

Prevalence of Human Taeniasis in JOS South Local Government Area of Plateau State

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Abstract: A research work was carried out to determine the prevalence of human Taeniasis in Jos South Local government Area of Plateau State. Humans were randomly sampled in 3 communities namely; Du, Kuru and Vwang. A total of 217 human stool samples were collected and processed via formol-ether sedimentation technique and examined for eggs/ova of *Taenia solium*. The overall prevalence of human taeniasis in the study area was 1.38% ($P>0.05$). Prevalence of human taeniasis in relation to sex and communities showed that in Du, males recorded 5% prevalence and females 0%. In Kuru females recorded 2.5% and males 0% ($p>0.05$). while Vwang recorded 0% prevalence of human taeniasis for both males and females. Prevalence of human taeniasis in relation to Age in the three communities showed that Age group 0-5, 6-10, 11-15 and 16-20 years in all the three communities recorded 0% prevalence of human taeniasis while age above 20years in Du and Kuru recorded 3.4% and 6.7% prevalence of human taeniasis respectively. ($P>0.05$).vwang recorded 0% prevalence. Prevalence of human taeniasis in relation to sex and age groups showed that both males and females aged 0-20years recorded 0% prevalence, while males and females aged above 20years recorded 5% and 1.7% prevalence respectively ($P>0.05$).

Keywords: *Taenia solium*, Prevalence, Zoonotic

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I. Introduction

Taeniasis is a parasitic disease due to infection with tape worms belonging to the genus *Taenia*. The two most important species infecting humans are *Taenia solium* and *Taenia saginata* which are contracted through ingestion of undercooked pork and beef respectively. Taeniasis is generally asymptomatic, although severe infection results in weight loss, dizziness, abdominal pain, diarrhea, headache, nausea, constipation, chronic indigestion, and loss of appetite (Garcia *et al.*, 2014).

Taenia solium sometimes called pork tape worm belong to cyclophyllid cestodes in the family Taeniidae. It is an intestinal zoonotic parasite found throughout the world with high prevalence in countries where pork is consumed (Gutierrez, 2000; Pawlowski *et al.*, 2002; Williams, 2008; Carter *et al.*, 2013). Infection is common in many underdeveloped countries such as Latin America, Asia, Africa and Middle East. High prevalences are reported in Mexico, Latin America, West Africa, Russia, India, Pakistan, Manchuria, and Southeast Asia (Reeder and Palmer, 2001).

Taenia saginata commonly known as the beef tapeworm, is a zoonotic tapeworm belonging to the order Cyclophyllidea and genus *Taenia*. It is an intestinal parasite in humans causing taeniasis and cysticercosis in cattle. Cattle are the intermediate hosts, where larval development occurs, while humans are definitive hosts harbouring the adult worms. It is found globally and most prevalently where cattle are raised and beef is consumed. It is relatively common in Africa, Europe, Southeast Asia, South Asia, and Latin America (Eckert, 2005). Humans are generally infected as a result of eating raw or undercooked beef which contains the infective larvae, called cysticerci. As hermaphrodites, each body segment called proglottid has complete sets of both male and female reproductive systems. Thus, reproduction is by self-fertilisation. From humans, embryonated eggs, called oncospheres, are released with faeces and are transmitted to cattle through contaminated fodder. Oncospheres develop inside muscle, liver, and lungs of cattle into infective cysticerci (Somers, 2010). *Taenia saginata* infection is usually asymptomatic, but heavy infection often results in weight loss, dizziness, abdominal pain, diarrhea, headaches, nausea, constipation, chronic indigestion, and loss of appetite (WHO Fact Sheet, 2013).

Cysticercosis due to *Taenia solium* is said to be one of the most potentially lethal helminthic infections in humans and an important public health problem worldwide (Anantaphruti *et al.*, 2007). It is particularly reported to pose serious public health consequences in developing countries including Nigeria (Deckers and Dorny, 2010). About 20 million people are reported to be affected by cysticercosis with a resultant annual fatality rate of approximately 50,000 people (Berkvens *et al.*, 2006).

