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Outcome of the Treatment of Hydatid Disease in Children over a Period of 8 Years

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Abstract: Introduction: Hydatid disease is one of the most important health problems in developing countries. It can affect any part of the human body, commonly affects lungs and liver. Because of poor data and preventive measures in Sub-Saharan Africa, cystic echinococcosis (CE) is regarded as endemic disease. **Method:** This is a retrospective study of children under 12 years old admitted in paediatric surgical unit at Nelson Mandela Academic Hospital (NMAH), suffering from Cystic echinococcosis from May 2015 to April 2023. We studied groups of age, gender, organs affected, treatment, complications and recurrences. **Results:** 58 children were studied; the group of age most affected was 5 to 10 years old, 53.4% of females, 48.2% of males, lung hydatid cysts in 43% of cases, same as in the liver; 8.9% of the patients had cysts in multiple locations. In 48 (83%) cases, the treatment was anthelmintics for no less than a week previous the surgical procedure then punction-aspiration-injection and re-aspiration (PAIR), removing the germinal layer (Strongly Recommended), following in the post operatory with anthelmintics no less than 3 months (Albendazole and Praziquantel). In 10 (17%) cases medical treatment was enough for the resolution of the cyst. No documented recurrences. **Conclusion:** Females were most affected and the liver and lungs were the organs affected with more frequency. No recurrences found, suggesting that this treatment is suitable in endemic areas.

Key words: Hydatidosis, PAIR, CE, *Echinococcus granulosus*, Germinal layer (endocysts).

1. Introduction

The Echinococcosis is a zoonotic disease caused by a parasitic infection with the larval stage of the tapeworm Echinococcus genus [1]. Cystic echinococcosis (CE) is a chronic, complex, and neglected disease. Its treatment depends on a number of factors, such as location, size, and stage of the cysts, and availability of therapeutic options. Among the recognized species, two are of medical importance – *E. granulosus* and *E. multilocularis* – causing CE and alveolar echinococcosis (AE) in humans respectively. Cystic echinococcosis is the most common form of the disease [2]. Despite the wealth of scientific literature on treatment for echinococcosis, the current management of the disease is based on poor to moderate quality of evidence and recommendation strength [3].

The Echinococcus can infect domestic animals, the adult tapeworms are carried by the definitive host (dogs) asymptotically and can transmit the worms through defecation contaminating humans if ingest affected intermediate host meat (sheep, cattle, goats, and pigs). Human hydatid cyst is a health problem in some developing countries [3], this disease is asymptomatic for years until develop complications: such as compressive symptoms or rupture of the cyst causing anaphylactic shock. In most of the patients the symptoms are non-specific for the disease, therefore the clinical presentation of CE is protean and depends on many variables, including location, number, size and stage of the cysts, and it was statemented before depend frequently due to the presence of complications [4, 5].

There are four management options for CE, surgery,

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percutaneous treatment, medical treatment with benzimidazoles, and watch and wait or expectant management. Management of hydatid disease carries a substantial risk of complications and recurrence. The ultimate goal of surgery is to kill the parasites, evacuate the cyst, remove the germinal layer, and obliterate the residual cavity all while preserving the healthy tissue. In endemic areas, a conservative approach is preferred [6].

1.1 Course of Infection

According to Romig et al [7], ultrasonic (US) investigation showed that the cysts may grow 1-50 mm per year or persist without changes. Frider et al [8] indicated that may spontaneously rupture or collapse and also disappear.

The sequence of the changes during the natural history of these cysts is no well define, the liver cysts appear to grow at a lower rate than the lung cysts. The symptoms appear in this disease usually when the cyst compresses or ruptures into neighbouring structures [8].

The diagnosis of CE is based on the occurrence of symptoms, as well as accidental discovery in ultrasound, CT imaging techniques, and serology. The proof of the presence of protocolises could be given by microscopic examination of the fluid and histology.

The ultrasound examination is the basis of diagnosis and the basis for the classification of diseases of the WHO classification of the disease in abdominal locations of the cysts. This technique could visualize cysts in other unsuspecting areas, such as lungs, when the cysts are located peripherally [5].

