

*Full Length Research Paper*

# Assessment of impediments affecting health systems response to neurocysticercosis in two districts (Gulu and Amuru) of Northern Uganda: A cross sectional study

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Northern Uganda is recovering from the effects of prolonged war which devastated most of the health systems in the region. The aim of the study was to identify health sector impediments affecting health systems response to Neurocysticercosis in the districts of Gulu and Amuru. A cross sectional study was conducted on two hospitals and 10 health centers. Two hundred and three (n=203) respondents were involved. Questionnaires were used to collect the data. One hundred and forty two (70.0%) of the respondents are permanently employed (P=0.01). Seventy three point nine percent (73.9%) of respondents are residents from Gulu districts (P=0.024). One hundred and nine (53.4%) of respondents reported they received training on infectious diseases (P=0.507). One hundred and forty three (70%) reported their health facilities have polices (P=0.04). One hundred and forty seven (72.4%) reported in-charges reside at health facilities (P=0.01). One hundred and twenty four (61%) of the respondents reported Government is the primary source of funding (P=0.02). One hundred and seventeen (57.6%) of the respondents reported funding are irregular (P=0.23). Eighty seven percent (87%) reported inadequate physical infrastructure (P=0.04). Seventy three point six have limited knowledge on the diagnosis of Neurocysticercosis (P=0.01) and many prescribe anti-helminthic drugs to patients (P=0.27). Despite improvement in the healthcare services in the health sectors, health systems response to Neurocysticercosis in Gulu and Amuru, Northern Uganda is weak with most health facilities operating minimally. There is need for holistic approach to improvement of health systems in the region through increased Government funding and advocacy.

**Key words:** Impediments, health systems, neurocysticercosis, communities, northern Uganda.

## INTRODUCTION

There is growing evidence that the global health agenda needs to shift from an emphasis on disease-specific approaches of interventions to strengthening of health

systems, including dealing with social, environmental and economic determinants through multi-sectorial responses (Lancet, 2004; Senkubuge et al., 2014). The World health

Organizations (WHO) defines health systems as all organizations, people and actions whose primary intent is to promote, restore and maintain health (WHO, 2008). The health systems framework consists of six building blocks, namely; service delivery, health work force, health information systems, medical products including vaccines and other technologies, health financing, leadership and governance (WHO, 2007). These building blocks interact with other facets to constitute a system (Senkubuge et al., 2014). Improvement of healthcare service delivery requires synergies in the functionality of the building blocks at all levels of implementation including the district (Sengkubuge et al., 2014). Effectiveness of the organization and management of service delivery in the district depend among others, on the competence and number of members of the district health management team as well as relevant management teams in health centers, health post and communities (Sengkubuge et al., 2014; WHO, 2007).

Recent studies demonstrate that good governance, especially at the decentralized levels, can improve health outcomes (Anwari et al., 2015; Olafsdottir et al., 2011). On the other hand, previous studies have shown that poor governance especially in the health sectors contribute to poor health outcomes (Björkman et al., 2009; Gupta et al., 2002). The breakdowns in the health systems due to technical and administrative inefficiencies affect healthcare services delivery in a substantial manner (Gupta et al., 2002).

Over the last 20 years, Northern Uganda has been in a protracted war with serious negative consequences on the health systems (UNISDR report, 2015). The health systems and social determinants of health were devastated resulting in poor health indications and lack of productivity among rural communities (UNISDR report, 2015). Previous studies have shown that armed conflicts occur more frequently in low income countries of the world where their impact is more severe, thus compounding the poor situation of the social determinants of health and weak health systems associated with such countries (World Bank report, 1998). Northern Uganda is an area where majority of the communities live in extreme abject poverty. The region has experienced serious turmoil and most health systems were ravaged resulting in disruption of health services, reduced access to and utilization of health services (Vreeman et al., 2009). These attributable factors together with other physical challenges are serious impediments in the functionality of health systems particularly in response to the threat posed by infectious diseases. With the rising challenges of emerging infectious diseases coupled with inadequate number of health professionals, the functionality and readiness of

health systems response to neurocysticercosis (NCC) in the region is limited.

