

Prevalence and risk perception of adult-stage parasites in slaughtered food animals (cattle, sheep and goat) among local meat personnel in Ipata abattoir, Ilorin, Nigeria

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Abstract

Identification of fresh adult-stage parasites was used to study and determine the basic knowledge of local meat handlers on awareness and risk perception of parasites they are conversant with in Ipata abattoir, Ilorin. The prevalence of these parasites found in fresh slaughtered food animals include *Fasciola gigantica* (11.24%), *Paramphistomum cervi* (12.16%), *Moniezia expansa* (2.76%), *Moniezia benedeni* (3.86%), *Haemonchus placei* (10.19%), *Haemonchus contortus* (4.93%), *Ascaris vitulorum* (2.54%), *Strongyloides papillosus* (0.36%), *Dictyocaulus filaria* (0.07%), *Dictyocaulus viviparus* (0.09%), *Trichuris ovis* (0.07%), *Trichuris globulosa* (0.09%), *Dicrocoelium hospes* (0.26%) and *Dicrocoelium dendriticum* (0.15%). The overall prevalence is 36.04%, and the 'importance index' of parasites across the species shows significant difference of $P < 0.001$. Apart from *Fasciola gigantica* with 16.24% perception, the overall risk perception of 1.91% indicated poor awareness and inability of health workers to convince the unskilled meat personnel. There is significant difference $P < 0.05$ between adult-stage parasites prevalence and risk perception among local meat handlers.

Keywords: Risk perception, prevalence, parasites, meat personnel

Introduction

There are numerous discrete settlements of Fulani and Bororo herdsmen in Ilorin, Kwara State; especially during the raining season when these men travel down to the Guinea savannah from far North in search of fresh grassland and water for their flocks. The livestock rearing system in north central Nigeria is favourable for nomads. Ilorin city has a population of approximately 1 million people [14], with the major abattoir in Ipata, Ilorin. Most of these animals slaughtered have a high burden of parasites of which some are zoonotic. Gastrointestinal parasites are common pathogens in cattle, sheep and goat which could be harmful and cause serious economic loss due to reduced weight gain and death [6]. These parasites have predilection sites and their prevalence is based on vegetational or geographical location [11]. Basically, most of the butchers and wholesale meat sellers in the abattoir were interviewed to know if they know some of these parasites, the health implications and risk perception of these parasites. Humans

can contract parasites through the skin mucosa, digestive and respiratory tracts [4]. When some of these meats are not properly processed, it can cause parasitic infection in humans especially children and immunocompromised patients. The management, particularly the grazing conditions and patterns are not conventional or monitored by Animal scientist or Veterinarian but solely by nomads. The major constraints of live stock that caused great economic loss as a result of reduced growth, low productivity and increased susceptibility [16] especially in sub-Saharan Africa are parasitic infections. Local herbs are often given to these animals especially when there is snake bite or any form of wound; most times the targets were rarely parasites. The prevalence of adult-stage parasites of slaughtered livestock was determined which focused on adult helminths and cestodes, because these are parasites the local meat handlers come in contact with daily and are familiar with them. Oftentimes the number of existent adult parasites is dependent on age of the host animal, level of host

immunity, species of the parasite involved, stage of infection, recent deworming, consistency of the faeces, parturition, parasite resistance to drug and environmental factors. Hence, the prevalence in this study will reflect an apparent figure, because only the adult parasites were considered. The aim of this study is to carry out a survey of knowledge of risk perception among meat handlers in relation to the prevalence of adult-stage parasites in slaughtered food animals (ruminants).

Materials and methods

Study area

This study was conducted from May 2013 to February 2014 in Ilorin city, Kwara State, North-central Nigeria. The coordinates of Ilorin is latitude 8° 50' 00"N and longitude 4° 55' 00"E. The abattoir is located in a popular market where consumers in and from nearby towns visit. There are two compartments; leftside is the cattle slaughter slab while the right side features both the sheep and goat sections. This abattoir was targeted because the location of the market is central and serves as a converging spot for every household in the city. More than 90% of animal slaughtered and consumed in the city of Ilorin and environs emerge from this market.

