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M.I. Muhanga[1*], J.R. S. Malungo [2] and K.A. Kimario[3]

[1] Department of Development Studies, College of Social Sciences and Humanities, Sokoine University of Agriculture, P. o. Box 3024, Morogoro, Tanzania.

[2]Department of Population Studies, School of Humanities and Social Sciences, The University of Zambia, P. o. Box 32379, Lusaka, Zambia.

[3]Department of Community and Rural Development, Faculty of Co-operative and Community Development, Moshi Co-operative University, P. o. Box 474, Moshi, Tanzania.

**E-mail: mikidadi@sua.ac.tz.*

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M.I. Muhanga[1*], J.R. S. Malungo [2] and K.A. Kimario[3]

[1] Department of Development Studies, College of Social Sciences and Humanities, Sokoine University of Agriculture, P. o. Box 3024, Morogoro, Tanzania.

[2]Department of Population Studies, School of Humanities and Social Sciences, The University of Zambia, P. o. Box 32379, Lusaka, Zambia.

[3]Department of Community and Rural Development, Faculty of Co-operative and Community Development, Moshi Co-operative University, P. o. Box 474, Moshi, Tanzania.

**E-mail: mikidadi@sua.ac.tz.*

SUMMARY

Attainment of optimal health calls for collaboration between animals, humans, and environmental health professionals together with understanding the consequences of animals, humans, and environment interactions on health. In cognizant of this, the government in Tanzania introduced One Health Strategic Plan (2015–2020), little is empirically known on how this plan has facilitated the enhancement of knowledge, awareness, attitudes, and practices (KAPs) under One Health Approach (OHA). This article analyses KAPs under OHA from a cross-sectional study conducted in Morogoro, Tanzania. Data were collected by a questionnaire from 1440 respondents obtained through a multistage sampling procedure, 80 Focus Group discussions (FGDs) participants and 16 key informant interviewees. IBM-SPSS v.20 analysed quantitative data while qualitative data were organised into themes on specific objectives. Results revealed that only 32.3% (95% CI:30.3 to 35.3) had adequate OH knowledge. Only 5% (95% CI:4.0 to 6.1) were aware of OHA concept and practices; 3.8% (CI 95%, 2.8 to 4.8) managed to identify collaborative efforts and strategies, and 2.5% (CI 95%, 1.7 to 3.4) correctly explained/ described OHA. Whereas, 38.5% (95% CI:32.6 to 37.5) had a positive (favourable) attitude towards OHA. Despite the efforts outlined in the OH Strategic Plan to promote OHA, there is little awareness and knowledge on OHA. This indicates that the One Health Strategic Plan (2015–2020) and other initiatives have not significantly facilitated the enhancement of KAPs. This study recommends strengthening efforts towards OHA information dissemination to enhance awareness and knowledge on the concept and practices.

Keywords: *One Health, Knowledge, Attitudes, Awareness & Practices, Tanzania.*

INTRODUCTION

Ill-health and diseases are considered as an obstruction to economic prosperity and consequently to national development worldwide (Bloom and Canning, 2000; Bloom *et al.*, 2001; Strittmatter and Sunde; 2011; WHO *et al.*, 2013; Muhanga and Malungo, 2019).

Apparently, attaining development goal has to go hand in hand with improving the health status of a nation's population; nevertheless, there exist numerous challenges in achieving good health (Ratzan and Parker, 2000; Byrne, 2004; Mamdani and Bangser, 2004; Kaseje, 2006; Sanders and Chopra, 2006; Kaale and Muhanga, 2017). Notably, such challenges include; the failure to recognise health as one, that there is no dividing line between animals, humans, and the environmental health, and lack of understanding the consequences of the interactions existing amongst the environment, animals, and humans on health.

Knowledge, attitudes, awareness, and practices (KAPs) on the interactions of the environment, humans, and animals, and the consequences of animals, humans, and environment interactions on health are very

vital towards the attainment of optimal health.

Obviously, environmental, animal health, and health human health are inextricably linked (Mbugi, 2012; URT-PMO, 2015; Muhanga and Malungo, 2017; 2018a; 2018b) and definitely if optimal health for animals, the environment, and humans has to be attained, this has to be understood very well. Livestock production, for instance, makes the greatest contribution to greenhouse emissions, significantly influencing climate change.