NCC is an infection of the central nervous systems (CNS) with the larval stage of *Taenia solium* cyst. The disease may be asymptomatic or present with a number of nonspecific manifestations, such as seizures, headaches, focal neurological deficits, increased intracranial pressure or cognitive decline (Del Brutto and García, 2014). Approximately 50 million people worldwide are infected with *T. solium* parasites and 50,000 people die of cysticercosis related diseases annually (Fleury et al., 2006; Lescano et al., 2007). In developed countries particularly, United States of America, cases of human cysticercosis have been reported among immigrants (Lescano et al., 2007). *T. solium* infections are prevalent in rural areas in developing countries particularly in Central and South America, Asia and sub-Sahara Africa (Lescano et al., 2017). In Uganda, information on human cysticercosis/neurocysticercosis is still scanty. However, a recent study conducted in the districts of Gulu, Moyo and Amuru, Northern Uganda indicated that 15% of patients with epilepsy in the region were positive to *T. solium* cysticercosis (Alarakol et al., 2017). *T. solium* is one of the parasites that cause serious public health and socioeconomic problems in endemic region (Alarakol et al., 2017). Taeniasis is acquired when one eats raw or undercooked pork containing cysticerci, the larval stage of *T. solium* (Basem et al., 2010; Waiswa et al., 2009). When ingested, the cysticerci migrate to mucosal of the intestine where they attach and become adults. These adult worms shed proglottids containing eggs in human feces and become the source of infection that can infect other human or pigs by direct or indirect contamination of food or water (Alarakol et al., 2017). *T. solium* causes human cysticercosis when one ingests embryonated eggs in food or water contaminated with fecal matter of persons harboring the adult tapeworm (Xu et al., 2010). When the CNS is infected with the larval stage of *T. solium*, NCC occurs which manifest as epileptic seizures.

Strong health systems play a pivotal role in the prevention of infectious diseases including NCC in the region (Ekouevi et al., 2011). When health systems are synergistically functional, the impediments are minimized. Health systems governance refers to a wide range of steering and rule-making related functions carried out by governments and/or decisions makers in order to achieve national health policy objectives that promote universal health coverage.

In this study, the six health systems building blocks as defined by WHO namely: service delivery, governance, health financing, medical technologies and health information systems, were examined and the functionality and readiness of health systems based on these

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essential features were assessed. The objective of the present study was to identify impediments that affect the functionality of health systems response to NCC in two districts of Northern Uganda: Amuru and Gulu.

## MATERIALS AND METHODS

### Study design

The present study is mainly a cross sectional one but a mixed method approach was adopted to answer the stated research questions. The research questions investigated identified impediments affecting the functionality of health systems response to neurocysticercosis within the health systems framework in Amuru and Gulu districts, Northern Uganda. Semi structured questionnaires and interviews were used to collect quantitative and qualitative data. Qualitative data were collected and analyzed as described by Bryman (2001). The qualitative approach was employed to investigate in depth dimensions of the health systems from the expert point of views. Real life experiences and opinions were collected as described by De Vaus (2014). The research protocol was approved by Gulu University, Research Ethic Committee (GUREC) and Uganda National Council of Science and Technology (UNCST) (Ref: HS987).

### Study settings

This study was conducted in the two districts of Amuru and Gulu, Northern Uganda from August, 2016 to June, 2017. The two districts cover a total area of over 3000 km<sup>2</sup> with an estimated population of 600,000 inhabitants (Uganda Bureau of statistics, 2006). These areas experienced the ravage of the brutal war which occurred in Northern Uganda from 1987 to 2006 during which the health systems virtually collapsed. The communities in these areas practice largely subsistence farming where peasant farmers focus on growing food stuffs to feed themselves and their families. These areas have high level of poverty, lack sanitation infrastructure and the communities practiced free range pig farming which provide suitable environment for survival of *T. solium* in the study population (Alarakol et al., 2017). The pigs are usually kept at night in pens and released in the morning to scavenge for foods in the environment. In addition, these areas have shortage of toilets/pit latrines as well as safe sources of water (Alarakol et al., 2017). The toilets/pit latrines coverage is estimated at 89% (Uganda Bureau of statistics, 2006).

