007b; Lee *et al.*, 2004). Tombrink and Vanasse (2013:

2) argue that through "health literacy it is possible to reframe the different components of health knowledge in a way that can lead to a new understanding of health behavior". Similar findings are reported from a study by Fleary *et al.* (2018) which found a meaningful relationship between health literacy and adolescents' health behaviors. In a study by Sun *et al.* (2013) on Determinants of Health Literacy and Health Behavior regarding Infectious Respiratory Diseases, HL has been observed to be a direct influencing factor of health behavior ($\beta = 0.101$). Other studies (von Wagner *et al.,* 2007; Speirs *et al.,* 2012; Geboers *et al.,* 2014; Husson *et al.,* 2015) have also found an association between IHL with unhealthy behaviours.

Similar findings are reported from other studies with respect to the association of HL and health professionals-patients interaction. In this study health professionals-patients interaction was found to have slightly lower beta values which signify a relative less contribution to the dependent variable (HL). Almost similar observation has been made by Nutbeam (2018) who claims that sometimes patients find it very difficult to interact "with a person (like a doctor) whom they find unfamiliar and intimidating". Undeniably, other studies (Weiss *et al*., 1992; Baker *et al*., 1998; Moon *et al*., 1998; Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs, 1999; Doak *et al*., 1998; Kalichman *et al*., 1999; Nichols-English, 2000; Nielsen-Bohlman *et al*., 2004) found the health professionals-patients interaction among potential sources of health information. The Sick Role Theory explains that when a person is ill, he or she is expected to visit a doctor and this encounter involves a reciprocal set of obligations and privileges (Parsons, 2005). Lalazaryan and Zare-Farashbandi (2014) argue that health workers have another role beyond just providing medication to patients. Transfer of health information by educating the patients and encouraging them to search for related information is considering to be a role that health workers have to play towards preventing diseases. This is supported by Making Every Contact Count Approach *(*NICE, 2007 as cited by NWPH[1], *n.d*;) and Beck *et al* . (2002). In a study by Rains and Ruppel (2013) it was found that information seekers utilize multiple sources including health care providers.

It is worthwhile to note that LGAs initiatives score was found to associate with HL in this study. Similarly, URT (2017) is reporting number of ways out of which LGAs have been involving themselves in health literacy behaviour enhancing through promoting initiatives in several other areas in Tanzania. Various bylaws, policies and directives have been issued in Tanzania by the local government authorities to discourage health impairing practices/ behaviours and encourage health practices/ behaviours. It is obvious that the findings in this study are in support of the campaigns that have been going on throughout the country on WASH. LGAs through the support of the Ministry of Health, Community Development, Gender, Elderly and Children have been implementing national wide campaigns on WASH which has always led to enhancing health literacy and behaviour. In line with this finding, a similar observation has been made by Mboera *et al.* (2007) that public meetings and print materials were the most frequently used channels of health information communication in their study. Bambra *et al.,* (2003); Williamson and Carr (2009) and Mackenbach (2014) are also acknowledging the fact that local public policies, directives and bylaws have influence on health and related aspects.

[1]North West Public Health (n.d). Evaluation of Approaches to Health Literacy in Ashton, Leigh and Wigan http://www.nwph.net/nwpho/Publications/NHS%20ALW%20Health%20Literacy%20Final%20Oct%202012.pdf

The score in influence of politics on health (expressed in influence of politics on health promotion, care and diseases prevention total score) was found to associate with increase in the HL in this study. In line with this finding, Werner (1981) proclaims that health of the people is influenced far more by politics and power groups and by the distribution of land and wealth than it is by the prevention and treatment of disease. Obviously there are ways through which politics influence health. Health has increasing relevance for political legitimacy and the economy, it is critical to fiscal policies and to the social state. That means it affects the interests of many stakeholders and society at large. Similarly, PEN-3 model acknowledges the influence of politics on health beliefs and actions, among others (Airhihenbuwa, 1995, 2007).

Health Related Discussion Engagement (expressed in terms of scores of engagement in health related discussion) was found to associate with HL. In line with this finding, Vahdat *et al.*, (2014) are claiming that patients involvement facilitates sharing information, impliedly that contributes to enhancement of HL.

Otherwise, in this study there are numerous variables which were found to associate with HL through review of literature, hence included in the model and were not found to be statistically significant associates of HL. This is due to the fact that the studies /literature from which variables were obtained presented the reality/context which is different from where this study was conducted.

4.0 Conclusions

It can be concluded that Health Literacy (HL) is associated with a number of factors, but not at all the factors that are associated with health literacy have afforded to have the strongest unique contribution to HL. It is worthwhile to note that some of these variables are well reported in other literature to have profound influence on HL in the context which did not take on board the inextricable link between humans, animals and the environmental health. The difference existing between what is reported in these other literature and what has been found in this study account for the context specificity and they remain important in scaling up health literacy initiatives towards attainment of good health.

Ethical Considerations

The protocol for the study was approved by the University of Zambia (UNZA). Local research clearance was granted by Morogoro municipality and Mvomero district administrative officials. In order to avoid any impediment to the research process the researcher had to clarify the purpose of the study to the local government and village leaders. Introducing the purpose of study to the local leadership facilitated the process of identifying the key informants for qualitative interviewing. The researcher obtained the written and oral (for those who could not read and write) informed consent from all those who participated in the study, and they were informed of their right to withdraw from the study at any time. The participants were assured of their anonymity in that none of information from them will be attributed to their names. Permission was sought from individuals to use various photographs in this report in which they appear.

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