Taenia solium infection is believed to be rising in most pigs-raising regions of West African countries (Zoli *et al.*, 2003). This increase has been associated with increased demand for animal protein and declining environmental hygiene/sanitation due to ever increasing human population (Mwape *et al.*, 2013). Despite the relatively high prevalence of human taeniasis in many parts of Nigeria, there is paucity of information on the epidemiology of the disease in many parts of the country particularly in Plateau State where most of the communities are involved in pig farming.

II. Materials And Methods

The Study Site

Jos South Local Government Area is located between latitude 9° 30' to 10°N and longitude 8° 30'E. It is situated at the north western part of the state with its headquarters at Bukuru, which is about 15km from the state capital, Jos (Figure1). The local government area has four districts; Du, Gyel, Kuru and Vwang districts. The local government area has a total land area of about 1,037km² and a population of 306,716 (NPC, 2006). It has a cool climatic condition due to its altitude. The coldest period is between November and February with an average mean daily temperature of 18°C, while it gets warm between March and April before the onset of the rain. Rainy season which is between the months of May and October has its peak in August. The mean annual rainfall varies between 1347.5 and 1460mm per annum.

The people of Jos South are predominantly farmers and hunters. Common food crops grown in the area include Irish potato, maize, millet, Acha, tomato and many other varieties of vegetables. Due to the evergreen vegetation in the pig rearing and cattle grazing are some of the major livestock kept in the area.

These animals are most often kept in open houses, particularly the pigs which needs little space. This form of animal husbandry more often than not result in the contamination of the environment especially where sanitation are poor.

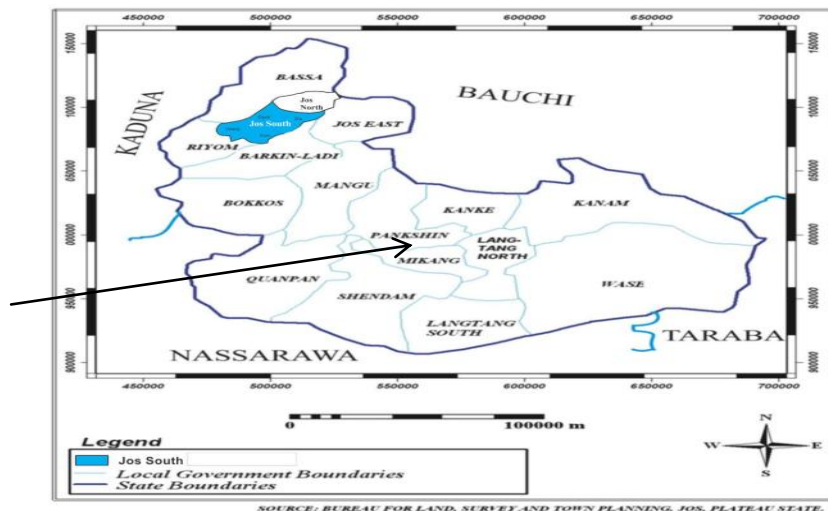


Fig 1 Plateau State Nigeria showing Jos South Local Government Area

Study Population

The study population composed of individuals living in Jos South which composed of the following districts: Du, Kuru and Vwang respectively. Individuals aged between 1-50years from 217 community members in the 3 districts were selected randomly irrespective of age, sex, health status or tribe during the study period.

Sample Size Determination

Sample size was determined using the following formula (Araoye, 2004);

$$N = \frac{Z^2 Pq}{L^2}$$

$$N = \frac{(1.96)^2 \times 0.83 \times 0.17}{(0.05)^2} = 217$$

Where

N = sample size

Z = Score for a given confidence interval usually 1.96 for 95%

P=prevalence value of 83%(0.83)

$q = (1 - p) = 1 - 0.83 = 0.17$

L = permissible error of estimation is taken as 0.05 (5%)

The sample size was calculated at approximately 217 household (one person per household).

Ethical Clearance / Consent

A proposal on this study was submitted to the Plateau State Ministry of Health. Permission to conduct the study in the selected district was obtained from district head and local authorities (Appendix). Consent for selection of a participant in a sampled household was sought from the selected individuals as well as the head of the household. Before sample collection, each selected participants was approached individually to obtain informed consent.

