

## Preplanned Studies

## Investigation on the Management for Patients with Echinococcosis Treated with Albendazole — Three PLADs, China, 2019

Min Qin<sup>1</sup>; Liying Wang<sup>1,2,3,6</sup>; Ying Wang<sup>1</sup>; Xu Wang<sup>1</sup>; Jiayi Lei<sup>1</sup>; Xixi Cheng<sup>1</sup>; Yu Feng<sup>4</sup>; Yanyan Hou<sup>5</sup>; Qian Wang<sup>6</sup>; Chuizhao Xue<sup>1</sup>; Laurent Gavotte<sup>2</sup>; Roger Frutos<sup>3</sup>

### Summary

#### What is already known about this topic?

In China, patients with echinococcosis receive complimentary healthcare services, such as medical treatment, diagnostic examinations, and follow-up care. Despite this, no studies have been conducted to assess the quality of patient management to date.

#### What is added by this report?

This study reviewed the medical records of 899 patients who underwent albendazole treatment across 10 endemic counties. Out of 634 evaluable patient files, the proportion of patients with a ratio of actual follow-up and reexamination times to theoretical follow-up and reexamination times  $\geq 0.8$  were both low (21.92% and 23.19%, respectively).

#### What are the implications for public health practices?

This study identified weaknesses and specific issues in patient management and proposed feasible recommendations to enhance patient file documentation, follow-up, and reexamination.

Echinococcosis is a parasitic disease that poses a significant threat to human health and constitutes a global public health concern (1). Medication serves as one of the primary treatments, with albendazole considered the first-line drug (2–3). Present evidence indicates that Chinese mainland experiences the highest prevalence of echinococcosis (4). To alleviate the economic burden on patients and enhance treatment efficacy, China initiated “The National Project for Echinococcosis Control and Prevention” in 2008, offering free albendazole for patients undergoing medical treatment and mandating regular patient management. This study examined and investigated 899 patient files of individuals receiving and having received albendazole treatment, registered at the CDC across 10 endemic counties in Sichuan, Gansu, and

Xinjiang provincial-level administrative divisions (PLADs) in 2019. The objective was to evaluate patient management quality, identify issues, and recommend viable strategies and measures. Among 634 assessable patient files, 71.60% of patients demonstrated a ratio of actual follow-up times to theoretical times below 0.8, and 71.46% of patients exhibited a ratio of actual reexamination times to theoretical times below 0.8. The proportion of individuals with a ratio of actual follow-up times to theoretical times decreased as the duration of albendazole treatment increased ( $\chi^2=229.394$ ,  $P<0.001$ ), as did reexamination rates ( $\chi^2=195.144$ ,  $P<0.001$ ). These findings suggest that relevant authorities should focus on improving the quality of patient management.

According to “The National Project for Echinococcosis Control and Prevention,” the CDC is responsible for establishing patient files upon initial diagnosis of echinococcosis. These files should include basic personal information, disease characteristics, and the date of initial diagnosis. Furthermore, it is mandated to record all follow-ups and reexaminations during the treatment period. Based on these findings, the therapeutic effects are evaluated, and the medical treatment plan may be adjusted as necessary (5). Follow-up assessments are conducted every three months to monitor patient medication adherence and to encourage corresponding reexaminations. Additionally, imaging reexaminations for patients undergoing albendazole treatment are recommended every six months.

In this study, we randomly selected 10 endemic counties in 2019 to examine the treatment of patients with relatively complete patient files. The selected counties included Daofu County, Ganzi County, and Ruorgai County in Sichuan Province; Huining County, Tianzhu County, Zhang County, and Maqu County in Gansu Province; and Gaochang District,

Jimusar County, and Fukang City in Xinjiang Uygur Autonomous Region. We employed cluster sampling to investigate all patients treated with albendazole in these endemic counties. Data were collected from patient files, including administrative entry dates, actual follow-up occurrences, imaging reexaminations, and the duration of albendazole therapy.

The duration of albendazole therapy was calculated in months based on administrative entry dates and investigation dates. Durations of less than 15 days were excluded from the analysis. Due to missing mandatory data (e.g., administrative entry dates), we were unable to calculate the duration of albendazole therapy for some patients. Theoretical follow-up occurrences were computed based on follow-up frequency every three months. To evaluate follow-up, we calculated the ratio of actual to theoretical follow-up occurrences ( $R_f$ ). The assessment of imaging reexaminations was calculated similarly by determining  $R_r$ . Additionally, we calculated the ratio of the actual duration of albendazole therapy to the recommended duration of therapy ( $R_m$ ).