The WHO-IWGE classification (Fig. 1). In 1995, standardization and allowing a natural grouping of the cysts into three related CES [Cystic echinococcosis]: active, transitional and inactive. This classification added: the transitional cysts can be differentiated into CE3a (with detached endocyst) and CE3b (predominantly solid with daughter vesicles). The CE1 and CE3a are early stages and CE4 and CE5 late stages.

Computed tomography (CT), magnetic resonance imaging (MRI), and magnetic resonance cholangiopancreatography (MRCP) are performed on (a) subdiaphragmatic location; (b) disseminated disease; (c) extra abdominal locations; (d) in complicated cysts (abscess, cysto-biliary fistulae) and (e) in some cases when is necessary in the pre-surgical evaluation. MRI imaging should be preferred to CT due to better visualization of liquid areas.

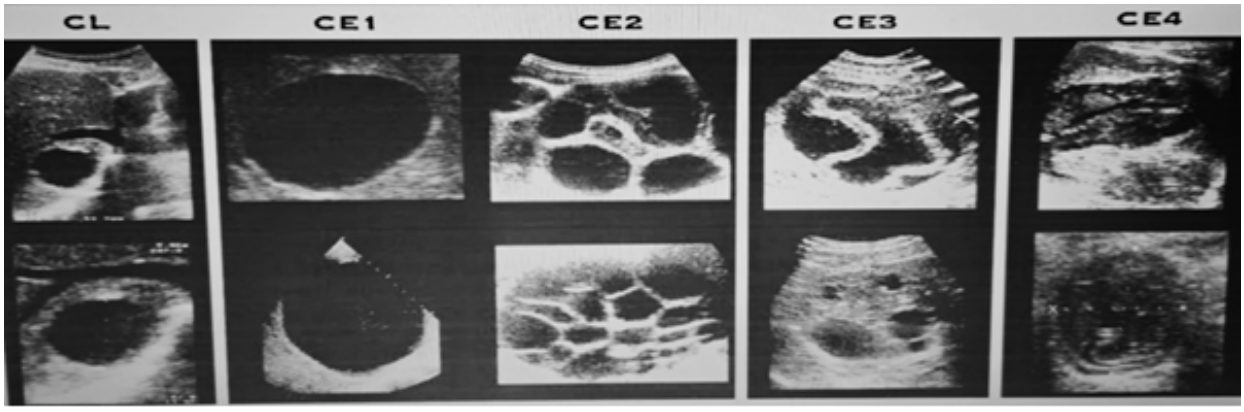

Fig. 1 WHO Ultrasound Classification of the CE.

1.2 Serology of the Echinococcus Granuloses

According with some authors, the sensitivity of the serum antibody detection using indirect hemagglutination, ELISA, or latex agglutination, in the hydatid cyst fluid antigens, is between 85 and 98% for liver cysts, 50-60% for lung cysts and 90-100% for multiple organ cysts [5].

Other cestode infections such as *E. multilocularis* and *Taenia solium*, malignancies, liver cirrhosis and presence of anti-P1 antibodies limits the Specificity of all those tests due to this possibility, so a confirmatory test should be used as: (arc-5 test; Antigen B (AgB) 8 kDa/12 kDa subunits or EgAgB8/1 immunoblotting) [5].

1.3 Affectation

Any organ could be affected by Echinococcal cysts, including the muscles but the commonest organs affected are lungs, liver and spleen. If the liver is affected, might cause a compartmental abdominal Syndrome and might cause obstructive jaundice when there is compression to the biliary system. In cases that the lungs are affected, the patients could present with productive cough, weight loss and poor appetite.

Rupture of the cyst into pleural cavity, the child could suffer of shortness of breath and these cases on chest x-ray the cyst can be confused with pleural effusion and wrongly make the doctors to insert a chest drain into the cyst, founding later in another chest x-ray/or CT-chest a cystic cavity [9-11].

1.4 Objectives

The main aims of our study was to find out the prevalence of the hydatid cysts in children in the population of our area, the organs more common affected and also the effectivity of the treatment performed.