Study design and sampling

A total of 39 men and 47 women were interviewed at different times on their perception to adult-stage parasites; their consciousness to human health on meat consumption and their believe protection. Slaughtered domestic animals were examined to evaluate the prevalence of adult parasites daily encountered by butchers and other meat handlers. A total of 1168 Cattle, 394 Sheep and 943 Goats were examined during the experimental period. A cross-section of local names given to these parasites was also considered. The parasite samples collected using parasite extraction from meat method either by scrappings or picked live from animal specimens post-mortem. These were studied using morphometric tools (textbooks and microscope) and identified morphologically [12,13] for confirmation.

Questionnaire design

A questionnaire, targeting local meat handlers was composed for this study and aimed at collecting information on risk perception of adult-stage parasite by meat handlers and its public health importance. The questionnaire was used to study the familiarity of meat handlers to adult stage parasites, demographic data such as: frequency of meat consumption, duration spent in the abattoir, frequency of hospital check-ups and their deworming records. A participatory and unstructured pattern of questioning was used. General prevalence was calculated from the number of animals' positive of adult-stage parasites.

Statistical analysis

Determination of relationship between adult-stage parasite

prevalence and risk perception among local meat handlers were analysed with Chi square using GraphPad Prism version 5 for Windows (GraphPad, San Diego, CA, USA). Worm burden prevalence among the three species of animals was analysed using analysis of variance (ANOVA). Correlation analyses and covariance analysis was used to analyse transformed counts of the parasites in the animal species. Parasites were isolated and grouped according to methods based on the value of the 'Importance Index, I' [1,15]. Species with an importance index higher than 1 was considered dominant, species with an importance index between 0.01-1 were considered co-dominant and species with an importance index less than 0.01 were considered as subordinate.

Results

A total of 1168 cattle, 397 sheep and 943 goats were sampled. The overall prevalence of adult-stage parasites is 36.04%. Most of the parasites were known as "kokoro" in the local language, with other distinct names as stated in Table 1. The data indicated the adult-stage parasite prevalence was high in *Paramphistomum cervi* (12.16%) and *Fasciola gigantica* (11.24%) where it was discovered in 305 and 282 samples respectively. Other nematodes and trematodes found were reported in Table 2. The importance index of all the parasites seen in the three species of animals slaughtered was calculated in Table 3. Analysis of variance (ANOVA) result shows significant difference $P < 0.001$ among the three species of animals. Table 4 reported a total of 86 meat personnel that included 39 male butchers and 47 women interviewed. Predisposing factors among personnel shows heavy burden in parasites of which some are zoonotic (*Fasciola gigantica*, *Haemonchus species* and *Strongyloides papillosus*). This study revealed that 84.89% of these personnel submitted that they have never been dewormed; while 90.70% stayed in the abattoir for more than three hours daily. Furthermore, 46.51% consume meat on daily basis, yet 75.58% do not go for hospital check-ups rather depend on self-medication. The risk perception of fasciolosis was the highest (16.28%), probably due to caseation found in chronic fasciolosis in the liver which is similar to nodules in tuberculosis of high risk perception. However, an overall risk perception of 1.91% was revealed among meat personnel in this study. There is significant difference between the adult-stage parasites found and the risk perception among the unskilled meat personnel.

Discussion

Most of the animals examined in the slaughter slab were emaciated indicating one form of anomaly or the other. Female animals were more than male probably due to old reproductive age or reduced productivity which could be as result of heavy parasitic burden. Parasites of various types could cause mild pathological signs ranging from anorexia, emaciation, dehydration to severe signs like anaemia, abortion and death. The adult-stage parasitic prevalence reported

Table 1. Level of awareness and perception of visible parasites by local meat handlers.