Kayunze *et al, (*2012*)* claim that intensive animal production practices also provide for easy transmission of infectious diseases The methane produced under intensive production system also significantly contributes to climate change. The exploitation of wildlife, trading on wildlife and increasing interactions between livestock and wildlife also can lead to the emergence of infectious diseases.

All these activities have economic incentives underpinning them, with infectious disease emergence and spread, and environmental degradation being unintended consequences (Jones *et al.,* 2008; Mumba *et al.*, 2014). It, therefore, remains crucial for the animal health, human health, and related sectors professionals to closely collaborate and along with it, a high-level understanding of OHA promoted amongst people to maintain good health.

A study by Kambarage *et al.*,(2003) points out that the interaction between humans and animals can result in a number of consequences including diseases such as human Brucellosis originating from both traditional and dairy animals. This study reports a total of 50000 detected cases, however claiming that there is a number of disease incidences undetected, unreported or underreported without pointing out to any empirical reasons for such cases. A number of factors are attributed this: including, low awareness on the interaction between animals and humans (Scholz *et al*., 2008); lack of a holistic systems approach to understanding health across all species; failure to recognize that humans and animals health are inextricably linked (Schwabe, 1984; Rweyemamu *et al.*, 2012), absence of working cooperation between physicians and veterinarians (Rweyemamu *et al.*, 2013).

Low awareness by itself indicates apart from other factors lack of information on the interaction between animals and humans and how such interactions impact on health. Karimuribo (2007) also reports on the incidences of human brucellosis in northern Tanzania. The study has been concerned with the need for public health information awareness creation to arrest the situation, among others, the study recommended for a need to formulate public health education programmes plus building disease diagnostic capacities.

It is obvious that there is a gap in awareness on humans' and animals' interaction plus its consequences and lack of public health education together with limited working cooperation between physicians and veterinarians. Despite pointing out to the issues related to low awareness (Scholz *et al*., 2008) and the need for public health information awareness creation (Karimuribo, 2007) these studies have not empirically studied knowledge, attitudes, awareness, and practices on OHA.

Obviously, for a precise interpretation of disease dynamics and for the sake of driving public policies, the need for substantial knowledge on the consequences and causes of some behaviours, human activities, and lifestyles in ecosystems remains crucial (Destoumieux-Garzón *et al.*, 2018).

In cognisant of this, the government in Tanzania introduced One Health Strategic Plan (2015–2020). This plan is a guiding document meant to summarize operations and activities amongst diverse stakeholders. It also intends to formulate and maintain close collaboration between the sectors towards preventing and controlling zoonotic diseases. The plan further intends to ensure that there is appropriate preparedness and consistent and coordinated response in case of a zoonotic event.

In this context, the plan among other targets at having One Health and related programs to afford meeting prevailing and approaching challenges through Training, Advocacy, and Communication; Research and Development; Surveillance; and, Preparedness and Response (URT-PMO,2015).

This strategic plan on One Health sets a formal/institutionalized entry towards creating and maintaining active collaboration between the sectors. It is worthwhile to note that the absence of a participatory health policy that focuses on multi-sectoral contributions has been previously cited to be a major hurdle towards One Health practices (Mbugi *et al.,* 2012). Little is empirically known on how this plan has facilitated the enhancement of KAPs under OHA.

This study was conducted in Morogoro region, a region cited by The National One Health Strategic Plan 2015 – 2020 under potential routes of risk exposure due to the identification of some incidences of zoonotic diseases in the area (URT-PMO, 2015:16). In the same areas, studies (Karimuribo, *et al.,* 2005; Mgode *et al.,* 2014) have also identified the presence of health risks. This article analyses KAPs under OHA in selected wards in Morogoro, Tanzania.