For statistical analysis, we utilized Epidata (version 3.1, EpiData Association, Odense, Denmark) and SPSS (version 22.0, IBM Corporation, Armonk, US).

In this study, a total of 899 patients from 10 endemic counties received albendazole treatment. The integrity of each patient file was assessed during the evaluation process. Out of the 899 patient files, 265 (29.48%) were found to have missing mandatory information and were consequently excluded from statistical analysis. Ultimately, 634 valid patient files (70.52%) were considered for further examination in this research.

Among the 634 files analyzed, 41 were found to be without follow-up records, resulting in a follow-up rate of 93.53% (593/634). The majority of  $R_f$  values fell within the range of  $0.3 \leq R_f < 0.5$ , accounting for 35.17%, followed by the range  $0.5 \leq R_f < 0.8$ , accounting for 25.55%. Only 21.92% of patients had  $R_f$  values  $\geq 0.8$ . When stratified according to the theoretical duration of albendazole treatment,  $R_f$  values  $\geq 0.8$  were observed in 95.24% (20/21), 88.00% (44/50), 69.39% (34/49), 12.75% (26/204), 5.12% (15/293), and 0 (0/17) of patients for those treated with albendazole for less than 1 year, 1–2 years, 3–4 years, 5–6 years, 7–9 years, and  $\geq 10$  years, respectively. The proportion of patients with  $R_f$  values  $\geq 0.8$  significantly decreased as the duration of albendazole treatment increased ( $\chi^2_{trend} = 229.394$ ,  $P < 0.001$ ) (Table 1). The recorded rate of reexamination was 94.64% (600/634). The  $R_r$

was mainly concentrated  $0.3 \leq R_r < 0.5$ , accounting for 41.17%, and  $0.5 \leq R_r < 0.8$ , accounting for 21.61%. Only 23.19% of patients had  $R_r \geq 0.8$ . Among patients taking albendazole for less than 1 year, 1–2 years, 3–4 years, 5–6 years, 7–9 years, and  $\geq 10$  years, the percentages of patients with  $R_r \geq 0.8$  were 100.00% (21/21), 84.00% (42/50), 57.14% (28/49), 10.78% (22/204), 11.26% (33/293), and 5.88% (1/17), respectively. As the treatment duration increased, the proportion of patients with  $R_r \geq 0.8$  significantly decreased ( $\chi^2_{trend} = 195.144$ ,  $P < 0.001$ ) (Table 1).

Among 593 patients with follow-up records, 65.94% (91/138) of patients with  $R_f \geq 0.8$  had the  $R_m \geq 0.8$ , which was significantly higher than that of patients with other ratios ( $\chi^2 = 281.745$ ,  $P < 0.001$ ) (Table 2). For reexamination, 87.05% (121/139) of the patients with  $R_f \geq 0.8$  had the  $R_r \geq 0.8$ , which was significantly higher than that of patients with other ratios ( $\chi^2 = 825.136$ ,  $P < 0.001$ ) (Table 3).

## DISCUSSION

Since the initiation of “The National Project for Echinococcosis Control and Prevention,” China has invested significant funds in treating and curing patients with echinococcosis. However, the present study revealed that there are serious issues in the management of this patient population, which may considerably impact the effectiveness of echinococcosis prevention and treatment in China.

The data were incomplete, with invalid or empty files containing only the patient’s name. Most counties continue to use a paper-based record management system, which proves to be inefficient and inconvenient for real-time access. For patients with incomplete records, it becomes impossible to determine whether they are being appropriately monitored and supervised, thereby revealing gaps in the management efforts. Indeed, comprehensive patient records can reflect the quality of patient management and evaluate their treatment outcomes.

The ratio of actual follow-up and reexamination times to theoretical follow-up and reexamination times was higher in cases involving early medication. However, this study found that the follow-up and reexamination ratio decreased as the duration of patients’ medication increased. This observation suggests that not only do patients neglect their condition, but also the relevant follow-up personnel may disregard their management responsibilities or fail to record pertinent information due to oversight.

TABLE 1. Number and percentage (%) of echinococcosis patients treated with albendazole, stratified by duration of therapy, across ten endemic counties in 2019.