The main sources of water in these areas are: spring, wells, bore holes, tape water and protected wells (Uganda Bureau of statistics, 2006). Recent study conducted in the area has indicated that the communities in the areas have been exposed to *T. solium* infections (Alarakol et al., 2017). Key informant participants were selected from one government referral hospital (GRH) and one large private not-for-profit hospital (PNH) in the region. These hospitals were selected because they are centrally located and have large catchment areas of the communities in Northern Uganda. Additionally, they employ large number of health professionals. The selected privately owned hospital, is one of the WHO accredited sentinel site for data collection in Uganda. It receives the largest numbers of patients from rural communities in Northern Uganda. The sample population was constituted from key informants, health professionals and village health teams who are resident in the two districts of Gulu.

### Sample size

Estimation of the sample size for the functionality of the health

systems was done according to a formula described by Kish (1965). Since, the functionality of the health systems in the two districts is unknown, 50% estimate was considered at 95% confidence interval, with a 10% precision. A total of 96 samples were required. In order to minimize the sampling error and to increase the power of the study, this was doubled to 192 samples. A 20% samples were allocated to cater for non-responses from respondents. Thus, the overall sampled size was 203.

### Sampling

Convenient sampling was conducted in which two hospitals namely: GRH, PNH and a total of 10 health centers II, III and IV were selected. However, no hospital was selected in Amuru district since it does not have one. Only health centers II, III and IV in the area were included. A total of 500 health workers in the two hospitals and the health centers were registered for the study. The proportion of health workforce investigated includes: doctors, 20 (9.8%), nurses, 110 (54.2%), clinical officers, 30 (14.8%), laboratory technologist/technicians, 15 (7.4%), physiotherapists 5 (2.5%), orthopedic technologists, 13 (6.4%) and other allied workers 10 (4.9%) which constituted the majority of the health work force. All participants who consented to participate in the study were recorded in the register using identification number. Simple random sampling was used to select the participants from the sampling frame of 500. Random numbers were generated from a sampling frame of 500. These were then aligned to the participants register. Each participant assigned a random number was included in the study. Thus, a total of 203 participants were enrolled in the study.

### Data collection tool

This study was preceded by initial visits to the study area to mobilize the communities and to seek for permissions from the health authorities and local leaders to conduct the research in the area. When permissions were granted, the research team visited the health facilities and identified the research assistants to assist in the administration of the questionnaires. Semi structured questionnaires were administered to the health workers. The questionnaires investigated issues related to the functionality of health systems in the two districts under study. This includes issues related to: governance, human resource, health financing, medical technologies and supplies, service delivery and health information systems. In addition, the questionnaires assessed demographic information such as age, gender, education level, time lived in the area and occupation.

### Data management and confidentiality

The study data were collected with no identification information included in the database except personal identification numbers. Participants' register, data, paper surveys, transcripts and field note books were stored in a secured cabinet in the faculty throughout the study period. After data collection, computer with the study data were kept in a secured cabinet in Faculty of Medicine, Gulu University. Therefore, participants' confidentiality was ensured.

### Statistical analysis

The categorical data are presented as mean, standard deviation, interquartile range or percent frequency. Data were analyzed using Pearson's Chi-square to test for statistical difference between proportions. The probability value ( $P < 0.05$ ) were considered to be statistically significant. Statistical analysis of data was performed using SPSS version 19.

**Table 1.** Socio-demographic characteristics in relation to functionality of the health system.

Study population data	Frequency	Percent	P-value
<b>Age</b>	Mean, 33.5 SD, 8.5		
<b>Sex</b>			
Male	87	42.9	0.074
Female <sup>a</sup>	116	57.1	
<b>Marital status</b>			
Married	87	42.9	0.34
Single <sup>b</sup>	140	68.9	
<b>Staff</b>			
New staff	37	18.2	0.03
Old staff <sup>c</sup>	116	81.8	
<b>Employment status</b>			
Permanent <sup>d</sup>	142	70	0.001
Contract	61	30	
<b>Residence</b>			
Within Gulu <sup>e</sup>	150	73.9	0.024
Other areas	53	26.1	
<b>Training</b>	109	53.4	0.507

n: Total number of respondents, a: most respondents were female ( $P=0.074$ ), b: most respondents were single ( $P=0.34$ ), c: most respondents were old staffs ( $P=0.03$ ), d: most staffs were on permanent terms ( $P=0.01$ ), e: most respondents originates from Gulu district ( $P=0.024$ ).

