



COMPARATIVE EFFICACY OF ANTHELMINTHIC INTERVENTION DRUGS AMONG SCHOOL AGED CHILDREN IN GIREI LOCAL GOVERNMENT OF ADAMAWA STATE



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Received: September 21, 2022 Accepted: November 12, 2022

Abstract:

In Girei Local Government, a study is being carried out to determine and compare the efficacy of different anthelmintics (Albendazole and Levamisole) against intestinal helminths in naturally infected school-aged children. The study compared cure rates (CR) and egg reduction rates (ERR) for *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm infections using disintegration and dissolving testing as well as a randomized clinical trial. About 180 school-aged children were placed into two intervention groups, each with 90 children: the first was given albendazole and the second was given levamisole. Faecal samples are taken on day 0 prior to therapy and on day 7 following treatment. The Faecal Egg Count Reduction Test (FECRT) and cure rates are used to test the efficacy of each anthelmintic. Albendazole (94.4 percent) was much more effective against *A. lumbricoides*. Albendazole had a greater CR than levamisole (80.5%), but an ERR of 74.4 percent compared to 69.9% for those treated with levamisole. Albendazole has a substantially lesser effect on *T. trichiura* (CR 47 percent, ERR 42.4 percent). Albendazole outperformed Levamisole in *A. lumbricoides* and *T. trichiura* co-infections (CR 52.7 percent, ERR 71.9 percent), while Levamisole outperformed Albendazole in *T. trichiura* and hookworm co-infections (CR 50.0 percent, ERR 67.5 percent). The study found that albendazole was more successful than levamisole in treating *Ascaris* and hookworm, but that it was less effective in treating *T. trichiura*. The efficacy of various anthelmintics (Albendazole and Levamisole) against intestinal helminths in naturally infected schoolchildren is being investigated. It is therefore recommended, that Albendazole drugs should be used in the treatment of *Ascaris* and hookworm for both single and double infections while levamisole be used treatment and deworming of *T. trichiura* respectively.

Keywords: Anthelmintics, intestinal helminths, Albendazole, Levamisole, *A. lumbricoides*, Hookworm and *T. Trichiuris*.

Introduction

Intestinal helminths, also known as geo-helminths, are nematodes that are commonly mistaken for intestinal worms. Intestinal helminths are a type of parasitic nematode that infect humans when they come into touch with parasite eggs or larvae. Before becoming infective, immature stages (eggs) must be incubated in the soil. Humans are most commonly affected by ingesting infective geo-helminths from soil, raw fruits and vegetables, or filthy hands. Roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), threadworms (*Strongyloides stercoralis*), and hookworms are among them (e.g. *Ancylostoma duodenale* and *Necator americanus*) (Bethony et al. 2006).

They are especially common in areas with warm, humid temperatures, as well as poor sanitation and hygiene. In terms of epidemiology, it is well recognized that while people of all ages harbor worms, children in rural areas of tropical and subtropical areas have the highest prevalence (Bethony et al., 2006). Behavioral factors are another key risk factor for increased intestinal helminth infection in children. Children are generally quite active, playing unsupervised with the earth and other items in their environment. Because of the high prevalence of helminthic infection in school-aged children, this subgroup is a strong target for helminth control programs in the general population, and schools provide good possibilities for control program implementation (Ojurongbe, 2014).

Anemia, diarrhea, poor physical condition, bottle jaw, and even mortality are common clinical indications of this infection, especially in children. To address some of these issues, it's critical to keep track of the efficacy of regularly prescribed anthelmintics and take corrective action when any fall short of expectations (Olaniran et al., 2015).

To determine the efficacy of deworming medications (albendazole and levamisole) utilized by the Girei local area. To examine the efficacy of albendazole and levamisole in the treatment of infections caused by *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms, a randomized single-blind trial was conducted in school-aged children in Girei local government. In this publication, the results of the efficacy trial are contrasted and analyzed.

Materials and Methods

Sample collection

Between March and June 2021, 384 school-aged children were checked for intestinal helminths in six primary schools in Girei local government (Table 4.1), with 46.1 percent of the children being male and 53.9 percent being female. The helminthic infection was found in 183 (47.6%) of the children. The overall prevalence of helminths among the study pupils was 47.7% (183 out of 384), with the highest prevalence (10.2%) among pupils in Lamido Lawal primary schools and the lowest prevalence (5.2%) among pupils in Bakalchi primary schools.