Duration of albendazole therapy (year)	Total (N)	Follow-up (N, %)					Reexamination (N, %)				
		R <sub>f</sub> <0.3	0.3≤R <sub>f</sub> <0.5	0.5≤R <sub>f</sub> <0.8	R <sub>f</sub> ≥0.8	Unrecorded	R<0.3	0.3≤R <sub>r</sub> <0.5	0.5≤R <sub>r</sub> <0.8	R <sub>r</sub> ≥0.8	Unrecorded
<1	21	0 (0.00)	0 (0.00)	1 (4.76)	20 (95.24)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	21 (100.00)	0 (0.00)
1–	50	0 (0.00)	0 (0.00)	4 (8.00)	44 (88.00)	2 (2.00)	0 (0.00)	1 (2.00)	4 (8.00)	42 (84.00)	3 (6.00)
3–	49	0 (0.00)	4 (8.16)	7 (14.29)	34 (69.39)	4 (8.16)	3 (6.12)	4 (8.16)	10 (20.41)	28 (57.14)	4 (8.16)
5–	204	35 (17.16)	76 (37.25)	56 (27.45)	26 (12.75)	11 (5.39)	14 (6.86)	99 (48.53)	59 (28.92)	22 (10.78)	10 (4.90)
7–	293	28 (9.56)	135 (46.08)	94 (32.08)	15 (5.12)	21 (7.17)	22 (7.51)	157 (53.58)	64 (21.84)	33 (11.26)	17 (5.80)
≥10	17	6 (35.29)	8 (47.06)	0 (0.00)	0 (0.00)	3 (17.65)	16 (94.12)	0 (0.00)	0 (0.00)	1 (5.88)	0 (0.00)
Total	634	69 (10.88)	223 (35.17)	162 (25.55)	139 (21.92)	41 (6.47)	55 (8.68)	261 (41.17)	137 (21.61)	147 (23.19)	34 (5.36)
χ <sup>2</sup>				229.394						195.144	
P-value*				<0.001						<0.001	

Note: N represents the total number of patients.  
Abbreviation: CI=confidence interval; R<sub>f</sub>=the ratio of actual to theoretical follow-up occurrences; R<sub>r</sub>=the ratio of actual to theoretical reexamination occurrences.  
\* P-values were compared at a significance level of 0.05.

TABLE 2. Follow-up and medication analysis for echinococcosis patients treated with albendazole in ten endemic counties, 2019.

Follow-up	Total		Medication (N, %, 95% CI)					χ <sup>2</sup>	P*
	(N)	R <sub>m</sub> =0	0<R <sub>m</sub> <0.3	0.3≤R <sub>m</sub> <0.5	0.5≤R <sub>m</sub> <0.8	R <sub>m</sub> ≥0.8	Unrecorded		
R <sub>f</sub> <0.3	69	8 (12.50, 4.17–20.83)	27 (42.19, 29.75–54.62)	23 (35.94, 23.86–48.02)	6 (9.38, 2.04–16.71)	0	5		
0.3≤R <sub>f</sub> <0.5	223	15 (8.29, 4.23–12.34)	35 (19.34, 13.53–25.15)	63 (34.81, 27.80–41.81)	60 (33.15, 26.23–40.07)	8 (4.42, 1.40–7.44)	42		
0.5≤R <sub>f</sub> <0.8	162	21 (13.13, 7.84–18.41)	15 (9.38, 4.81–13.94)	42 (26.25, 19.36–33.14)	53 (33.13, 25.75–40.50)	29 (18.13, 12.09–24.16)	2	281.745	<0.001
R <sub>f</sub> ≥0.8	139	0	0	2 (1.45, 0.57–3.47)	45 (32.61, 24.69–40.53)	91 (65.94, 57.94–73.95)	1		
Total	593	44 (8.10, 5.80–10.41)	77 (14.18, 11.24–17.12)	130 (23.94, 20.34–27.54)	164 (30.20, 26.33–34.08)	128 (23.57, 19.99–27.15)	50		

Note: N represents the total number of patients. "Unrecorded" indicates a lack of medication records with corresponding follow-up data. Chi-square tests were utilized to determine the significance levels across varying ratio distributions.  
Abbreviation: CI=confidence interval; R<sub>f</sub>=the ratio of actual to theoretical follow-up occurrences; R<sub>m</sub>=the ratio of the actual duration of albendazole therapy to the recommended duration of therapy.  
\* P-values were compared at the 0.05 significance level.

TABLE 3. Analysis of Follow-up and reexamination for echinococcosis patients treated with albendazole in 10 endemic counties, 2019.

