Rapid Assessment of Health Education Package on Community Knowledge, Attitude and practices for Control of *Taenia solium* cysticercosis in Tanzania

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SUMMARY

Taenia solium cystcercosis/Taeniasis (TSCT) is endemic in many rural areas practicing traditional pig keeping with potential transmission to urban communities in Tanzania. The endemicity of the parasite is associated with low community knowledge and poor sanitation. Community health education intervention was conducted in Nyasa district using a community-based Health Education Package (CHEP) to improve community knowledge, attitude and practices (KAP) related to TSCT control. Two wards and one village from each ward were purposively selected based on number of pigs and occurrence of porcine cysticercosis. The CHEP included a leaflet, poster and a practical guidebook. The delivery model involved one-day Training of selected community members who then trained the community for two days. Structured questionnaire involving eighty-eight (88) participants was used to assess the knowledge, attitude and practices (KAP) of the community about TSCT before and immediately post health education intervention. At baseline, about 70% of the participants were aware of the existence of TSCT and the awareness increased to 90% post Health Education (HE) intervention. Forty-three percent of the participants were ignorant about TSCT transmission, risk factors and its effects on human health. There was an improvement in all aspects regarding community KAP about TSCT transmission and control post HE intervention. Education level of the participants had an impact on baseline knowledge but did not affect knowledge acquisition during community health training. The intervention improved community KAP about TSCT prevention and control confirming the efficiency of the CHEP in controlling the parasite. The study recommends long-term impact assessment of the HE interventions to observe the community change in risky behavior and practices in control of TSCT.

Key Words: Taeniosis, Parasitic zoonoses, Cestodes, Public health, health education

INTRODUCTION

Pig faming and pork consumption is increasingly becoming popular in many parts of Tanzania. It contributes significantly to community livelihood and food security in the country (Kimbi et al., 2015). Traditional pig rearing may expose them to infections including parasites such as *Taenia solium*, which has economic and public health consequences (Roesel et al., 2017). The societal cost of TSCT in endemic communities is high; for instance, in Tanzania, it has been estimated to USD 8 million annually (Trevisan et al., 2017). The costs consist of economic loss due to the decline in the market value of infected pigs, condemnation of infected pork and those related to diagnosis and management of human cases (Atawalna and Mensah, 2015).

Among limitations for controlling *T. solium* cysticercosis is poor community knowledge about the parasite and hence the need of health education (Alexander et al., 2012; Johansen et al., 2014; Ngowi et al., 2017). Health education in endemic regions is crucial for an effective and sustainable control programmes (Mwidunda et al., 2015; Ngowi et al., 2017). However, the previously conducted health education interventions suffered from either low efficacy or lacked sustainability (Carabin and Traoré, 2014; Ngowi et al., 2008). Long-term change can only be achieved if health education programmes engage the target community in all stages (Alexander et al., 2012; Mwidunda et al., 2015; Ngowi et al., 2017). Therefore, there is a need to assess efficiency of new educational programmes in terms of community KAP regarding control of TSCT.

The community-based health education package (CHEP) developed and rapidly assessed is a conventional education approach aimed at improving TSCT control. The CHEP was developed based on the knowledge gap established from the communities in four districts in Tanzania, namely Mbulu, Mpwapwa, Mbinga, and Rungwe, on their knowledge and practices regarding TSCT control. The CHEP is believed to improve KAP, which in turn will lead to behaviour change which is fundamental to controlling TSCT. The CHEP consists of three components; a Training of Trainers (TOT) manual with illustrations (pictures) on critical TSCT control strategies, posters and brochures. It is expected that the package will be integrated with other existing TSCT control strategies. Furthermore, it is assumed that the CHEP can be adapted and implemented by other communities in resource-poor endemic countries. This work presents the rapid assessment of the community-based health education package for TSCT control in Nyasa district in southern highland Tanzania.

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MATERIALS AND METHODS

Study area

The study conducted in Nyasa district southern highland of Tanzania in September and October 2021. The district was selected due to reported cases of porcine cysticercosis (PCC) and popularity in small-scale pig farming. Nyasa District is one of the six administrative districts of Ruvuma region. The district is located between latitude 10° 15′S and 11° 34′N and Longitude 35° 24′ E and 34° 28′ W with an area of 3,811 km2. Major economic activities in the district were subsistence farming with fishing and mining on a small scale. Two villages were purposively selected which are Mbamba bay and Tingi.

Study design

The study adopted quasi-experimental study design with base line and post intervention evaluation.

Selection of households

Eighty-eight (88) participants comprising of 44 pig farmers and 15 non-pig farmers and 29 Government officials were selected to attend the HE training. A list of all smallholder pig keeping and non-pig farmers' households selected from the list provided by local village leaders. The government officials included hamlets chairpersons, village chairpersons, village executive officers, two science subject teachers from primary and secondary schools, ward executive officers, ward education officers, ward community development officers and ward councillors.

