

# Efficacy of ultrasound in diagnosis of patients with gallbladder, common bile duct and hepatic duct worms

## Abstract

Ascariasis is confirmed to be more common in over populated rural societies with insufficient sewage and warm environments.

We addressed the ultrasonic demonstration of biliary ascariasis and the worth of ultrasound in ratifying the diagnostics and assessment outcomes.

In our study, 20 patients (8 females and 12 males) were included and conducted from Sep 2019 to Mar 2020 in the Saido Sharif hospital, SWAT, KPK, Pakistan. The criteria for including patients were based upon the ultrasonic findings expressing the biliary ascariasis such as non-shadowing curved or straight echoic structures like cords with or without central hypo-echoic tubes. The ultrasound follow-up was made in three consecutive interludes; 1 week subsequent to first ultrasonic diagnostics of all patients, 2 weeks after first treatment for 10 patients and 2 weeks after recurrent therapeutic treatment for 10 patients. There were 8 females and 12 males, including 3 pregnant patients (4, 5 and 6 months). Approximately 70% patients belong to the rural sides.

The results of clinical laboratory exhibited higher level of leukocytosis in 85%, higher alkaline phosphatase in serum of 30% participants, irregular alanine aminotransferase level among 40%, and higher amylase in the serum of 10% patients. The sequential follow-up ultrasound was also made for diagnostics verification and evaluating the managing outcomes. After one week of initial ultrasound diagnosis, the 1<sup>st</sup> follow-up ultrasound was carried out to all the patients which revealed variation in the parasitic configuration and confirmed diagnosis in 14 cases. In 5 cases without any treatment, an impulsive exits of worms was reported from the biliary tree. In remaining 15 cases, the patients underwent multiple kinds of treatment. Six patients were cured using anthelmintic medications and four with surgical management.

To conclude, Successive follow-up ultrasound proved to be very operational in ratifying the biliary worm's diagnosis and has a significant function to assess the administrative outcomes.

**Keywords:** Ascariasis, *Ascaris lumbricoides*, ultrasonography

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## Introduction

Over one billion people have *Ascaris lumbricoides* causative ascariasis across the globe which made it the 3<sup>rd</sup> most serious infection distressing the human beings. Ascariasis is confirmed to be more common in over populated rural societies with insufficient sewage and warm environments.<sup>1</sup> The causative infestation is critically challenging in children who are infected more severely and frequently as compared to adults. The size of an adult worm is estimated about 2-6 mm in diameter and 15-35 cm in length.<sup>2</sup> There are 2 external coverings occur in the worms, the hypodermis and cuticle while the internal layer comprises several contractile muscles having central alimentary duct.<sup>3</sup> In the past, many characteristics of ascariasis have been exhibited by ultrasonography in the common bile duct, pancreatic duct, gallbladder along with conventional computed tomography and radiology.<sup>4</sup>

The early diagnosis and treatment of this infection is of crucial significance. The adult worm can travel via the extra-hepatic biliary tree and might approach at gallbladder and the intra-hepatic tubes that can cause biliary colic, obstruction, acute cholecystitis, acute cholangitis and hepatic abscess.<sup>5</sup> The ascariasis is also found as an

etiological factor for acute pancreatitis with inclusively 3% death rate. The conservative techniques of radiographic inspection are mostly substandard for recognizing biliary tract worms.<sup>6</sup> Ultrasonography has been known a non-invasive and secure method for diagnosing accurately all kinds of biliary ascariasis.<sup>7</sup>

*Ascaris lumbricoides* has been exhibited as the parallel lines during fluid-filled small intestine ultrasonography. Overall, on the basis of previous reports, number of cases related to small intestine ascariasis diagnosis have been reported based upon ultrasonography.<sup>8</sup> We illustrate the method of examining the ultrasonographic characteristics of ascariasis in the intestines of 30 patients. Our research addressed the ultrasonic demonstration of biliary ascariasis and the worth of ultrasound in ratifying the diagnostics and assessment outcomes in the Pakistani patients.

## Material and methods

### Hospital and patients

In our study, 20 patients (8 females and 12 males) were included and conducted from Sep 2019 to Mar 2020 in the Saidu Sharif hospital, SWAT, KPK, Pakistan. The broad-spectrum abdominal

sonography focused on the biliary system and liver was accomplished for all patients reported with epigastric and acute right hypochondria pain with the help of Aplio 300 and Logic P6 machines in 4 MHz probe. Keeping the patients in the lateral and supine positions, the biliary, liver and the pancreatic regions were scanned in transverse, oblique and longitudinal projections.<sup>9</sup>

