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Original article

Prevalence of Haemoparasites in *Clarias gariepinus* (Burchell, 1822) obtained from different sales points in Ibadan, Southwest Nigeria

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ABSTRACT

This study examined the prevalence and diversity of haemoparasites of *Clarias gariepinus* (Burchell, 1822) from Ibadan, Southwest Nigeria. A total of four hundred and five (405) randomly selected fish were analysed, revealing an overall prevalence rate of 60(14.8%).The prevalence among males 32(15.7% male and 28(13.9%) female showed no significant difference (p>0,05). Four (4) genera of haemoparasites were identified, Leucocytozoan sp(13.3%), *Haemoproteus* sp (26.7%), *Plasmodium* sp (25.0%) and *Babesiosoma* sp (18.3%). Mixed infections were also observed *Haemoproteus-Plasmodium* sp (15.0%) and *Plasmodium* - *Babesiosoma*(1.7%). Males exhibited a higher rate of mixed infections (10.0%) than female (6.7%). The occurrence of individual haemoparasites varied between sexes but did not show significant differences. The study concludes that while the prevalence of haemoparasites in *C. gariepinus* is relatively low, continued surveillance is necessary. Monitoring fish blood parasites is essential, as infected fish may appear healthy despite potential physiological impacts

Keywords- Haemoparasites, *Clarias gariepinus*, prevalence, Blood, Scarcity

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INTRODUCTION

Haemoparasitic studies in aquatic animals are scarce (1). The most prominent among the piscine haemoparasite is *Trypanosoma* spp. which was first discovered in the blood of *Salmo trutta* (Valentin, 1841) and thereafter in diverse *Clarias* species across different parts of the world. Such parasites include *Trypanosoma mukasai* and *Trypanosome britskii* from Brazil (2), *Trypanosoma acanthobremae* in Iraq (3) and *Trypanosoma batrachi* in India (4). However it has also been reported in *C. gariepinus* according to Hassan *et al.* (1) and Smit *et al.* (5) while blood parasites

such as *Babesiosoma* had been reported according to Shahi *et al.* (6).

Among other haemoparasitic investigation, Bartha (7) has reported six of the species *Babesiosoma*, while Koledoye and Akinsanya (8) affirmed the presence of *Trypanosoma* in the blood of *Clarias gariepinus* with a prevalence of 21.2% in male, which contradicts a prevalence of 20.95% found in the female by Hassan *et al*. (1).

The infection symptoms are characterised by mild anaemia associated with a low level of parasitaemia to severe clinical pathological changes such as leukocytosis, hypoglycemia and hypocholesterolemia that are caused by heavy parasitic burden (9, 10).

The haemoflagellates prevalence in *C. gariepinus* and *Bagrus* spp were reported to be 50% by Paperna (11), however, Nico *et al*. (12) reported 43% and 79% prevalence in *Clarias gariepinus* and *Synodontis* spp respectively. A trend of 35.24% and 7.27% prevalence were found respectively in *Synodontis* spp and *Clarias gariepinus* for Trypanoasomes infection with male recording 14.29% and female with 20.95% infection rate in *S. clarias*, while in *C. gariepinus*, trypanosome infection was 6.67% and 0.61% in male and female respectively (Hassan *et al*. (1).

This varying prevalence may be centred on differential diet and habit, supporting similitude feeding characteristics of *Synodontis schall* exploring bottom habitat and *Synodontis clarias* with gut containing less plant debris compared to *Clarias gariepinus*, corroborating Bruton (13) which indicated that *Clarias gariepinus* did not consume intermediate hosts of heamoparasites which could have contributed to lower prevalence in the study.

Myxosporea, has been reported as protozoan parasite causing both histozoic and coelozoic infections in the tissue and internal cavities respectively in fish (11). Also *Plasmodium* spp were discovered in Carp (14), while Obiekezie and Okaema (15) discovered ten species of *Myxosporea* in cultured Tilapia. Additionally, Hassan *et al.* (1) found *Myxospora* spores in the blood of *Synodontis clarias* at a prevalence of 1.09% with 0.95% prevalence each in male and female hosts, although, Landberg (16) had earlier reported the presence of *Myxosporea* in *Clarias gariepinus*.