Data Collection

The training workshop began with a questionnaire intended to identify farmers' baseline knowledge and practices regarding *T. solium* life cycle, knowledge of clinical signs of human infection with *T. solium*, the transmission of taeniasis and neurocysticercosis and the transmission of porcine cysticercosis. Also, methods of pig keeping and personal hygiene habits likely to affect the transmission of *T. solium* eggs from either pigs or people as well as recognition of tapeworm segments in stool were assessed. Moreover, farmers were asked to describe what proportion of time they kept their pig tethered during the harvest, planting, and growing seasons of the year and whether the family is always using a toilet, washing hands with soap after using a toilet, before eating, and washing fruits and vegetables. The administration of the questionnaire was followed by a workshop where health education intervention was conducted.

Health Education workshop

The health education intervention for all participants began with a questionnaire followed by a health education-training workshop. Trainers were educated for one day and participated in training the community for two days. The post-intervention evaluation was conducted immediately after the health education workshop using the same questionnaire filled during the baseline survey. The purpose was to conduct a rapid assessment

of the effectiveness of the health education on KAP.

Data Analysis

Data were exported to a Microsoft Excel spreadsheet for cleaning and storage and SPSS version 20.0 (Armonk, NY: IBM Corp) was used for statistical analysis. A chi-square test used to test for associations between categorical variables. Descriptive statistics were summarised in terms of frequencies and percentages of correct responses. Data from the household observation were also analysed based on the chi-square test.

RESULTS

Participant demographics

The HE training workshop involved 44 (50%) pig farmers, 29 (32%) TOTs, and 15 (17.04%) non-pig farmers. Among the participants, 39 (44.3%) were female, and 49 (55.68%) were male. The majority 62 (70.45%) had primary school education.

Effect of health education training on participants knowledge, attitude and practices

There was an improvement in the knowledge and practices about tapeworm/taeniasis and cysticercosis, though most of the changes were not statistically significant **(Table 1).**

There was an overall improvement in tapeworm/taeniasis and cysticercosis knowledge in all three groups. When the data were separately analysed for the pig farmers, non-pig farmers and the TOTs group, results showed that during the pre-intervention survey, non-pig farmers had greater knowledge about tapeworm transmission ($P<0.001$). Pig farmers were more aware of the health effects of porcine cysticercosis and on how tapeworm transmission can be prevented. Pig farmers were more likely to be aware of the connection between porcine cysticercosis and epilepsy because they were more inclined to reject infected pork. The post-intervention survey showed a great improvement in the knowledge of most aspects of tapeworm/taeniasis and cysticercosis compared with baseline knowledge **(Table 2)**.

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Table 1. Comparison of knowledge and practices before and immediately after the health education intervention

Question	Correct response n (%)		P-value ($\chi 2$)
	Pre-intervention	Post-intervention	
Knowledge-related questions			
Heard of human tapeworm	67 (77.5)	83 (95.4)	0.001
Tapeworm prevention	84 (96.55)	85 (97.7)	0.975
Tapeworm treatment	71 (81.3)	83 (95.4)	0.008
Heard of human cysticercosis	54 (62.06)	77 (88.05)	<0.001
Health effect of human cysticercosis	81 (93.11)	86 (98.85)	0.065
Heard of porcine cysticercosis	69 (79.3)	68 (75.0)	0.006
Prevention of porcine cysticercosis	85 (97.7)	85 (97.5)	0.980
Link between porcine cysticercosis and epilepsy	40 (45.97)	80 (91.95)	<0.001
At risk of getting tapeworm	45 (51.72)	52 (59.77)	0.057
At risk of getting human cysticercosis	43 (49.4)	52 (59.77)	0.328
Safe to eat infected pork	77 (88.5)	81 (93.1)	0.392
Condemnation of infected pork	73 (83.9)	79 (80.1)	0.445
Practice-related questions			
Confining pigs	67 (77.0)	77 (88.5)	0.109
The problem of roaming pigs	68 (89.5)	75 (94.9)	0.203
Wash vegetables and fruits	87 (98.86)	88 (100)	0.025
Using toilet	83 (94.31)	87 (98.86)	0.114
Wash hands after visiting the toilet	81 (92.04)	76 (84.45)	0.433
Wash hands before eating	80 (90.9)	84 (95.45)	0.433

All p-values are based on a Chi-square analysis of numbers across the four districts

Regarding practices, pig farmers were more aware of the effect of free-roaming pigs while, non-pig farmers were more aware of the practices related to washing of fruits and vegetables before consumption, washing hands before eating and after visiting toilet **(Table 3)**.