Efficacy trial

We tested the efficacy of Albendazole and Levamisole in a school-based, randomized, single-blind experiment. The research was conducted among primary school pupils in the Girei Local Government. The schools were chosen because to a high frequency of intestinal helminth infection, relative ease of access to nearby villages, and security concerns. Children eligible to participate in the experiment were visited at their schools one day before the scheduled treatment date, and their parents or guardians were given a consent explanatory letter in the local language. They were also given a container to put a fresh feces sample in the next day. On collecting day, the field team went to each school and enrolled the students who were eligible. Pre-packaged albendazole and levamisole tablets were sealed in opaque envelopes.

After excluding 384 primary students, we discovered 183 with helminthiasis based on stool examination, three of whom had begun therapy prior to the trial. They were given the medicine under strict monitoring. Children were randomly assigned to one of two groups: albendazole 400 mg/200 mg (Group A) or levamisole 80/40 mg (Group B). If a child was too sick (e.g., severe diarrhoea, severe anemia, high fever), did not have parental/guardian consent to participate, or did not give a stool sample, they were not allowed to participate in the experiment. Stool samples were taken to the field lab and analyzed the same day using the Kato Katz technique to determine the prevalence and severity of *A. lumbricoides*, *T. trichiura*, and hookworm infections using WHO criteria (WHO, 1994).

In order to assess the accuracy of the diagnosis and the precision of the egg counts, a random sample of 10% of the Kato-Katz smears were read in duplicate by two independent technicians. If the readings revealed a variation in egg count of more than 10%, the slides were re-examined. A new smear was prepared and examined independently by two technicians in the instance of hookworm. All children who were checked at baseline and tested positive for intestinal helminth infections were re-visited seven days following treatment, and another stool sample was taken. Children who did not produce a stool sample were contacted the following day. Children who failed to produce a stool sample were followed up the next day.

Statistical analysis

SPSS 26 was used to enter and analyze the data. In both treatment groups, egg counts before and after treatment allowed for the computation of cure rate (CR) and egg reduction rate (ERR), the study's key end points. The proportion of children with egg counts >0 before treatment who were cured after therapy was used to compute CR. The ERR was computed as the percentage of mean egg counts that were lowered as a result of the treatment. Chi square test were carried to determine association at the 5% level. Helminth infections were categorized into intensity groups to represent the distribution of egg counts in the study.

Ethical considerations

The National Agency for Food and Drug Administration Control (NAFDAC), approved the drug goods for marketing in this work. In the study's population, these products were utilized by certified health practitioners for their recognized indications. Field teams were given the task of gathering data

on adverse events that occurred in treated children. The trial's goal was described to parents or guardians of children who were eligible to participate via a written consent form by the head teacher, and any questions were answered by the study team. Prior to their children's enrollment, parents and guardians gave their consent. Children who were still infected at the end of the study were given extra anthelmintic therapy. Feedback an official report was distributed to all study participants and MoH personnel. In Adamawa state, ethical clearance was requested and gained from the Ministry of Health.

Results and Discussions

Subjects with a single *A. lumbricoides* infection included 36 children (50.7%) in the Albendazole group, 35 students (49.2%) in the Levamisole group and 26 children (50.9%) in the first group and 25 children (49.01%) in the second group. Single *T. trichiura* infection affected 17 children (45.7%) in the first group, 19 children (51.3%) in the second group, and double infection AL+HW affected 5 children (45.4%) in the first group, 6 children (54.5%) in the second group, AL+TT double infection affected 2 children (40%) in the first group, 3 children (60%) in the second group, and TT+ HW double infection affected 2 children (66.6%) in the second group.

Assessment of anthelmintic drugs based on cure rate after day 7 of pre and post treatment regimen against single/double infections**Drug efficacy against *Ascaris lumbricoides***

the two anthelmintic medications Albendazole was found to be significantly superior in a lumbricoides study (all $P < 0.05$). The estimated average cure rates for albendazole were 94.4 percent and for levamisole were 80.5 percent, with significant disparities between the two therapies in the one-to-one comparison. All four treatments had considerably higher rates ($P > 0.05$), however there were no significant variations between the rates. Albendazole is clearly more successful than levamisole in treating of ascaris lumbricoides.