**Data collection**

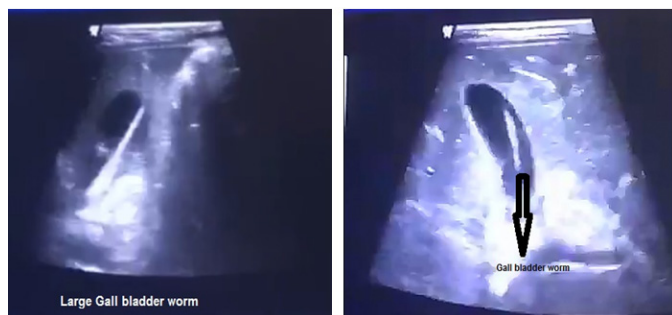
The criteria for including patients were based upon the ultrasonic findings expressing the biliary ascariasis such as non-shadowing curved or straight echoic structures like cords with or without central hypo-echoic tubes. Moreover, the spaghetti sign shows either a rounded hyper-echoic virtual cancerous masses or intrahepatic hyper-echoic bundles. Furthermore, a sonographic demonstrations of sinuous motility or variation in the structural configuration of non-shadowing tube-like intrabiliary region was an imperative inclusion criteria in diagnosis.<sup>10</sup>

The ultrasound follow-up was made in three consecutive interludes; 1 week subsequent to first ultrasonic diagnostics of all patients, 2 weeks after first treatment for 10 patients and 2 weeks after recurrent therapeutic treatment for 10 patients. The data from clinical laboratory trails, management records and ultrasonic follow-up results were documented. The terminal diagnosis was established on the basis of recognized sonographic standards and maintained by the surgical, endoscopic and medical findings along with laboratory and clinical outcomes.

**Results**

In this study, the included 20 patient’s ages were within 10-50 years (average 25 years). There were 8 females and 12 males, including 3 pregnant patients (4, 5 and 6 months). Approximately 70% patients belong to the rural sides. The results of clinical laboratory exhibited higher level of leukocytosis in 85%, higher alkaline phosphatase in serum of 30% participants, irregular alanine aminotransferase level among 40%, and higher amylase in the serum of 10% patients. The adult kinds of *Ascaris lumbricoides* were shown in the 80% patient’s stool and clinically, every case of biliary ascariasis was severe. The biliary ascariasis diagnosis was recognized inaccurately in 1 patient having higher pneumobilia due to lateral internal sphincterotomy.

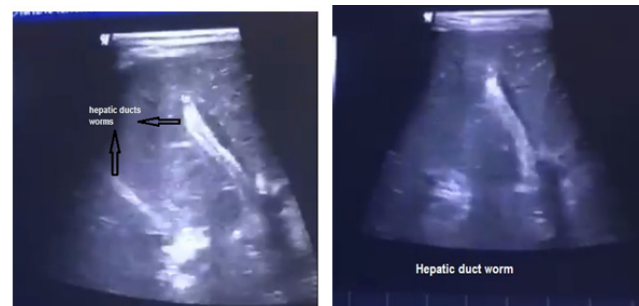
In 20 cases with biliary ascariasis observed with ultrasonography, there were 8 patients with gallbladder (Figure 1-2) and 7 with worms in the common bile duct (Figure 3-4). In 5 cases, the worms were found in the main hepatic duct (Figure 5-6) and pancreatic duct (Figure 7-8) and no case was seen with complicated intrahepatic abscess cavity. Ultrasound confirmed the dilatation in common bile duct as estimated about 10-20 mm, in 7 patients (Table 1 and Pie chart 1).



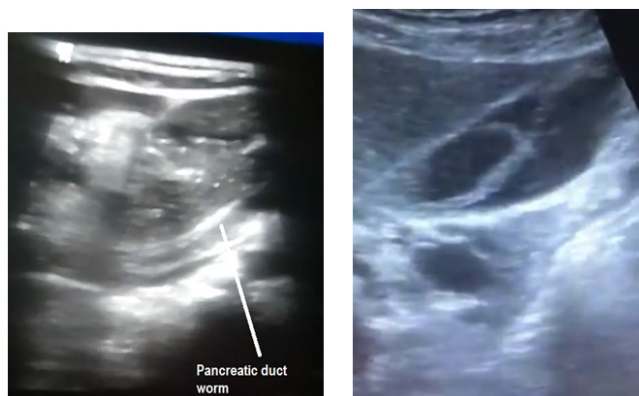
**Figures 1-2** Gall bladder worm.



**Figures 3-4** Common bile duct worm.



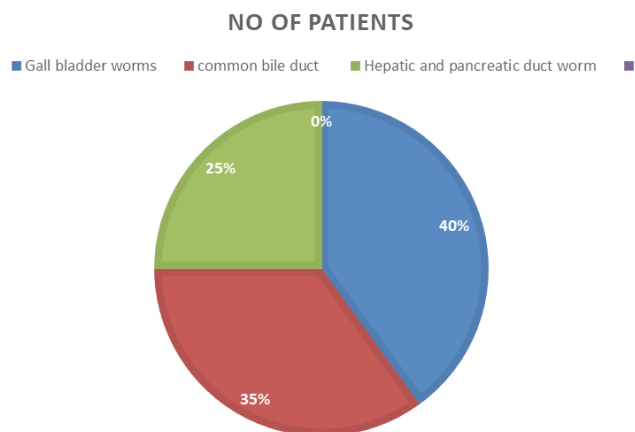
**Figures 5-6** Hepatic duct worm.