Parasites	Predilection site(s)	Animal involved	Local name	Knowledge of Risk Perception
<i>Fasciola gigantica</i>	Liver, Bile duct	Ruminants	Ipepe	Low
<i>Paramphistomum cervi</i>	Rumen	Ruminants	Kokoro-wini	Low
<i>Dicrocoelium hospes</i>	Bile ducts	Cattle	NR	Very low
<i>Dicrocoelium dendriticum</i>	Bile ducts	Ruminants	NR	Very low
<i>Moniezia expansa</i>	Small intestine	Sheep and Goat	Tape rule	Very low
<i>Moniezia benedeni</i>	Small intestine	Cattle	Tape rule	Very low
<i>Haemonchus placei</i>	Abomasum	Cattle	Tanwunji	Very low
<i>Haemonchus contortus</i>	Abomasum	Sheep and Goat	Tanwunji	Very low
<i>Ascaris vitulorum</i>	Small intestine	Sheep	Ekolo	Very low
<i>Trichuris ovis</i>	Caecum	Sheep	NR	Very low
<i>Trichuris globulosa</i>	Caecum	Cattle	NR	Very low
<i>Dictyocaulus filarial</i>	Bronchi	Sheep and Goat	NR	Very low
<i>Dictyocaulus viviparus</i>	Bronchi	Cattle	NR	Very low
<i>Strongyloides papillosus</i>	Large intestine	Cattle	Owu	Very low

NR: Not recognized

Table 2. The overall prevalence of adult-stage parasite observed in slaughtered cattle, sheep and goat in Ipata abattoir, Ilorin.

Parasites	Cattle	Sheep	Goat	Total
<i>Fasciola gigantica</i>	20.29% (237/1168)	5.54% (22/397)	2.44% (23/943)	11.24% (282/2508)
<i>Paramphistomum cervi</i>	24.91% (291/1168)	2.27% (9/397)	0.67% (5/943)	12.16% (305/2508)
<i>Dicrocoelium hospes</i>	0.26% (3/1168)	0.00% (0/0)	0.00% (0/0)	0.26% (3/1168)
<i>Dicrocoelium dendriticum</i>	0.00% (0/0)	0.25% (1/397)	0.11% (1/943)	0.15% (2/1340)
<i>Moniezia expansa</i>	0.00% (0/0)	7.30% (29/397)	0.85% (8/943)	2.76% (37/1340)
<i>Moniezia benedeni</i>	3.68% (43/1168)	0.00% (0/0)	0.00% (0/0)	3.68% (43/1168)
<i>Haemonchus contortus</i>	0.00% (0/0)	12.34% (49/397)	1.80% (17/943)	4.93% (66/1340)
<i>Haemonchus placei</i>	10.19% (119/1168)	0% (0/0)	0% (0/0)	10.19% (119/1168)
<i>Ascaris vitulorum</i>	0.00% (0/0)	5.29% (21/397)	1.39% (13/943)	2.54% (34/1340)
<i>Trichuris ovis</i>	0.00% (0/0)	0.25% (1/397)	0.00% (0/943)	0.07% (1/1340)
<i>Trichuris globulosa</i>	0.09% (1/1168)	0.00% (0/0)	0.00% (0/0)	0.09% (1/1168)
<i>Dictyocaulus filarial</i>	0.00 (0/0)	0.00% (0/397)	0.11% (1/943)	0.07% (1/1340)
<i>Dictyocaulus viviparus</i>	0.09% (1/1168)	0.00% (0/0)	0.00% (0/0)	0.09% (1/1168)
<i>Strongyloides papillosus</i>	0.68% (8/1168)	0.00% (0/397)	0.11% (1/943)	0.36% (9/2508)
TOTAL	--	--	--	36.04% (904/2508)