Pre Survey

In each district, a pre-survey meeting was conducted to explain the purpose of the study to the local authorities and heads of households. The following day, visits were carried out to selected household to identify eligible household members. Eligibility and selection of members was based on age (1-50years). Among all eligible household members who consent to participate in the study, a member was selected by simple random sampling technique.

A short structured questionnaire was administered to all participants to collect information on biodata such as age, sex, occupation hygiene and sanitary practices, pig keeping, pork consumption among other information. Administration of questionnaire was carried out by assistants who speak both local language/dialects and English.

Sample Collection

Before sample collection, consenting individuals were guided on ways of collecting their samples. There after sample bottles for stool collection were distributed to participants a day before and instructed to provide samples the next morning. To enable ease of processing 30 stool samples were collected daily. Samples collected were appropriately labeled to enable tracing of individual donor. Samples collected were transported in ice-chests on ice packs to the Parasitology Department, National, Veterinary, Research, Institute Vom for processing the same day.

Laboratory Analysis of Stool Samples

Stool samples were processed using formol-ether sedimentation technique as described by Gracia (2017). Small portion of stool specimen about the size of a walnut was mixed thoroughly in 10mls of saline solution. The emulsion was filtered through fine mesh gauze into a conical centrifuge tube and the suspension centrifuged at 2,500 for 5 minutes. The supernatant was decanted and the sediment suspended in 10ml of normal saline solution and was centrifuged again. This process was repeated until the supernatant was clear. The supernatant was then poured out and 10ml of 7% formal saline added. To the mixture, 3ml of ether was added and shook vigorously before centrifuging again at 2500g for 5mins. Using an applicator stick, the top plug of the debris formed was freed and the supernatant decanted.

A small amount (1 drop) of the sediment was placed on a glass slide and a drop of iodine added and covered with a cover slip. Slide prepared was examined microscopically at x10 magnification for the presence of *Taenia solium* ova (Gracia, 2017).

Statistical Analysis

All data obtained from the research work, was entered into Microsoft Excel 2016, and analyzed by statistical package. Comparative analysis between the various location, Age group and sex was performed by Chi Square to check for the prevalence of human Taeniasis in the study population. For all analysis, 95% confidence interval was set for significance. Prevalence of Taeniasis was calculated by dividing the number of positive samples by the total number of the samples collected and multiplied by one hundred to obtain the percentage positivity.

III. Result

Overall Prevalence of Human Taeniasis in Selected Communities of Jos South Plateau State, Nigeria

The egg of *Taenia solium* detected in human in selected communities of Du, Kuru and Vwang is shown in Plate 4.1. Overall prevalence of taeniasis was 1.38% (Table 4.1). However, there was an unequal distribution of *Taenia solium* among the different communities. Du community recorded 2.86% prevalence, while Kuru had

a prevalence of 1.43%. No case of Taeniasis was recorded in Vwang. Statistical analysis shows no significant difference in distribution of taeniasis among humans in Du, Kuru and Vwang communities ($P>0.05$).

Prevalence of Human Taeniasis in Relation to Sex and Communities

Prevalence of Human taeniasis in relation to sex of individuals sampled in the three communities of Jos South as shown in Table 4.2. Male individuals sampled in Du community recorded a prevalence of 5% while no case of taeniasis was recorded in their female counterparts. However, the reverse was observed in Kuru community where human taeniasis was recorded in 2.5% of the females sampled while no single case was recorded in males. In Vwang community, both male and female individuals sampled recorded zero prevalence.

Prevalence of Human Taeniasis in Relation to Age Group in Du, Kuru and Vwang Communities

The prevalence of Human taeniasis in relation to age group of sampled individuals in the three communities of Du, Kuru and Vwang in Jos South is shown in Table 4.3. Age groups 0-5yrs, 6-10yrs, 11-15yrs and 16-20yrs in Du, Kuru and Vwang communities recorded zero prevalence while individuals aged above 20years in Du and Kuru had prevalence of taeniasis in range of 3.4-6.7%. In Vwang community, all the age groups recorded no incidence of taeniasis.



Taenia solium egg on x40

Prevalence of Human Taeniasis in Relation to Sex and Age Group

The prevalence of Human taeniasis in relation to sex and age groups of sampled individuals is presented in Table above, Males and females aged between 0-20years recorded zero prevalence during the study, however, males and females aged above 20years had prevalence of 5% and 1.7% respectively.