Drug efficacy against hookworm

Albendazole had a cure rate of 52.7 percent when used to estimate medication efficacy against hookworm (table 4.2). The levamisole rate is 50.0 percent, which is substantially higher than the albendazole rate ($P < 0.05$). This finding suggests that the albendazole drug regimen is more effective than levamisole in treating hookworm infections, despite the fact that both are efficacious.

Drug efficacy against *T. trichiura*

Albendazole had a cure rate of 47 percent, which was much lower than the cure rates of levamisole (78.9 percent). With estimated cure rates of (78.9%; $P > 0.05$), Levamisole was shown to be substantially more effective than Albendazole. When we compared the rates of the two therapies one to one, we found no significant differences.

Drug efficacy against double helminthic infections

The estimated average cure rates for the double helminthic AL+HW infection were 75% for albendazole and 25% for levamisole in a one-to-one comparison, with substantial differences between the two therapies. The estimated average cure rates for the double helminthic AL+TT

infection were 90% for albendazole and 90% for levamisole in a one-to-one comparison, with no significant differences between the two therapies. The estimated average cure rates for the double helminthic TT+HW infection were 100 percent for albendazole and 100 percent for levamisole in a one-to-one comparison. The rates of all treatments were

significantly higher ($P < 0.05$). Both albendazole and levamisole reduced the mean intensity of eggs by a significant amount. As a result, it is obvious that albendazole is more efficacious than levamisole in treating various helminthic double infections.

Table 1: The Cure Rate of single and double Helminthiasis infection

Parasite(s)	Treatment	Recovery				P
		Cured		Not Cured		
		n	%	n	%	
A. lumbricoides	Albendazole	34	94.4	2	5.6	0.0176
	Levamisole	29	80.5	7	2.5	
Hookworm	Albendazole	19	52.7	9	47.3	0.031
	Levamisole	18	50.0	11	50	
T. trichiura	Albendazole	9	47	10	53	0.023
	Levamisole	15	78.9	3	21	
AL+HW	Albendazole	3	75	1	25	0.0015
	Levamisole	1	25	3	75	
AL+TT	Albendazole	1	90	1	90	0.043
	Levamisole	1	90	1	90	
TT+HW	Albendazole	1	100	1	90	0.042
	Levamisole	1	100	-	-	

Key: AL=Ascaris lumbricoides HW=Hookworm, TT= Trichuris Trichiura

Assessment of anthelmintic drugs based on egg reduction rate of pre and post treatment regimen

After a seven-day treatment with albendazole and levamisole, the egg reduction rates for A. lumbricoides, hookworm, and T. Trichiura infections, as well as their coinfections, are shown in Table 4.2. For A. lumbricoides, patients who got albendazole had an egg reduction rate of 74.40 percent, whereas those who received levamisole had an egg reduction rate of 69.9 percent. The egg reduction rate for hookworm was 71.9 percent with albendazole and 67.5 percent with levamisole. The egg reduction rates for T.

Trichiura were 42.4 percent for albendazole and 55.7 percent for levamisole. The egg reduction rates for Ascaris lumbricoides and hookworm were 63.4 percent for albendazole treatment and 60.1 percent for levamisole treatment with coinfection. The ERR for A. lumbricoides and T.trichiuria treatment with albendazole was 75.9% and 74.8 percent, respectively. In addition, Albendazole was more successful than levamisole in treating A. lumbricoides and hookworm infections, but less effective in treating T. Trichiura infections, according to the findings.

Table 2. ERR for pre and post treatment regimen after day 7 intervention

Parasites	Anthelmintic regimen	Pre-treatment	Post-treatment	Egg Reduction	P-Value
A. <i>lumbricoides</i>	Albendazole	25.7±5.88	6.58±1.79	74.40%	0.9405
	Levamisole	28.05±1.9	8.51±1.21	69.66%	
Hookworm	Albendazole	25.30±2.24	7.09±3.75	71.98%	0.9455
	Levamisole	29.51±5.01	9.58±1.5	67.57%	
<i>T. trichiuria</i>	Albendazole	28.94±6.26	16.66±3.59	42.43%	0.8511
	Levamisole	23.86±1.72	10.57±3.86	55.70%	
AL+HW	Albendazole	27±7.01	9.86±2.01	63.48%	0.961
	Levamisole	29.74±7.11	11.86±3.18	60.12%	
AL+TT	Albendazole	26.52±5.95	6.37±1.73	75.98%	0.9849
	Levamisole	27.37±2.43	6.89±1.44	74.83%	
TT+HW	Albendazole	28.17±6.5	7.41±2.47	73.70%	0.963
	Levamisole	23.22±4.44	6.79±2.42	70.76%	