## RESULTS

### **Socio-demographic characteristics in relation to functionality of health systems**

Table 1 describes the socio-demographic characteristics of the study participants. A total of 203 health workers in the districts of Amuru and Gulu were included in the study. Two hospitals: LH and GRRH, and 10 health centers (II, III and IV) were assessed for the functionality of the health systems. The ages of the respondents ranged from 20 to 65, with a mean age of 33.5 years and SD 8.5. Majority, 140 (68.9%), of the respondents were single ( $P=0.34$ ). Most of them, 142 (70.0%) are permanently employed with experience ranging from 1 to 30 years ( $P=0.01$ ). Of the 203 respondents sampled, majority, 116 (57.1%) were female. There was no statistical difference in proportion between the male and female ( $P=0.074$ ). One hundred and fifty, 150 (73.9%) of the respondents are staff who are residents of Gulu districts ( $P=0.024$ ).

Additionally, 109 (53.4%) of the respondents reported they received training on infectious diseases (Table 1) and there was no statistical difference between those who received the training or not ( $P=0.507$ ). One hundred

and nineteen, 119 (58.6%) of the respondents reported they received training every six months since they were recruited into the health service ( $P=0.33$ ). Twenty two percent (22%) of the respondents reported receiving training at least between 1 and 2 years. Every health worker attended at least training in the past 10 years. Most of the respondents received training on HIV, 108 (91.6), hepatitis B, 59 (29.1%) and Ebola, 22 (10.8%). Others received training on infectious diseases such as neurocysticercosis, cancer, nodding syndromes among others.

### **Governance in relation to functionality of health systems**

Respondents were interviewed at various hospitals and health centers in Gulu and Amuru with respect to key aspects of governance (Table 2). Of the 203 respondents, 143 (70%) reported their health facilities have functional policies. Chi-square analysis showed no statistical difference ( $P=0.04$ ) between those who reported presence of the policies or not. When asked for the persons in charge at the health facilities, the responses were quite variable for the 203 respondents

**Table 2.** Governance in relation to functionality of health systems.

Variable related to governance	Frequency (n=203)	Percent	P-value
In-charge, director <sup>a</sup>	86	42.4	0.07
Residency at facility <sup>b</sup>	147	72.4	0.001
Availability at facility <sup>c</sup>	139	68.5	0.003
Departmental meetings <sup>d</sup>	180	80.0	0.02
<b>Frequency</b>			
Once a month <sup>e</sup>	127	62.6	0.056
Policy	143	70.4	0.04

n: Total number of respondents, a: titles, 'directors' were mostly used, b: most respondents think the in-charge resides at their health facilities ( $P=0.01$ ), c: most respondents think the in-charge are available at their health facilities ( $P=0.03$ ), d: departmental meetings are held in most health facilities ( $P=0.02$ ); e: most departmental meetings are held once a month.

**Table 3.** Health financing in relation to functionality of health systems.

Variable related to health financing	Frequency (n=203)	Percent
<b>Funding</b>		
Government**	124	61.1
Donor	48	23.6
Faith based organizations	23	11.3
Private	8	3.9
<b>Support</b>		
Regular	90	44.3
Inadequate	117	57.6

\*\*Government is the primary source of funding for most health facilities in the region ( $P=0.02$ ) though the funding are usually inadequate.

sampled, 42.4% reported the director as the one in charge, while 44, 39, 14 and 20% reported clinical officers, medical superintendent, medical assistant and others (enroll nurse and focal person/chairman), respectively. One hundred and forty seven, 147 (72.4%) of the respondents reported that the in-charges reside at their health facilities ( $P=0.02$ ), while 19 (9.4%) did not know whether the in-charge are resident or not at the facilities. However, most of the respondents, 139 (68.5) reported the presence of in-charges at their health facilities ( $P=0.07$ ), while some (46%) reported irregularities of the in-charge at the health facility.

Additionally, 127 (62.6%) of the respondents reported they hold departmental meetings once every month ( $P=0.02$ ) and that these meeting are regularly held at the facilities ( $P=0.056$ ).