was 36.04% aside the larvae and ova stages that were not considered, this revealed a possibly very high parasitic burden in the slaughtered animals which is not safe for consumption. Unlike previous reports from various geographical regions of Nigeria which focused on all stages of parasitic infection. In northern Nigeria prevalence ranges from 77-100% [3,7,10] while [9] and [5] reported 62-75% prevalence in south-east and south-south Nigeria respectively. The high prevalence of adult-stage gastrointestinal parasites found in this study

could reveal developed resistance of the parasites to available anthelmintic drugs available in the market. Most of these parasites were found more in rainy season due to the feeding habit of the animals. Not less than seven parasites have a unique identification name popularly known by these people. It is interesting to know that these local meat personnel are aware of adult-stage parasites in slaughtered food animals, regarding them all as "kokoro". Meats were not processed in a mechanized way; most of the handlers

Table 3. The calculated importance index among the species of animal slaughtered in the abattoir, Ipata, Ilorin.

Parasites	Importance index		
	Cattle	Sheep	Goat
<i>Fasciola gigantica</i>	9.25	0.88	0.92
<i>Paramphistomum cervi</i>	11.60	0.35	0.20
<i>Dicrocoelium hospes</i>	0.25	0.00	0.00
<i>Dicrocoelium dendriticum</i>	0.00	0.07	0.07
<i>Moniezia expansa</i>	0.00	2.16	0.60
<i>Moniezia benedeni</i>	3.68	0.00	0.00
<i>Haemonchus contortus</i>	0.00	3.66	1.27
<i>Haemonchus placei</i>	10.19	0.00	0.00
<i>Ascaris vitulorum</i>	0.00	1.57	0.97
<i>Trichuris ovis</i>	0.00	0.07	0.00
<i>Trichuris globulosa</i>	0.09	0.00	0.00
<i>Dictyocaulus filarial</i>	0.00	0.00	0.07
<i>Dictyocaulus viviparus</i>	0.09	0.00	0.00
<i>Strongyloides papillosus</i>	0.32	0.00	0.04

x>1 represents dominant, 1≥x≤ 0.01 connotes co-dominant and x<0.01 indicates subordinate; where x represents the parasite in any of the species. P value=P<0.001; indicating that there is significant difference among the three species.

have no protective clothing on them, except the butchers who are on protective rubber boots. These personnel find it hard to believe that there are parasites that cannot be seen with the eye, which involve protozoans and other groups in egg and larvae stages. It is important to know that assisted meat inspection policy by providing a valid feedback report to veterinary services to control and or eradicate disease in order to protect the public from infectious and zoonotic hazards is necessary [2]. The identified factors designed in the questionnaire revealed, the possibility of more people getting infected with these parasites. **Table 4** shows that a total 73(84.89%) personnel out of 86 indicated that they have never been dewormed in the hospital or by self-medication which could make them carriers of heavy parasitic burden or become resistant to parasitic infection depending on the immune system. Individual hygiene may be difficult to assess, but there may be huge public health consequences when sanitary conditions are poor. Long hours of work in the abattoir increase the contact duration of personnel and animals, which can also have an upward parasitic effect on them. Sums of 46.5% consume meat on daily basis, although the processing procedure was not quantified. However, there are tendencies of consuming undercooked meat, which may predispose them to parasitic and other microbial infection. A total of 75.6% never visited hospitals for check-ups, which confirms that good numbers of them are carriers of heavy parasitic burden. *Fasciola gigantica* happens to be the most

Table 4. Risk perception among unskilled meat personnel.