Follow-up	Total (N)	Reexamination (N, %, 95% CI)			Unrecorded	$\chi^2$	P*
		$R_f < 0.3$	$0.3 \leq R_f < 0.5$	$0.5 \leq R_f < 0.8$			
$R_f < 0.3$	69	29 (42.65, 30.59–54.71)	39 (57.35, 45.29–69.41)	0	1		
$0.3 \leq R_f < 0.5$	223	22 (10.50, 6.03–14.06)	191 (87.21, 82.76–91.67)	5 (2.28, 0.29–4.28)	4		
$0.5 \leq R_f < 0.8$	162	4 (2.50, 0.05–4.95)	22 (13.75, 8.36–19.14)	115 (71.88, 64.83–78.92)	2	825.136	<0.001
$R_f \geq 0.8$	139	0	1 (0.72, 0.07–2.14)	17 (12.23, 6.72–17.74)	0		
Total	593	55 (9.39, 7.02–11.75)	253 (43.17, 39.15–47.20)	137 (23.38, 19.94–26.82)	141 (24.06, 20.59–27.53)		

Note: N represents the total number of patients. "Unrecorded" indicates the absence of reexamination and follow-up records. Chi-square tests were utilized to determine the significance levels among various ratio distributions.

Abbreviation: CI=confidence interval;  $R_f$ =the ratio of actual to theoretical follow-up occurrences;  $R_r$ =the ratio of actual to theoretical reexamination occurrences.

\* P-values were compared at the 0.05 significance level.

The inadequate follow-up and reexamination information makes it challenging to assess medication compliance, current disease and health status, and accurately evaluate treatment outcomes. This issue, while easily overlooked, necessitates proper attention. Reexamination serves the purpose of understanding therapeutic effects and preventing recurrence (5–7). Although the records indicate that patients taking albendazole for extended periods are still undergoing treatment, their follow-up and reexamination numbers fall significantly below the requirements. As a result, it remains unclear whether these patients are adhering to their medication regimen and what the treatment outcomes are.

This study revealed poor patient compliance with medication, indicating that these problems require urgent attention and resolution.

We conducted a comparison of the limited research available on the management of patients with echinococcosis (8–9). A consistent challenge identified in these studies is the long-term follow-up of patients treated with albendazole for echinococcosis, as few individuals consistently undergo regular reexaminations.

This study was subject to certain limitations. The results were primarily based on patient medical records, potentially introducing information bias. We propose the following recommendations to address these issues:

1) Patients with incomplete records or insufficient follow-up should be thoroughly investigated to determine their current status, medication usage, and potential loss to follow-up. If lost, try reconnecting with them through village leaders and schedule re-examinations. Adjust treatment plans to the development of their lesions and establish regular management records.

2) Improve the training of follow-up personnel to enhance awareness of echinococcosis and their professional competence, ensuring no patients are overlooked during follow-up. Our findings indicate that patients with a high follow-up ratio ( $R_f \geq 0.8$ ) demonstrated better medication and re-examination compliance, emphasizing the importance of regular follow-ups.

3) Develop a unified national scheme and implementation rules for file records to address incomplete patient medical records. We also recommend establishing a standardized electronic information platform for echinococcosis patient management to enable real-time data entry, online

verification, and patient information supervision.

4) Improve patients' accessibility to re-examinations by providing portable B-ultrasound examination instruments in local township health centers or village clinics, and train medical staff to use them effectively.

5) Consider adjusting follow-up intervals based on patients' disease duration and severity in different endemic counties. Prioritize patients with severe conditions and prompt medication adherence to improve treatment effectiveness.

6) Regularly conduct health education activities to promote active patient compliance and cooperation, particularly for patients taking albendazole for extended periods.

In conclusion, more emphasis should be placed on the management of patients with echinococcosis. Implementing these recommendations may result in better patient outcomes and reduce the limitations faced in this study.

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\* Corresponding author: Liying Wang, wangliyingcdc@163.com.

<sup>1</sup> National Institute of Parasitic Diseases, Chinese Center for Disease Control and Prevention (Chinese Center for Tropical Diseases Research); NHC Key Laboratory of Parasite and Vector Biology; WHO Collaborating Centre for Tropical Diseases; National Center for International Research on Tropical Diseases, Shanghai, China;

<sup>2</sup> Espace-Dev, UMR 228, Université de Montpellier, Montpellier, France; <sup>3</sup> Cirad, UMR 17, Intertryp, Campus international de Baillarguet, Montpellier, France; <sup>4</sup> Gansu Provincial Center for Disease Control and Prevention, Lanzhou City, Gansu Province, China; <sup>5</sup> Xinjiang Uygur Autonomous Region Center for Disease Control and Prevention, Urumqi City, Xinjiang Uygur Autonomous Region, China; <sup>6</sup> Sichuan Provincial Center for Disease Control and Prevention, Chengdu City, Sichuan Province, China.

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