### Health financing

In the present study, 124 (61%) of the respondents reported that the government is the primary supporter of the health facilities in the districts ( $P=0.02$ ) (Table 3), statistical difference ( $P=0.04$ ) between those who reported presence of the policies or not. When asked for

the persons in charge at the health facilities, the responses were quite variable for the 203 respondents sampled, 42.4% reported the director as the one in charge, while 44, 39, 14 and 20% reported clinical officers, medical superintendent, medical assistant and others (enroll nurse and focal person/chairman), respectively. One hundred and forty seven, 147 (72.4%) of the respondents reported that the in-charges reside at their health facilities ( $P=0.02$ ), while 19 (9.4%) did not know whether the in-charge are resident or not at the facilities. However, most of the respondents, 139 (68.5) reported the presence of in-charges at their health facilities ( $P=0.07$ ), while some (46%) reported irregularities of the in-charge at the health facility.

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In the present study, 124 (61%) of the respondents reported that the government is the primary supporter of the health facilities in the districts ( $P=0.02$ ) (Table 3),

**Table 4.** Health service delivery in relation to functionality of health systems.

Variables related to health service delivery	Frequency (n=203)	Percent
Inadequate physical infrastructure**	176	86.6
Out patients services/hospital visits**	201	99.0
In patients service/admissions**	191	94.1
Referral systems**	189	93.1
Diagnosis of NCC at the facilities*	81	40.0
Access to anthelmintic drugs*	122	61.1
Prescriptions of anthelmintic drugs*	123	60.6
NCC control/prevention programs	94	46.3

n: Total number of respondents, \*\*most respondents reported inadequate physical infrastructure ( $P=0.04$ ) presence of inpatients and out patients at health facilities ( $P=0.154$ ), \*only few respondents know how diagnosis of NCC is done ( $P=0.04$ ) and yet many health workers prescribe anthelmintic drugs to their patients ( $P=0.03$ ), only few respondents know there is a NCC control/prevention program ( $P=0.043$ ).

while, 48 (23.6) reported the donors, and faith based organizations and private enterprises 8 (3.9%) as the sources of funding at their health facilities in the two districts. More than 117 (57.6%) of the respondents reported funding at the health facilities are irregular ( $P=0.23$ ) and that it received very limited healthcare support in the last financial year. In addition, the funding is received late at the health facilities; therefore, affecting the day to day operations.

### Health service delivery

Table 4 describes the health attributes and outcomes at health facilities. The findings indicate that of the 203 respondents interviewed, 176 (87%) reported inadequate physical infrastructure at all health centers (II, III, IV) ( $P=0.041$ ). Two hundred and one (99.0%) of the respondents reported they receive patients at their health facilities ( $P=0.01$ ). One hundred and ninety one (94.1 %) and 201 (99.0%) of the respondents reported that they have in-/out- patients currently at the health facilities, respectively. In addition, the respondents reported receiving more than 100 out-patients per day at each health facility. Many of these patients are referred from other health facilities in the region. One hundred and eighty nine (93.1%) of respondents reported a functional referral systems with Lacor Hospital (23.6%), Gulu Regional Referral Hospital 48 (23.6%), Gulu independent hospital (GIH) 15 (7.4%) and Mulago Hospital (MH) 92 (45.3%) respectively being the most favored primary health facility.

Additionally, 40% of the respondents reported having seen patients diagnosed of NCC at the health facilities. One hundred and twenty two (60.1%) of respondents reported there are adequate anthelmintic drugs at health facilities with most health workers, 123 (60.6%) prescribing them to patients. Chi-square analysis showed significant statistical difference in the number of

respondents who prescribed anthelmintic drugs ( $P=0.03$ ) and those who did not give out these drugs. In addition, statistical significant difference was observed between respondents who did not know the dangers associated with prescribing anthelmintic drugs to NCC patients and those who knew about it ( $P=0.001$ ). Furthermore, more than 109 (53.7%) of the respondents did not know of any program at health facilities that address issues on NCC in the region ( $P=0.043$ ).

### Health information systems (HIS)

The current study also investigated the functionality of the HIS at the health facilities. Up to 185 (91.1%) reported the presence of HIS ( $P=0.01$ ). One hundred and sixty seven, 167 (82.3%) of the respondents reported that there is a technical person in-charge of the HIS (Table 5). Chi-square analysis showed significant difference between those who reported the presence of HIS at the facilities and those who did not know ( $P=0.023$ ). Additionally, more than 114 (56.2%) reported that the HIS is linked to GRH and PNH. Majority of the respondents reported that monthly reports from health centers II, III and IV are submitted to both GRH and PNH ( $P=0.034$ ). Up to 157 (77.3%) of the respondents reported the inpatient reports are submitted in these health facilities. While, 147 (72.4%) reported that the outpatients reports are also sent to these higher health facilities. Other records sent include: records of the meetings, referral of cases as well as epidemiology reports.