Key: AL=ascaris lumbricoides, HW=hookworm, TT= TrichisTrichiuria

Discussion

Cure rates and egg reduction rates are used to determine the ERR of hookworm and Efficacy of anthelmintic medications. The comparison was done qualitatively since both criteria must be taken into account in comparisons of medication efficacy for each helminth species. We discovered no significant differences in efficacy against *A. lumbricoides* and all medications were highly effective, with Albendazole marginally outperforming levamisole. When taken in single oral doses, albendazole demonstrated the most efficacy for treating hookworm infections, with significantly greater cure rates. Levamisole demonstrated the highest, but only moderate, efficacy against *T. trichiura* infections, with significantly greater egg reduction rates than albendazole. Levamisole's cure rate was different from Albendazole's.

Levamisole's cure rate was different from Albendazole's. Albendazole, the most commonly used anthelmintic medication for *A. lumbricoides* and *hookworm*, is extremely effective in terms of both cure and egg reduction rates. In 2015, the World Health Organization (WHO) provided around 134 million doses (WHO, 2016). It has a good efficacy against *A. lumbricoides* and a high hookworm activity. Levamisole has a strong anti-*A. lumbricoides* efficacy and a modest anti-hookworm efficacy. The Albendazole medicines' limitation is their limited efficacy against *T. trichiura*, for which levamisole performed best. This data highlights the urgent need for novel anti-*T. trichiura* medicines with improved efficacy in preventive chemotherapy programs.

The comparative efficiency of the two medications against different worms revealed that albendazole had a high efficacy rate across both worms. This finding is consistent

with the findings of (Ekenjoku, Oringange, and Meremikwu 2013), who found that albendazole is extremely effective against common nematodes, with stronger activity against ascaris than hookworm.

The efficacy of anthelmintic medications is determined by cure rates and egg reduction rates (Moser and schindler 2016), and because both criteria must be considered, a comparison of the efficacy of the drugs for each helminth species was conducted. We found a substantial difference against *lumbricoides*, and all medicines showed great efficacy, with albendazole marginally outperforming levamisole in terms of cure rate and egg.

This research supports the findings of another study (Naomi Sahun Kinley, Yingxi, Archie clement *et al.*, 2019). According to the researchers, all medications are ineffective against *trichuris trichura*, with levamisole having the highest cure rate (42.0%) and egg reduction rate (66.0%). Albendazole had a higher cure rate and egg reduction rate against *A. lumbricoides* and *hookworm* in this investigation than levamisole. This is correct (Olsen, 2007). Who is highly effective against *A. lumbricoides* and *hookworm* infections, but less effective against *trichuris trichura* and *S. stercoralis* infections? This is also in line with (Moser et al., 2017), who found that albendazole is more effective than levamisole in treating *A. lumbricoides* and *hookworm* infections, as well as levamisole in treating *trichuris trichura* infections.

In this study, albendazole showed a better cure rate and egg reduction rate in both *A. lumbricoides* and *hookworm* (A1+HW) infections, although levamisole showed the similar results in *A. lumbricoides* + *T. trichura* and *T. trichura* infections. This may be due to the findings of (Naomi, et al., 2019) on the efficacy of Anthelmintic medications and drug combinations against helminthiasis, which indicated severe drug combinations with better

efficacy than single dose albendazole against *T. trichura* without compromising efficacy. The development of novel medications for the treatment of helminths, especially in the event of resistance, is critical for helminth control in the future.

Conclusion

The results of this investigation revealed that *A.lumbricoides*, *T.trichiura*, and hookworms are among the soil-transmitted helminth parasite species discovered in the study area. The efficacy of two antihelminthic medications, albendazole and levamisole, against the three helminthic infections studied was also investigated. The results show that albendazole is more effective in treating *Ascaris* and hookworm infections, although levamisole has a good effect on *T trichiura*, as evidenced by cure and egg reduction rates. Given the high incidence of these illnesses in the area, techniques for educating people about the mode of transmission and prevention methods, as well as a chemotherapeutic approach, should be used to halt transmission and eradicate the infection.

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