The study is within the context of the PEN-3 model which recognizes the role of health education in empowering People, Extended Family and Neighbourhood (PEN) to make informed health decisions. Understanding the knowledge, attitudes, awareness, and practices of the people under OHA contributes towards the creation of efficient interventions to bridge knowledge gaps on OHA. The PEN-3 cultural model comprises of three primary domains: (1) Cultural Identity, (2) Relationships and Expectations, and (3) Cultural Empowerment. Each domain includes three factors that form the acronym PEN; Person, Extended Family, Neighborhood (Cultural Identity domain); Perceptions, Enablers, and Nurturers (relationship and expectation domain); Positive, Existential and Negative (Cultural Empowerment domain) (Iwelunmor, 2014).

Under the Cultural identity domain, the role of health education in empowering People, Extended Family and Neighbourhood (PEN) to make informed health decisions suitable to their roles in their families and communities is generally recognised. Another domain of this model is Relationships and Expectations which encompasses Perceptions, Enablers, and Nurturers (PEN).

Perceptions contain the knowledge, attitudes, values, and beliefs, within a cultural context, with the potential to facilitate or obstruct personal, family, and community motivation towards change. (Airhihenbuwa, 1995; Airhihenbuwa and Obregon, 2000; Yick and Oomen-Early, 2009).

MATERIALS AND METHODS

Both quantitative and qualitative data were collected in a cross-sectional study which was conducted in Morogoro municipality and Mvomero districts in Morogoro region in Tanzania after institutional approval. A structured questionnaire guide was employed to collect data from consented participants. The population for the study included all households with livestock species at Mvomero district plus the medical, veterinary and environmental Officers. In Morogoro district, the population included all the households and medical, veterinary and environmental officers in the study area.

Data were collected from 1440 (729 and 711 respondents from Morogoro and Mvomero respectively) , 80 Focus Group discussions (FGDs) participants (40 from Morogoro and the other 40 from Mvomero) and 16 key informant interviewees (8 from Morogoro and the other 8 from Mvomero district).

The multi-stage sampling procedure was used in selecting study units. The districts, wards and villages/streets were purposively

sampled, whereas simple random sampling was used to select respondents.
The inclusion criteria for the wards at Mvomero were those wards that pastoralists were mostly residing, and for the households are those having animals being kept and selling of livestock products to Morogoro urban. Those wards which were included in the study from Morogoro were those from areas products from Mvomeral districts were sold, these are the wards where meat (particularly *offals – utumbo in Kiswahili*) and milk vending by Maasai from Mvomero district has been taking place. These traders are popular in the area as *Wang'ombe* and *Baba Yeyo*. Four wards were purposively selected (two per district).

The selected wards were Doma and Melela wards in Mvomero district, also Mazimbu and Kihonda Maghorofani in Morogoro municipality. Thereafter two villages/streets were purposely selected from the four wards making a total of eight villages/streets in the Mazimbu ward as well as at Msamvu B and Maghorofani in Kihonda Maghorofani.

To estimate sample size, a 95% confidence interval (CI), a margin of error of 5%, and a design effect of 1.5 were assumed. A statistical estimation method of Kelsey *et al.*, (1996) was employed to calculate the minimum adequate sample size. A sample size of 1440 respondents was determined by using the formulae:-

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}$$

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 .50 since this would provide the maximum sample size), d = the degree of accuracy expressed as a proportion (.05).

Sample size was calculated from the total population of each 2 purposive selected villages/streets from a ward. After obtaining the total sample for each ward, the proportions for each village/street from the total sample was calculated. The sample size was then distributed in the identified study villages/streets. IBM-SPSS v20 was used for computing frequencies, percentages, mean and maximum scores.

Measurement of knowledge

To assess knowledge on OHA, the respondents were supposed to indicate their disagreements or agreements to twenty-two (22) attitudinal statements that described certain aspects of OHA. Half of the statements administered had negative connotations while the other half had positive connotations. From the statements, an index score for each respondent was constructed to measure their knowledge on OHA.

For all positive statements, the response "Strongly Agree" was given a weight of 5, while "Agree" was given a weight of 4, "Undecided" was given a weight of 3 and "Disagree" was given a weight of 2 and "Strongly Disagree" was given a weight of 1. For all the negative statements, the response "Strongly Agree" was given a weight of 1, while "Agree" was given a weight of 2, "Undecided" was given a weight of 3 and "Disagree" was given a weight of 4 and "Strongly Disagree" was given a weight of 5.