### Medical equipment and supplies

One hundred and fifty four (75.9%) of the respondents reported that there are functional medical equipment at their facilities ( $P=0.01$ ) (Table 6). However, these do not include specialized medical equipment such as MRI and

**Table 5.** Health information systems in relation to functionality of health systems.

Variables related to HIS	Frequency (n=203)	Percent	P-value
Health information systems**	185	91.1	0.001
In-charge**	167	82.3	0.023
Records of meeting*	124	61.1	0.056
Records of referrals of cases*	153	75.3	0.023
Records of epidemiology report*	120	59.1	0.336
Inpatients monthly report*	157	77.3	0.041
Outpatients monthly report*	147	72.4	0.021

n: Total number of respondents, \*\*Majority of respondents reported presence of HIS ( $P=0.001$ ); also most respondents reported presence of a technical person in-charge of HIS ( $P=0.023$ ). \*Most reports from health centers II, III and IV are submitted to GRRH and Lacor Hospital monthly ( $P=0.034$ ).

**Table 6.** Medical equipment and supplies in relation to functionality of health systems.

Variable related to medical supplies	Frequency (n=203)	Percent	P-value
Medical Equipment***	154	75.9	0.001
Condition of equipment	65	31.9	0.088
MRI and CT scan	55	27.1	0.073
Access to medical equipment to the community***	139	68.5	0.021
Servicing of Medical equipment	83	40.9	0.063
Referral for MRI and CT scan	92	45.3	0.099
Medical supplies	122	60.1	0.252

n: \*\*\*Significant numbers of respondent reported the presence of medical equipment ( $P=0.01$ ); \*only few actually know the conditions of these equipment ( $P=0.088$ ); \*only few respondents think MRI scans and CT scans are at health facilities ( $P=0.073$ ); \*\*\*most respondents think access to MRI and CT scans is impossible for the community ( $P=0.021$ ); \*some respondents are not sure whether medical equipment are serviced at health facilities or not ( $P=0.065$ ); \*\*\*most respondents reported they receive medical supplies ( $P=0.0252$ ); \*\*most MRI and CT scans referrals are sent to Mulago Hospital ( $P=0.099$ ).

CT scans which are expensive. Sixty five (31.5%) of the respondents reported that there are MRI and CT scans; however, 55 (27.1%) did not know whether these equipment are in good working condition ( $P=0.088$ ). Most of the respondents, 139 (68.5%) reported that these equipment are not available to local community ( $P=0.021$ ).

In addition, most of respondents are not sure whether the services derived from this equipment are either free or not. 94 (46.3%) reported that these equipment are not free, 64 (31.5%) reported that the equipment are free while, 45 (22.2%), do not know. A good number of respondents, 83 (40.9%) are not sure whether these equipment are serviced at the health facilities ( $P=0.065$ ). Only few, 58 (28.6%), reported that some services may be provided at the facilities. More than 92 (45.3%) have reported that patients in need of the services of MRI and CT scans are usually sent to MH (92: 45.3%), LH (48: 23.6%), GRRH (48: 23.6%) and GIH (15: 7.4%) ( $P=0.099$ ). Additionally, more than half of the respondents, 122 (60.1%), reported that they frequently receive medical supplies at their facilities. However, 73 (36.0%) of them do not know how frequent these medical supplies are delivered to health facilities ( $P=0.0252$ ).

## DISCUSSION

### Governance

Although, health facilities in Northern Uganda have survived on very limited resources in order to provide healthcare services to the community, they have continued to operate dismally. In the present study, measurable indicators of governance as a function of a health system were assessed. The findings of the current study indicate that majority of the health authorities in the region have played their functional administrative role or leadership oversight. Respondents at GRH and PNH, and health centers in Gulu and Amuru were interviewed with respect to key aspects of governance. Seventy percent (70%) reported that their health facilities have operational policies and are functional ( $P=0.04$ ).