Table 2: Comparison of knowledge of the three groups studied

Variables	Correct response n (%)			P-value ($\chi 2$)
	Pig-farmers	TOT's	Non-pig farmers	
1. Tapeworm transmission				
Pre-intervention	18 (40.9)	20 (68.8)	14 (93.33)	<0.001
Post-intervention	28 (63.6)	35 (86.2)	13 (86.8)	0.076
2. Health effect of human cysticercosis				
Pre-intervention	41 (93.9)	27 (93.3)	14 (92.3)	0.970
Post-intervention	43 (97.8)	29 (100)	15 (100)	0.667
3. Prevention of porcine cysticercosis				
Pre-intervention	44 (100)	29 (100)	14 (92.6)	0.144
Post-intervention	43 (95.5)	29 (100)	15 (100)	0.642
4. A link between porcine cysticercosis and epilepsy				
Pre-intervention	28 (63.6)	18 (62.06)	11 (73.33)	0.821
Post-intervention	42 (95.5)	29 (100)	15 (100)	0.229
5. At the risk of getting human cysticercosis				
Pre-intervention	21 (47.72)	15 (51.72)	10 (66.66)	0.351
Post-intervention	32 (72.72)	17(58.62)	7 (46.66)	0.103
6. Safe to eat infected pork				
Pre-intervention	39 (88.63)	24 (81.3)	13 (86.66)	0.788
Post-intervention	41 (93.18)	29 (100)	14 (93.33)	0.898

Table 3: Comparison of practices of pig farmers, non-pig farmers and TOT's

Variables	Correct response n (%)			P-value ($\chi 2$)
	Pig-farmers	TOTs	Non-pig farmers	
1. Do you think it is harmful if pigs roam free?				
Pre-intervention	32 (91.4)	25 (93.3)	15 (84.6)	0.60
Post-intervention	41 (93.2)	29 (100)	14 (96.4)	0.569
2. Do you always wash vegetables and fruits				
Pre-intervention	41 (94.1)	25 (86.7)	14 (96.2)	0.478
Post-intervention	44 (100)	29 (100)	15 (100)	**
3. Do you always use the toilet				
Pre-intervention	41 (94.3)	25 (86.7)	14 (100)	0.203
Post-intervention	44 (97.7)	29 (100)	15 (100)	0.541
4. Do you always wash your hands after visiting the toilet				
Pre-intervention	40 (91.2)	26 (92.9)	13 (92.6)	0.801
Post-intervention	42 (95.5)	29 (100)	14 (93.1)	0.627
5. Do you always washing hands before eating				
Pre-intervention	40 (91.2)	24 (92.3)	13 (92.6)	0.978
Post-intervention	42 (95.5)	29 (100)	13 (93.1)	0.627

**Statistical comparison not computed because the variable is a constant

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DISCUSSION

The study assessed the efficacy of the CHEP on community KAP regarding TSCT in disease endemic area. The package resulted into improvement in knowledge and practices in all three groups assessed (TOTs, pig farmers, and non-pig farmers) suggesting efficacy of the CHEP. This could be enhanced by key messages being crafted in different formats. This conventional approach may be more suitable for most endemic areas where other approaches such as video and digital technology are not feasible due to poor infrastructures such as lack of electricity, and internet.

Awareness about effects of the parasite on human health was poor across the groups. Knowing the effects of the disease will influence the community to take preventative measures, suggesting the need for health education to the whole community (Makingi et al., 2023). In the present study, health education improved community knowledge in all aspects. Additionally, the absence of a significant difference between the baseline and post-intervention results in some aspects may indicate that participants had insufficient time to fully absorb the material, pointing to the need for repeated interventions. The community health education delivery model involving local trainers aimed to ensure sustained health education delivery in the community, however, its efficiency need to be assessed.

The participant's level of education influenced the baseline awareness on the presence of the disease in the community, but did not affect the participants to grasp knowledge during health education training. This indicate that the level of education have no effect on health knowledge acquisition if messages are well crafted and packaged. This further shows that the package comprised clear messages about the disease enabling easy acquisition of intended knowledge. Similarly, community-based study in Mexico reported that an intensive community-participatory educational campaign was associated with improvement in knowledge about PCC (Sart et al., 1997). However, the spread and sustainability of the knowledge need to be monitored.

Health education training has significantly improved knowledge on awareness of *T. solium* infections, the transmission cycle of parasites, and knowledge of preventive measures related to TSTC. For instance, community study in Kongwa District showed significant improvement in knowledge on PCC (Makingi et al., 2023). Also, a study in Southern India and Mexico showed health education to significantly improve the knowledge on TSTC and on ways in which NCC is transmitted, although the change of risky practices was not significant (Sart et al., 1997). Therefore, efforts in providing health education intervention to the community regarding the disease will have a positive impact in improving knowledge and hence behavioural and practical change in controlling the parasite.

To conclude, the study has revealed that intervention improved community KAP about TSCT prevention and control confirming the efficacy of the CHEP. The study recommends long-term impact

assessment of the HE interventions to observe the community change in risky behaviour and practices in control of TSCT.

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