Using IBM-SPSS (v20) under percentile values, knowledge on OHA scores were cut into 3 equal groups. Percentile values were used to categorise knowledge on OHA. Knowledge on OHA was categorised into Inadequate OHA Knowledge (IOK) for those who scored below 106.00, Marginal OHA Knowledge (MOK) with scores ranging between 106.00 to 114.00 and Adequate OHA Knowledge (AOK) with scores above 114.00.

Attitudes towards OHA

Attitudes of individuals towards OHA were gauged using thirty eighty (38) statements describing various practices related to OHA identified through literature review. To assess the attitudes of respondents towards OHA, the Likert scale was employed. Of the thirty eighty (38) statements administered,

half of the statements had negative connotations while the other half had positive connotations. The weighting of scores for positive statements were 5 points (Strongly Agree), 4 points (Agree), 3 points (Undecided) 2 points (Disagree) and 1 point (Strongly Disagree) . From the statements, an index of the score for each respondent was constructed to measure the attitude of respondents towards OHA.

To categorise attitudes towards OHA, IBM-SPSS (v20) was employed to cut the scores into 3 equal groups. For those who scored below 112 were categorised into unfavourable (negative), for those scoring 112 to 117 into neutral (undecided) and those above 117 into favourable (positive) Attitudes towards health behaviours.

Awareness on the Concept and Practices on OHA

For the purposes of investigating respondents' awareness of OHA, respondents were asked to indicate whether they had ever come across the concept and practices related to OHA. This required the respondents to simply say 'yes' or 'no' to indicate their awareness of the concept and the practices. The responses were recorded as 0 and 1 for No and Yes respectively. This created a dummy variable.

The respondents were also asked about their awareness of medical, veterinary and environmental personnel collaborations and technical collaboration on diagnosis and surveillance of diseases in the study area. A Yes or No response was recorded from this question.

RESULTS

Socio-Demographic Characteristics of the Respondents

Table 1 presents the respondents' socio-demographic characteristics. Results reveal that the highest group 29.2% (95% CI: 23.3% to 35.0%) were between 30 to 39 years and the lowest group which formed 3.8% (95% CI: 1.7% to 6.2%) were above 70 years. The mean age was 43.7 years (95% CI: 42.1 to 45.3 years), and the highest age and the lowest age were 21 and 72 respectively.

It is indicated that 47.9% of the respondents were men (95% CI: 41.3% to 53.7%) and 52.1 % were women (95% CI: 46.3% to 58.8%). Slightly more than one-third (39.2%; 95% CI: 32.9% to 44.6%) had no formal education, and 30.0% (95% CI: 25.0% to 36.2%) completed primary school education.

Of the interviewed respondents, the majority 57.5% (95% CI: 50.9% to 63.8%) of the respondents were married. The average household size was 5 (95% CI: 4.9% to 5.4%) members, the 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.

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	30.4
	Married	57.5
	Separated	1.7
	Widow	5.4
	Widower	2.5
	Cohabitating	0.8
	Too young to marry	1.7
Household Size	1-3	21.7
	4-7	65.9
	> 8	12.4

Knowledge on OHA

Table 2 presents OHA knowledge into categories, the results indicate that 37.8% (95% CI: 35.7 to 40.9) of the respondents had IOK, 29.9 % (95% CI: 26.4 to 31.3) with MOK, and 32.3% (95% CI: 30.3 to 35.3) had AOK

Table 2. OHA Knowledge categories (n=1440)

OHA Knowledge Categories	Frequency	Per cent	95% Confidence Interval Lower and upper bound	
Inadequate OHA Knowledge (IOK)	544	37.8	35.7	40.9
Marginal OHA Knowledge (MOK)	431	29.9	26.4	31.3
Adequate OHA Knowledge (AOK)	474	32.3	30.3	35.3
Total	1440	100.0		

Table 3. Awareness on OHA Concept and Practices

Response	Frequency	Per cent	95% Confidence Interval	
			Lower Bound	Upper Bound
Not aware	1368	95.0	93.8	96.0
Aware	72	5.0	4.0	6.2
Total	1440	100.0	100.0	100.0