Shashi *et al.* (6) reported 68.12% prevalence of haemoparasites comprising 51.52% *Trypanosoma* species and 16.6% *Babesiosoma* spp. with clinical manifestation conditions such as reduction in red blood cell count, haemoglobin (Hb) and packed cell volume (PCV) in infected fish compared to non-infected fishes.

Haematological examination of fish is one of the standard methods commonly used to evaluate the fish's physiological status and health (17, 18). Also, investigating haematological parameters in fishes have been reported to be the best methods to predict the diseases in fish medicine (19) as well as to interpret the metabolic conditions and overall health of fish (20).

Due to paucity and fragmentary studies of haemoparasites on *Clarias gariepinus* in the study area, the aim of this study is to investigate the prevalence of haeomparasites in *C. gariepinus* in Ibadan Southwest Nigeria.

MATERIALS AND METHODS

Study area:

This study was conducted in Ibadan, the capital, and the most populous city of Oyo State, located in South-western Nigeria.

Ibadan is located on latitude of 7.37°N and longitude 3.94°E. It is cosmopolitan in nature, comprises heterogenous population of self-employed, corporate organization employed, as well as unemployed. The business types include governmental businesses, Private sectors and individual enterprises under which fish farming can be categorized. The estimated number of registered fish farms in Ibadan is not assertive as most exist at informal operation. The town has natural water bodies such as Eleiyele, Odo- Ona and Ogunpa rivers, also Asejire river that borders the town and neighbouring Osun state.

Fish markets as well as many retail outlets are numerous within Ibadan town. The fish sample collection sites for this study were Mashopa fish farms sales point at Alakia on latitude 8° 49′N and longitude 4° 39′E, Albarka fish sales point along Lagos - Ibadan express way on 7°.20′N, 3°51′E and Aquatec College of agricultural technology sales point, Ring Road on 7.34°N, 3.92°E. Others are fish farms estate sales outlet at Logudu Bembo, Apata Area on 7.38°N, 3.82°E and Lantiny fish farms, Omi Adio on 7.39°N, 3.75°E.

Collection of Fish Sample

Collection of fish samples were done using combination of careful hand pick protected by rubber hand gloves and fish net, this was done by random pick, the net use was to prevent rough handling of the fish and fall off the fish from hand, due to slippery nature of the fish as caused by the mucus contents of the skin. This precaution was due to the aggressiveness of *C. gariepinus*, and to avert soil contaminations in case the fish sample fall off.

Collected fish samples were carefully transferred into a black 50 litre plastic container with the fish habitat water (21). All fish samples were collected between the hours of 12:00 noon and 2^{o}clock during the afternoon sales. Varying number of matured and well identified *C. gariepinus* according to Olaosebikan and Raji (1998) was randomly selected per point of collection, totalling 405 fish samples collected in the study area.

Transportation of fish Specimens:

The fish were transferred with less agitation along with the water that accompanied it and later transferred into a 1,000L plastic holden tank with continuous supply of de-chlorinated water at the rate of 3-5 litres per minutes (23). The fish samples were allowed to rest for few hours, before the commencement of the haemoparasitic study.

Collection of fish blood:

This was done by dissection of the fish, firstly by placing a wet napkin on the fish head, with the dorsal side turned up and the gill chamber carefully opened to revealed the heart chamber that is still pumping, blood collection was done by heart puncture technique according to Konas *et al.* (24) into a well labelled Ethylene diamine tetra acetic acid (EDTA) bottle. After blood sample collection, the cap was replaced and the blood contents was shaken gradually and thoroughly before kept in a cooler containing ice pack, and transferred to the Laboratory of Veterinary pathology, University of Ibadan, for haemoparasitic analysis.

Parasitic examination of blood- This was done by preparing thin blood smears on clean glass slides, air dried, fixed in methyl alcohol for 3 to 5 minutes and stained with Giemsa stain for 30 to 45 minutes and

rinsed in buffered distilled water (25). These slides were observed using oil immersion objective (x100 magnification) of a compound microscope, and the identification of haemoparasites was done using morphologic characteristics as described by Soulsby (26).