When asked for the persons in charge of the health facilities, most respondents used variable titles to describe the in-charges at their health facilities. The titles such as: director, medical superintendent, clinical officers, medical assistant, Enroll nurse/in-charge or focal persons were commonly used. Most health workers refer to the in-charges as directors (42.4%), while 44, 39, 14

and 20% referred to them as: clinical officers, medical superintendent, medical assistant and others (enroll nurse and focal person/chairman), respectively. These different titles of the in-charges have been used to relate to the types of health facilities. The two prominent hospitals: GRH and PNH are headed by directors, while the health centers (II, III and IV) are usually headed by focal persons/Enroll nurse, medical assistant/clinical officers or medical officers/medical superintendent.

More than 72.4% of the respondents reported that the in-charges reside at their health facilities; this in essence does not really show an indication of good healthcare service to the community, but rather demonstrates the extent of commitment of the in-charges at the health facilities. It is interesting to note that 9.4% of the respondent do not know whether the in-charges are resident or not at the facilities. This is rather interesting but it is also a concern that should be noted. It appears some of the health workers do not come to work, so, they do not know about the availability of in-charges at their health facilities. Forty six percent (46%) of the respondents reported on irregularities of the in-charges at the health facility. This is an indication of lack of commitment to service at health facilities. It also demonstrates why there are evidence of poor health care service delivery at some health facilities in the region.

Recent studies demonstrate that good governance, especially at the decentralized levels, can improve health outcomes (Olafsdottir et al., 2011). Thus, the availability of the in-charges at the health facilities have contributed to improved health outcomes in the region. This in essence underscores the importance of technical oversight at health facilities with regard to prevention and control of infectious diseases, particularly the NCC. While the rural communities struggles with limited access and utilization of healthcare services in the region, the governance attributes have significantly enhanced the health outcomes and no doubt contributed to a certain extent, the control of the disease in the region. This finding agrees with previous studies which show that good governance in the health sectors, contribute to improved health outcomes (Lindelov and Serneels, 2006).

While governance, an essential component of a health system, remains a misunderstood concept (Siddiqi et al., 2009; Thidar et al., 2017), different conceptual frameworks have been proposed to define and measure governance, and its potential effect on health system performance and health service delivery (Lopez et al., 2011; Anwari et al., 2015). While this diversity of frameworks help in understanding governance as a construct in the context of health, these do not illustrate ways to apply effective governing practices in the fragile and conflict affected environments (Anwari et al., 2015). The districts of Gulu and Amuru are just recovering from a brutal rebellion which ravaged most of the health systems in the region. It is faced with health systems challenges as reported by VreeMan et al. (2009). The

governance attributes such as presence of policies, good infrastructure, good health information systems, regular departmental meetings among others are known to contribute to improved health sector performance in terms of good healthcare. The current findings indicate positive correlation of good governance with 62.6% of the respondents reporting they have functional policies, 70.4% hold departmental meetings once every month and that these meeting are regularly held at the facilities. Additionally, previous studies have demonstrated that significant health sector performance was found to be better in the provinces and districts where leaders were more committed to a people-centered approach as inferred from the extent of completion of their governance development action plans (Anwari et al., 2015; Thidar et al., 2017). Therefore, governance as a construct to context of health provides a platform for technical and leadership oversight at health facilities with corresponding positive effects on the prevention and control of neurocysticercosis at the community level.

### **Socio-demographic characteristics**

Human resource is a valuable asset that plays significant roles in a functioning health system. However, in a resource limited setting, limited number of skilled workforce exists at various health facilities in the region. The socio-demographic characteristics of the respondents from the study area were examined. The findings showed that most respondents ranged from 20 to 65 years old with majority (69.0%) being married. Most of the respondents are permanently employed with work experience ranging from 1 to 30 years. Women constitute up to 57.1% of this workforce and more than 73.9% of the respondents are residents from Gulu districts. This finding is in agreement with the World Bank information that shows that most of Ugandan work force consists of the youngest and most rapidly growing populations (World Bank Report, 2015). In addition, the current findings show that majority of the health workers are young people who mostly originate particularly from Gulu district. Interestingly, this may be attributed to strategic location of Gulu and it being the older district than Amuru. Therefore, the diversity and dominance of the populace at the work place with people from Gulu is not a mistake but historical.