Table 4a. Medical, Veterinary, and Environmental Personnel Collaborations

Response	Frequency	Per cent	95% Confidence Interval	
			Lower Bound	Upper Bound
No collaboration	72	5.0	3.9	6.2
Collaborated	54	3.8	2.8	4.8
Unaware of such collaboration	1314	91.3	89.7	92.7
Total	1440	100.0	100.0	100.0

Awareness on the Concept and Practices Related to OHA

The findings in Table 3 indicate that only 5% (CI 95%, 4.0 to 6.2) of the respondents were aware of the concept of OHA. The results in Table 4a reveal that only 3.8% (CI 95%, 2.8 to 4.8) of the respondents were aware, with the majority of the respondents (91.3%: CI 95%, 89.7 to 92.7) were not aware on the ways in which these professionals collaborated in the study area. The results in Table 4b indicate that only 2.5% (CI 95%, 1.7 to 3.3%) were aware of some technical collaboration on diagnosis and surveillance of zoonotic or non-zoonotic diseases.

Table 4b. Awareness on Technical Collaboration on Diagnosis and Surveillance of Diseases (n=1440)

Responses	Frequency	Per cent	95% Confidence Interval	
			Lower Bound	Upper Bound
Not aware	1368	95.0	90.3	99.8
Aware	36	2.5	1.7	3.3
N/A	36	2.5	1.7	3.4
Total	1440	100.0	100.0	100.0

Attitudes towards OHA

Table 10 presents attitudes towards OHA into categories, whereas only 38.5% (95% CI: 32.6 to 37.5) of the respondents had a positive (favourable) attitude towards OHA.

Table 5. Categories of Attitudes towards OHA (n=1440)

	Frequency	Per cent	95% Confidence Interval	
			Lower Bound	Upper Bound
Favourable (positive) attitude	554	38.5	32.6	37.5
Neutral (undecided) attitude	454	31.5	32.5	37.4
Unfavourable (negative) attitude	432	30.0	27.6	32.4
Total	1440	100.0		

DISCUSSION

This study identified low collaboration between human and animal health sectors. A similar observation has been made by Mwinyi *et al.,* (2015: 30) who claim that "One Health in terms of collaboration, particularly between human and animal health sectors to prevent and control zoonoses has been low while the sectors have a lot of things in common". Furthermore, in line with our findings, URT-Prime Minister's Office (2015) acknowledges low awareness on OHA, as it

is revealed in One Health Strategic Plan 2015 – 2020. Low awareness on OHA is also partly acknowledged by URT-MoHCDGEC (2017: 18) as it reports "limited coordination and collaboration between the health sector and other sectors as well as participation of non-state actors in addressing emerging and re-emerging diseases". Limited collaboration among sectors and low awareness on OHA is is not surprising as OHA is reported to be at its initial stages in various parts of the world (Miller and Olea-Popelka, 2013). Other factors likely to contributes to the limited collaboration between sectors and professions, is lack of institutionalization of OHA in day to day operations

Generally, the above findings in the study area is an indication that much has not been realized through One Health Strategic Plan which among others, continues to evolve, enhance, and refocus One Health programmes to meet current and future challenges. Since this plan is a guiding document aiming at summarizing operations and activities among various stakeholders, it is important to establish the best ways to reach a wider audience. There are common understanding that once common people are aware and knowledgeable on OH issues the burden of zoonotic diseases will be reduced. For instances, study by Mwinyi *et al* (2015) revealed that (98.5%) of the respondents claimed that they would support OHA to a large extent and 1.5% said that they would just support the institutionalisation of One Health practice.

Despite all these drawbacks, Tanzania has already put in place enabling environment for the effective collaboration between various professionals towards attaining optimal health for humans, animals and the environment. Tanzania's 5-year *One Health Strategic Plan* (2015–2020) is the country's first national One Health strategic plan developed using a multi-sectoral approach and has drawn expertise from various sectors reflecting a shared commitment to enhanced collaboration among human, animal, and wildlife health sectors to reduce the burden of zoonotic diseases. It, therefore, it is necessary that stakeholders make an extra effort to realize the desired goals in terms of scaling up collaboration among professionals and other actors to raise the knowledge, awareness, attitudes, and practices (KAPs) on One Health Approach (OHA).

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