RESULTS

Prevalence of Haemoparasitic infection in *Clarias gariepinus* in the study area

Sixty (60) (14.8%) out of the 405 *Clarias gariepinus* sampled were infected with haemoparasites. The highest infection was among the male fishes 32(15.7%), while the infection among female was 28(13.9%). The prevalence showed no significant difference between the male and female fish in terms of the infection ($p>0.05$) (Figure 1)

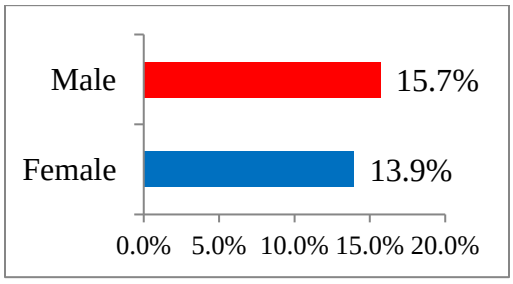

Figure 1: Prevalence of Haemoparasites among *Clarias gariepinus* in relation to Sex in Ibadan (p=0.619)

Diversity of haemoparasites among *Clarias gariepinus* in Ibadan

The diversity of the haemoparasites found were *Leucocytozoan* sp in eight fishes representing 13.3%, whereas another type, *Haemoproteus* sp were only recorded in 16 fishes (26.7%). The prevalence of *Plasmodium* sp was in 15 fishes (25.0%), while *Babesiosoma* sp was recorded in 11 fish samples representing 18.3%. Mixed haemoparasitic infections were found in 10 fishes. *Haemoproteus* sp and *Plasmodium* sp were recorded in nine fishes (15.0%), while Plasmodium sp and *Babesiosoma* sp were recorded one fish specimen representing 1.7%. The mixed infection was more in male fishes 6(10.0%) compared to females 4(6.7.0%).

While *Leucocytozoan* 8(25.0%) was only recorded in male fishes, *Haemoproteus* sp 9(28.1%) and 7(25.0%); *Plasmodium* sp 6(18.8%) and 9(32.1%), and *Babesiosoma* sp 4(12.5%) and 7(25.0%) were recorded in male and female fish respectively. The distribution of mixed haemoparasitic infections in the case of *Haemoproteus* and *Plasmodium* sp was recorded 4(12.5%) and 5(17.9%) in male and female fish respectively, while 1(3.1%) male was infected in with *Plasmodium* and *Babesiosoma* infection. Table (1).

Table1: Prevalence of haemoparasites among *Clarias gariepinus* in Ibadan

Number examined	Number infected	% infected	Number of male infected	% of male infected	Number of female infected	% of female infected	Diversity of haemoparasites			Prevalence of mixed infection %		Prevalence of haemoparasite %	
							Types of haemoparasites	Number of fish infected	% of Haemo-parasites	Male	Female	Male	female
405	60	14.8	32	15.7	28	13.9	*Leucocytozoan* sp	8	13.3	6 (10)	4 (6.7)	8(25.0)	-
							Haemopoteus sp	16	26.7			9(28.1)	7(25.0)
							Plasmodium sp	15	25.0			6(18.8)	9(32.1)
							Babesiosoma sp	11	18.3			4(12.5)	7(25.0)
							Haemoproteus sp *and* *Plasmodium* sp	9	15.0			4(12.5)	5(17.9)
							Plasmodium sp *and Babesiosoma* sp	1	1.67			1(3.1)	-
Total	60	14.8	32	15.7	28	13.9		60	14.8	6 (10)	4 (6.7)	32	28

DISCUSSION

Prevalence of Haemoparasites in relation to sex of *Clarias gariepinus* in the study

The study found that male *Clarias gariepinus* had a higher prevalence of haemoparasites compared to females both in single and mixed infections. This supports findings by Koledoye and Akinsanya (8) where male fish were more susceptible to parasitic infection than the female, but contrary Mohammed *et al.* (27) where haemoparasites infection in female fishes was higher than male.

The highest prevalence was found in *Haemoproteus* sp, followed by *Plasmodium* sp, the least was found in *Leucocytozoan* sp as single infection, The overall prevalence of haemoparasites was lower than reports in other studies such as those by Paperna (11) who reported 50% prevalence in lake Victoria and Nico *et al.*(12) in the proportion of 79% and 43% in *Synodontis* spp (upside down Catfish) and *Clarias gariepinus*.