Many of the health workers have spent more than two decades and have witnessed the collapse of the health systems in the region. However, this may also be an opportunity for the populace to demonstrate commitment to develop their homeland through hard work. It is worth noting that many of these health workers have had several training at the health facilities on infectious diseases and this has strengthened health systems effort in the prevention and control of NCC in the region. Up to 53.4% of the respondents have reported they received

training on infectious diseases. However, there was no statistical difference between those who received the training or not ( $P=0.506$ ). More than 119 (58.6%) of the respondents reported they received training every six months since they were recruited into the health service. Twenty two percent (22%) of the respondents reported receiving training at least between 1 and 2 years ago. Every health worker attended at least training in the past 10 years. Most of the respondents received training on HIV (91.6%), hepatitis B (29.1%) and Ebola (10.8%). Others received training on infectious diseases such as neurocysticercosis, cancer and nodding syndromes. Previous studies have reported that young people constitutes a work force for future development. African Development Bank Report (2016) indicates that young people continues to be a powerful work force for development. Additionally, Adeloje et al. (2017) reported that shortage of human resources for health has been the main barrier to scale-up health systems and health specific interventions. Previous studies have shown direct links between efficient health system governance and promising health workers outputs, which ultimately have positive effects on overall health outcomes (Adeloje et al., 2017).

### Health service delivery

Although, Uganda has significantly improved access to healthcare services in the health sector, challenges still exist. Health workers were interviewed on the extent of healthcare service delivery at their facilities. Focus was mainly on health outcomes such as access to health facilities, hospital visits/admissions as indications for functionality of health systems. The findings indicate that 87% of the respondent interviewed reported inadequate physical infrastructure at all health centers (II, III and IV). This in essence is a serious factor in any health systems concerns. Most health facilities in the study were ravaged during the war and post war reconstructions of some of these facilities are in progress. While the government is making significant progress in this direction, there are still concerns with resolving infrastructure. In addition, the current findings show that community access to and utilization of health services is constrained by a number of factors such as opening and closing time, limited budget allocation to health facilities.

Most of the respondents reported that government funds provided are inadequate to run health center activities. Additionally, the funds are often disbursed late and these greatly affect the day to day operations. Ninety nine (99.0%) of the respondents reported they receive patients at their health facilities. This is an indication of functional health facilities. However, the functionality of the health systems should not be misunderstood in this context since all the core pillars as described by WHO should interact together as a system. As shown, more

than 94.1% of the respondents have reported to have in-patients currently at the health facilities, implying interaction of the interfaces between the health facilities in the region and the community with each health facility receiving more than 100 out-patients per day.

Many of these patients are referred from other health facilities in the region. One hundred and eighty nine (93.1%) of the respondents reported having a functional referral systems with LH (48: 23.6%), GRRH (48: 23.6%), GIH (15: 7.4%) and MH (92: 45.3%), respectively being the most favored primary health facilities. Additionally, 40% of the respondents have reported the diagnosis of patients positive to NCC at the health facilities; however, most interviewed 104 (51.2%) did not know whether these patients exist at the health facilities in the region. One hundred and twenty two, (60.1%) of respondents reported access to adequate quality anthelmintic drugs at health facilities with most, (123: 60.6%) giving out these drugs to patients. Chi-square analysis showed significant statistical difference in the number of respondents who prescribed anthelmintic drugs ( $P=0.03$ ). This means significant numbers of the health workers are prescribing anthelmintic drugs to patients. Though this may be with good intention, there is possibility of clinical conditions of patients getting worse if not well attended to (Garcia et al., 2002). Statistical significant difference was also observed between respondents who did not know the dangers associated with prescribing anthelmintic drugs to NCC patients ( $P=0.023$ ). Previous studies show that anthelmintic drugs should be prescribed with caution to NCC patients (Garcia et al., 2002).

Furthermore, more than 109 (53.7%) of the respondents did not know of any program at health facilities that address issues on NCC in the region. This explains the need for more focus on issues of the neurocysticercosis in the region. Government has focused more on other diseases such as HIV/AIDS, malaria and TB, leaving out diseases such as NCC with equally serious consequences to the rural community in the region. It is high time the government considered the issues of Neglected Tropical Diseases, such as NCC in the region.

### Conclusion

Despite improvement in the healthcare services in the health sector, health systems response to neurocysticercosis in Gulu and Amuru, Northern Uganda is weak with most health facilities operating minimally. There is need for holistic approach towards improvement of health systems in the region. Further studies need to be conducted on understanding community perspective towards health systems in the area and assessment of performance of different players involved in the strengthening of health systems of the Northern Uganda.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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