2. Methods

We performed a retrospective study of every child under 12 years of age admitted in our hospital at the surgical paediatric ward (n = 58), suffering from hydatid cyst. We studied patients with this diagnosis from May 2015 to April 2023. 58 patients were studied, analysing the age, gender, localization of the cyst, treatment and complications. The diagnosis was based on clinical history, physical examination, serology test, abdominal ultrasound, chest X ray, CT and histology. The ultrasound ad CT scans were the most useful investigations in the diagnostics.

The decision to perform a surgical treatment was based on the size of the cyst when it was 6 cm or more, and when the patient having compressive symptoms and signs of complicated hydatid cyst. In hydatid cysts of the liver, the compressive symptoms and signs were jaundice, itchiness, abnormal liver function testes; on the other hand, in hydatid cyst on the lung; the patients could present productive cough, shortness of breath, especially when the cyst communicate to a bronchus, and when the cyst ruptured to the pleural cavity.

Patients with liver hydatid cyst and in those with lung hydatid cysts were performed PAIR (puncture – aspiration-injection and re-aspiration) through mini laparotomy or mini thoracotomy. Considering that this concentration of the saline solution is enough to kill the Ovo's that could remain after removal of the germinal layer, 5% hypertonic saline solution as sporicidal agent was used for the injection. Moreover, in the case of bronchial communication, there is no harm to bronchies, Therefore, after PAIR in every case, the cysts were opened and removed the germinal layer (endocyst) and taken it for histopathology examination as a confirmation of the disease. A capitonnage was done, and a drain was left into the cystic cavity. In case of lung hydatic cyst was left an intercostal drain into the cyst cavity and also into the pleural space.

In the post-operative time, we continued the children with Albendazole (20-30 mg/kg/day) and Praziquantel (30-40 mg/kg/day) for no less than 3 months; according the resolution of the cysts in some cases, the Albendazol was given more than 3 months, based on the results of liver function tests performed monthly to rule out hepatic toxicity.

Patients with hydatid cyst 5 cm or less in size and no signs of compression or other complications were treated conservatively with the combination of Albendazole and Praziquantel this treatment was

given for three months or more depending of the resolution of the cysts and the results of the liver function test and the full blood count.

Full Blood Count and liver function test were taken before the initiation of the treatment and every month after starting with medical treatment to find out drug toxicity.

3. Results

58 cases were analysed, 25 (43%) of them had cysts in the liver, and others 25 (43%) cysts in the lung. Some patients (9%) had cysts affecting liver, lung, spleen and in other organs shown in table 1, as multiple.

As it can be seen also in the table 1, the most affected group of age was the one from 5 to 10 years in a 52% of the patients, the group of children with more than 10 years was the second in frequency with 37%.

The presentation of hydatid cysts in liver were more frequent in females 27% than in male 15%, on the other hand lung hydatid cysts were most frequent in male affecting 27% of the patients, and females 15% as is showing in table 2.

Table 1 Patients' age *vs* Organ's location of the Cyst.

Ages	The number (N) and proportion (%) of patients with cysts					
	Liver Hydatid	Lung Hydatid	Soft Tissue	Other Organs	Multiple	Total
1-5 year	5 (9%)	2 (3%)				7 (12%)
5-10 year	12 (21%)	18 (31%)				30 (52%)
> 10 year	8 (14%)	5 (9%)	1 (2%)	2 (3%)	5 (9%)	21 (37%)
Total	25 (43%)	25 (43%)	1 (2%)	2 (3%)	5 (9%)	58 (100%)

Source: Patient`s fields and author`s records.

Table 2 Gender *vs* Cyst location.

Gender	The number (N) and proportion (%) of patients with cysts					
	Liver Hydatid	Lung Hydatid	Soft Tissue	Other Organs	Multiple	Total
Male	9 (15%)	16 (27%)	1 (2%)	1 (2%)		27 (46%)
Female	16 (27%)	9 (15%)		1 (2%)	5 (9%)	31 (53%)
Total	25 (43%)	25 (43%)	1 (2%)	2 (3%)	5 (9%)	58 (100%)

Source: Patient`s fields and author`s records.