The outcome recorded in this study is low compared to 35.24% of *Synodontis clarias* and higher than 7.27% in *Clarias gariepinus* in the study conducted by Hassan *et al.* (1) and lower compared to that of Koledoye and Akinsanya (8) with a prevalence of 19.1%.

The differences in parasite prevalence across studies may be due to the availability of some intermediate host, such as leeches (Hirudo) which are vector for *Trypanosoma* infections as found in Hassan *et al.* (1) investigation. The scarcity of haemoparasitic studies on *Clarias gariepinus* further affirmed its scarcity and diversity supporting according to Konas *et al.* (24)

Variations in the biotic environment may have contributed to the low prevalence of haemoparasites in this study compared to other investigation with high prevalence. This support the outcome of Adamu (28) in Sokoto with an overall prevalence of 6.37%

while male prevalence recorded was 2.73% against 3.63% among female fishes. This could also account for dissimilarities found across various studies

Four haemoparasites species were detected, these include *Haemoproteus* sp (most prevalent), *Plasmodium* sp, *Leucocytozoan* sp (least prevalent), *Babesiosoma* sp (found in mixed infections). Mixed infections included *Haemoproteus- Plasmodium* and *Plasmodium- Babesiosoma* which were observed only in male fish.

This study found a different haemoparasite composition compared to Alhayali *et al.* (29) where *Trypanosoma* (32%), *Babesiosoma* (16%) and *Haemogregarina* (18%) were recorded, while the absence of *Trypanosoma* here contrasts Hussein *et al.* (30) with variable prevalence in fish species.

This study is the first to report both *Leucocytozoan* sp and *Plasmodium* sp in the blood of *C. gariepinus*, although *Plasmodium* sp had been reported in Carp (14). This could be possible due to when infected black fly and mosquito respectively bite *C. gariepinus* during manual grading of fish prior to harvest in the bid to reduce cannibalism when likely the fish may be left out of water or temporarily swim out of water and later swim back. In both cases, *C. gariepinus* may serve as accidental host, rather than the existence of natural host- parasite relationship since the introductory pathway is not yet known

The existence of *Babesiosoma* sp in this study is like the outcome of Ali *et al.* (31) where same parasite type was found in *C. gariepinus*. This also established the presence of leech as a vector for transmission of *Babesiosoma* sp. However, the presence of amphibians are not exception in the vicinity of fish ponds playing complimentary roles to cause babesiosis in fish

The genus *Plasmodium, Haemoproteus* and *Leucocytozoan* represent a group of vectors- borne blood parasite causing a malaria-like diseases in birds (32), though the prevalence varies in host species, while Culicidae transmit mainly *Plasmodium* sp and *Haemoproteus* sp, *Leucocytozoan* sp is transmitted by (Simulidae) black flies and biting midges

Parasites of genus Leucocytozoan are distributed worldwide and occur in a broad range of host species (32), and it is likely both numerous wild birds which is the intermediate host and black fly which is the vector may both abide the vicinity of the fish pond, especially if the pond water possesses the characteristics of fast flowing nature to assist the breeding of the black flies as reported by Ya'cob *et al.* (34).

The low prevalence of haemoparasites in the study is due to the absence of parasites intermediate host. The diversity of haemoparasite in *C. gariepinus* remained understudied, requiring further research. Haematological studies are crucial for assessing fish health, as blood serves as a key bio-indicator of physiological status and potential disease. Thus needed for proper evaluation of the physiological status of the fish (35).Even fish that appear healthy may harbour haemoparasitic infections, underscoring the importance of continuous surveillance.

CONCLUSION

The study revealed four types of haemoparasites with overall low prevalence, despite this, it is suggested that continual studies of haemoparasitism of *Clarias gariepinus* should be encouraged as

a vital tool for the sustainability of *Clarias gariepinus* production and considering the importance in good health maintenance of its consumers and other allied usages, though often diseased fish may look healthier without observable clinical manifestation. Further study would also give insight into the environmental friendliness to culturing of fish, prevention of other parasitic infections through related intermediate hosts, the suitability of proper attempts to fish medicine and abuse of water bodies as sources of waste discharge.

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