Variables	Male (n=39)	Female (n=47)	Total (86)
Deworming	--	1	1
≤1 month	1	--	1
≥6 month	2	1	3
≥1 year	3	2	6
≥2 years	1	2	3
Never	32	41	73
Duration of work at the abattoir			
≤1 hour	--	--	--
≥2 hours	--	1	1
≥3 hours	29	17	46
>6 hours	3	29	32
Meat consumption frequency			
Daily	21	19	40
2-3 times weekly	1	17	18
4-6 times weekly	9	5	14
Weekly	--	4	4
Monthly	--	2	2
Yearly	1	--	1
Hospital check-ups			
Weekly	--	1	1
Bimonthly	1	--	1
Monthly	3	9	12
Biannually	--	1	1
Annually	2	3	5
Biennially	1	--	1
Never	32	33	65
Risk perception of parasites			
<i>Fasciola gigantica</i>	5 (12.82%)	9 (19.15%)	14 (16.28%)
<i>Paramphistomum cervi</i>	1 (2.56%)	2 (4.26%)	3 (3.49%)
<i>Haemonchus placei</i>	0 (0.00%)	1 (2.13%)	1 (1.16%)
<i>Haemonchus contortus</i>	1 (2.56%)	0 (0.00%)	1 (1.16%)
<i>Moniezia expansa</i>	1 (2.56%)	1 (2.13%)	2 (2.33%)
<i>Moniezia benedeni</i>	0 (0.00%)	1 (2.13%)	1 (1.16%)
<i>Ascaris vitulorum</i>	0 (0.00%)	1 (2.13%)	1 (1.16%)
Others	0 (0.00%)	0 (0.00%)	0 (0.00%)

perceived parasite with risk among these meat personnel. The study revealed a total of 16.28% personnel submitting to complete or partial condemnation of meats infected with these parasites because of its effect on humans while others believe that food animals are gifts from God without factors that can endanger human life. The statistically significant variation in the 'importance index' of the calculated parasite prevalence of the slaughtered animal reveals diversities of

the biochemical, seasonal and physiological properties of the parasites in various hosts; revealing how different host immune system modulate various parasitic challenges. The physiological status of ruminant could influence its susceptibility to gastro-intestinal nematode infections. Hormonal changes during late pregnancy and lactation lower the resistance of the host to nematodes and consequently result in the establishment of higher worm burdens (Coop et al., 1990). Other parasites with very low knowledge of risk perception among meat personnel according to **Table 4** are *Paramphistomum cervi*, *Moniezia expansa*, *Moniezia benedeni*, *Haemonchus contortus*, *Haemonchus placei* and *Ascaris vitulorum*. It is quite disheartening that despite different campaign strategies both by government and non-government agencies, the level of risk perception is still very low in Kwara state. Other parasites, especially the ones that were not readily recognized due to their sizes or predilection sites have <0.001% risk perception among meat personnel. Hence the overall risk perception of all the parasites related to the personnel responses produced 1.91% indicating that public awareness of these parasites among the local butchers and other personnel is very low despite years of experience and hours spent in the abattoir. A similar result of low risk perception was reported among dog-owners in Ibadan and environs; southwestern Nigeria [8]. However, no study on risk perception of parasites among meat personnel has been reported in Ilorin before now. The zoonotic importance of some parasites found in their adult-stage form should make the government to develop better forms of awareness of the risk associated with these parasites. There is a significant difference ($P < 0.05$) between parasite prevalence and risk perception among unskilled abattoir personnel, hence a prompt intervention is needed across the country to revise the animal management methods, awareness through the media, adult education by veterinarians, introduction of unskilled labour health insurance policy, public health biosecurity measures and qualitative and ideal method of processing meats.

Conclusion

The study emphasizes adult-stage parasites and the risk perception among unskilled meat personnel. The prevalence of the parasites, their importance index, local names of the parasites and public health importance on the populace was well-studied. There was significant difference between parasite prevalence and risk perception among unskilled abattoir personnel, likewise the importance index across the host. This study raised an alarm of rational surveillance across the abattoirs, occupational hazard and consumer risk of zoonotic parasites, rearing and management mishaps in the livestock industry and encouraging awareness policies in Nigeria.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors' contributions	POO	HOJ	TOA
Research concept and design	✓	--	--
Collection and/or assembly of data	✓	✓	✓
Data analysis and interpretation	✓	✓	✓
Writing the article	✓	--	--
Critical revision of the article	--	✓	--
Final approval of article	✓	✓	✓
Statistical analysis	--	--	✓

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