Surgical treatment (PAIR and removed of the endocyst) was performed in 40 (69%) cases. Postoperative bronchopleural fistula occurred in approximately 26% of patients with lung hydatid cysts who underwent this procedure that closed by itself mostly in the first week (Table 3).

In our cases, 18 (31%) patients were treated with medical treatment instead of surgery during a period of 6 to 8 months. The histopathology examination of the germinal layer confirmed the *Echinococcus granulosus*.

We can also see from Table 3 that one with cyst in the liver developed a Cysto biliary fistula, and the one with soft tissue cyst developed wound infection.

Table 3 Complications after OT vs Cyst's Location..

Complications after OT	The number (N) and proportion (%) of patients with cysts			
	Liver	Lung	Soft Tissue	Total
Biliary Fistula	1 (2%)			1 (2%)
Bronchopleural Fistula		15 (26%)		15 (26%)
Wound infection			1 (2%)	1 (2%)
Total	1 (2%)	15 (26%)	1 (2%)	17 (30%)

Source: Patient`s fields and author`s records.

4. Discussion

In endemic countries, the hydatid disease is still a national health problem and needs prevention for its eradication or its control [3]. Symptoms of hydatid disease depend on which organs are affected and only are evident when the complications arise, but most patients with hydatid cysts are asymptomatic, and the diagnosis is usually made incidentally during clinical or radiological examination for unrelated reasons [12].

In our study of 58 cases, 31 (53%) were females and 27 (47%) were males. In other studies, the statistical analyses indicate that in children males are more likely to be infected with lung hydatid, while females were infected more with liver hydatid cysts [13, 14]. We also found that the hydatid cyst disease in our children was no differences of affectation between the liver 43% and the lung also 43%.

Hydatid cyst can affect any organ, but the two organs most commonly affected organs are liver and lungs. In our study, the involvement of lungs, liver and other organs accounted in 9% in the same patient. On the other hand, some others reported 4%-25% in their cases [15]. A rare case of primary mesenteric hydatid cyst was reported [16].

In human hydatid cyst, the *Echinococcus granulosus* is the most common cause as it was in our children, confirmed with histopathology of the endocyst (germinal, layer) this finding was also reported by other authors [17-19].

5. Conclusions

The incidence of hydatid disease in children increases with age.

The most commonly affected organs are the liver and lungs.

As lung and liver can be affected for hydatid cyst in the same patient, we recommend when a hydatid cyst of the liver is diagnosed, a chest x-ray should be done to rule out lung involvement, especially in endemic regions.

In most case a conservative surgical technique (PAIR) and total or partial enucleation of the endocyst is sufficient, followed by medical treatment post operatively with Albendazol and Praziquantel for no less than 3 months.

As shown in Figures 2, 3, 4, and 5 (Source: Author's record), the effectivity of this method in a patient with big hydatid cyst in the left lung complicated with bronchial communication plus infection.

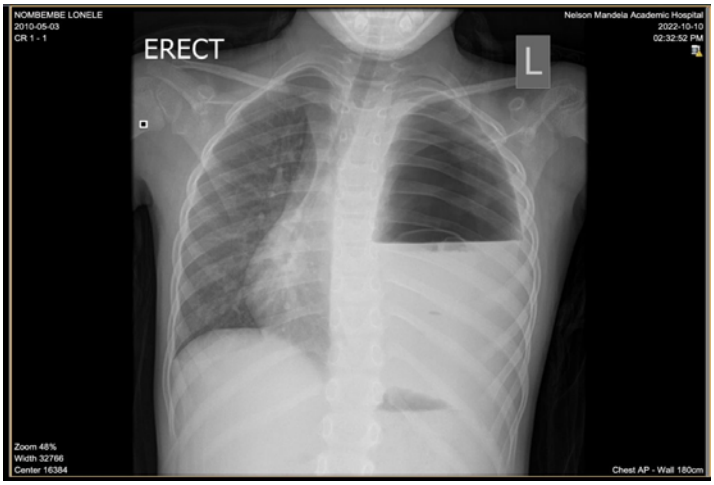

Fig. 2 Chest X-ray of a 7 years old child, male, showing a hydatic cyst in the left lung with air inside due to bronchial communication.