Prevalence of Human Taeniasis in Relation to Sex and Age Group

The prevalence of Human taeniasis in relation to sex and age groups of sampled individuals is presented in Table 4.4. Males and females aged between 0-20years recorded zero prevalence during the study, however, males and females aged above 20years had prevalence of 5% and 1.7% respectively.

Community	No. of samples examined	No. of sample Positive	% Positive	P – value =0.333
Du	70	2	2.86	
Kuru	70	1	1.43	
Vwang	77	0	0	
Total	217	3	1.38	

Table 1: Overall Prevalence of Human Taeniasis in Selected Communities of Jos South Plateau State Nigeria.

Community	Sex (Male)			Sex (Female)		
	No. of sample examined	No. of sample infected	% infection	No. of sample examined	No. of sample infected	% infection
Du	40	2	5	30	0	0
Kuru	30	0	0	40	1	2.5
Vwang	40	0	0	37	0	0
Total	110	2	1.82	107	1	0.93

Table 2: Prevalence of Human Taeniasis in Relation to Sex and Communities

Age Group (yr)	COMMUNITY								
	DU			KURU			VWANG		
	No. of samples examined	No. of samples infected	% infected	No. of samples examined	No. of samples infected	% infected	No. of samples examined	No. of samples infected	% infected
0 – 5	10	0	0	10	0	0	10	0	0
6 - 10	10	0	0	10	0	0	10	0	0
11 - 15	10	0	0	10	0	0	10	0	0
16 - 20	10	0	0	10	0	0	10	0	0
20 above	30	2	6.7	30	1	3.33	37	0	0
Total	70	2	2.86	70	1	1.43	77	0	0

Table 3: Prevalence of Human Taeniasis in Relation to Age Group in Du, Kuru and Vwang Communities

Age group (year)	MALE			FEMALE		
	No. of samples examined	No. of samples infected	% infected	No. of samples examined	No. of samples infected	% infected
0 – 5	10	0	0	20	0	0
6 - 10	10	0	0	20	0	0
11 - 15	20	0	0	10	0	0
16 - 20	10	0	0	20	0	0
20 above	40	2	5	57	1	1.7
Total	90	2	2.2	127	1	0.78

Table 4: Prevalence of Human Taeniasis in Relation to Sex and Age Group of households in sampled communities

IV. Discussion

The life cycle of *Taenia solium* involves human and porcine host. Man becomes infected when he feeds on pork harbouring the larval stage and when consumed undercooked. The overall prevalence of human Taeniasis in the study areas of Du, Kuru and Vwang communities was relatively low (1.38%) when compared with similar reports from other states in Nigeria. Mogaji *et al* (2016) in a related study reported an overall prevalence of 40.9% human Taeniasis in Odeda Area of Ogun State. Weka *et al.* (2013) reported also the overall prevalence of 9.6% *Taenia solium* among pig rearers in Jos North Local Government Area of Plateau State, Nigeria. Biu and Hena (2008) reported a prevalence of 4.2% human Taeniasis in Maiduguri, Borno State, Nigeria. The low prevalence of human taeniasis observed in the study area was due to the fact that most pork meat that is consumed among the study population is properly cooked thereby reducing the chances of infection to occur.

Males individuals in the sampled population recorded 5% prevalence of human Taeniasis while females individuals in the study population recorded 2.5%. This observed result was due to the fact that males are in charge of pork business and most times the meat is consumed undercooked also males are responsible for pig farming thereby given room for infection to occur.

This agrees with the reports of Okoli *et al.* (2006) that males are in charge of butchery work, are illiterate and school dropouts. As compared with the females who have access to the meat once in the while.

The analysis of age related data in the study indicate that ages 0-5 years, 6-11 years, 11-15 years and 16-20 years recorded prevalence of zero, while ages above 20 years recorded the prevalence of Taeniasis in the range of 3.4-6.7%. This agrees with the findings of Carrique *et al.* (2001) which showed that older age groups are among the risk factor included for human infection and participate in occasion were pork meat is consumed undercooked. Statistical analysis shows no significant difference in distribution of Taeniasis among humans in Du, Kuru and Vwang communities ($P > 0.05$).

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