**Figures 7-8** Pancreatic duct worm.

**Table 1** Division and demonstration of biliary ascariasis in ultrasonic outcomes

Divisions	No. of patients
Gall bladder	8
Common bile duct	7
Hepatic and pancreatic duct worm	5
<b>Ultrasonic demonstration</b>	
Non-shadowing echogenic strips along with tube signs	10
Spaghetti signs (multiple worms aggregates)	4
Intrahepatic hyper-echoic bundles	6



The sequential follow-up ultrasound was also made for diagnostics verification and evaluating the managing outcomes. After one week of initial ultrasound diagnosis, the 1<sup>st</sup> follow-up ultrasound was carried out to all the patients which revealed variation in the parasitic configuration and confirmed diagnosis in 14 cases. In 5 cases without any treatment, an impulsive exits of worms were reported from the biliary tree. In remaining 15 cases, the patients underwent multiple kinds of treatment. Six patients were cured using anthelmintic medications and four with surgical management. In 6 patients, the worms were eliminated from the biliary system with the help of endoscopic retrograde cholangiopancreatography. After 2 weeks of treatment, the 2<sup>nd</sup> follow-up ultrasound was made to all patients which demonstrated a treatment issues in 2 patients who manage by recurrent clinical administration. After 2 weeks, the 3<sup>rd</sup> follow-up ultrasound was normal in all cases.

## Discussion

In most of the cases, the consecutive follow-up ultrasound verified a variation in the structure of the worms as a confirmed indicative factor. As well, follow-up ultrasound exhibited comprehensive worm's disappearance from the biliary system of all the cases latterly to the management. Therefore, successive follow-up ultrasound proved to be very operational in ratifying the biliary worm's diagnosis and has a significant function to assess the administrative outcomes.

The *Ascaris lumbricoides* is the most frequent and largest human intestinal infectious roundworm parasite. In 3<sup>rd</sup> world states, it is endemic due to poor standards of medical and healthcare, lower status of socioeconomics as well as the geo-climatic weathers impact the parasitic prevalence in such zones of the world.<sup>11</sup> The biliary system is the common intestinal manifestation of the worm because it can get entry certainly into the common bile duct through the ampulla of Vater. It generally aggravates fever, biliary colic, obstructive jaundice and acute cholangitis along with asymptomatic issues. The diagnostics and post-therapeutic follow-up of biliary ascariasis proved to be reliable with the help of trans-abdominal ultrasound.<sup>12</sup>

Many researches have deliberated the sonographic outcomes of the roundworms in the gall bladder and biliary tracts. The general results have been illustrated as echogenic, curvilinear or linear thick and non-shadowing configurations with vital anechoic longitudinal tubes are ascariasis characteristics.<sup>13</sup> The worms are mostly observed as one or multiple tube-like and non-shadowing echoic structures that might be coiled, straight or stripped. The worms overlapping aggregates or coiling might have spaghetti like demonstration. The dilatations in the common bile duct with or without a swollen gallbladder is another most common consequence.<sup>14</sup>

Meanwhile, the lumen on packing sturdily with worms, particularly if the solidness seems amorphous, a dilated bile duct can be lost. Intrahepatic duct bundles and boluses provide a pseudo tumorous demonstration, but severe clinical attributes like socioeconomic status and age must deliver a clue for an accurate diagnostics.<sup>15</sup> The gallbladder lumen worms are least common while in the current study they were comparatively common outcomes. The inclusive appearances of the intra-ductal worms on transverse sight is valuable to resolve any ambiguity in the diagnosis of longitudinal sight.<sup>16</sup>

In current research, the young females were mainly affected, though young kids are most infected by *Ascaris* infestation with low biliary incidences that might be due to the narrow lumen and ampulla of biliary pathways. Pregnant patients might exhibits biliary parasites as shows in few cases of current study while ultrasound proved to very useful in their administration. Furthermore, worms can confound in prevailing biliary duct anomalies also observed in current study in the form of parenthetically fusiform cysts. Around 1/3<sup>rd</sup> cases had associated gallbladder and ductal stones while evidences confirmed that biliary ascariasis can also be a reason of intrahepatic stones.<sup>17</sup>

## Conclusion

Ultrasound play a pivotal role in diagnosis of biliary ascariasis and has a significant function to assess the administrative outcomes.

## Conflicts of interest

None.

## Funding source

None.

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