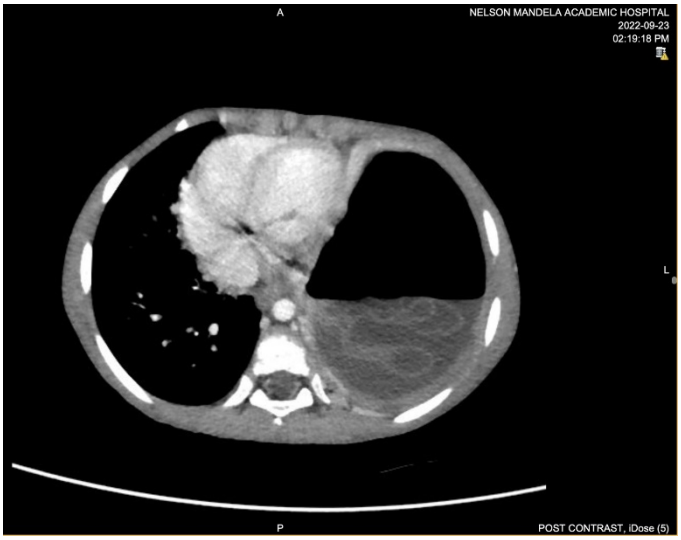

Fig. 3 Compute tomography of the same patient of Fig. 2, showing detachment of the endocyst.

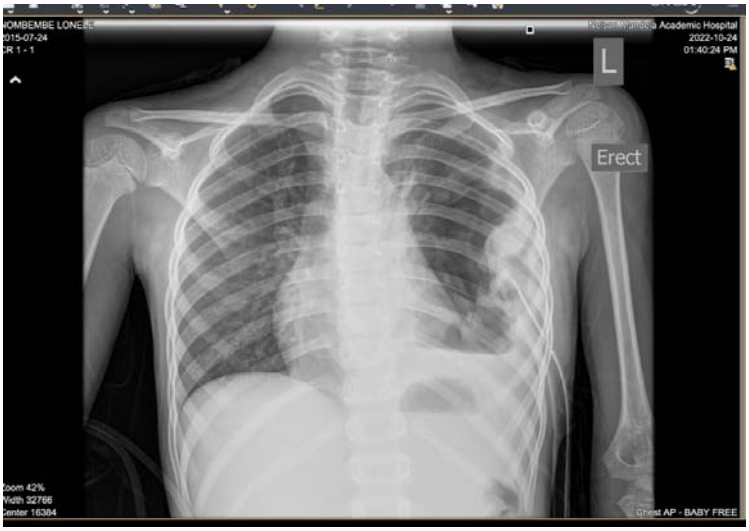

Fig. 4 Post op 24 hours, same anterior patient.

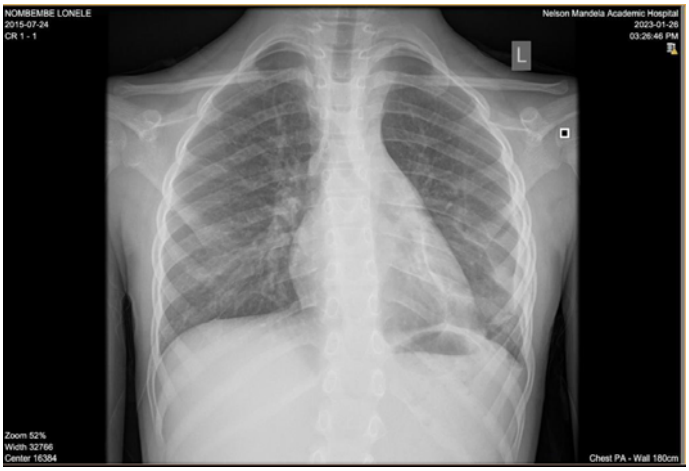

Fig. 5 Same patient 3 months post op.

As shown in Figure 6, during the surgery, the inner capsule is removed from the cyst located in the liver.

Fig. 6 Removing endocyst from liver hydatid cyst in a 10-year-old boy (Source: Author's record).

Recommendation

1. Educating the population is the only way from epidemic hydatid disease areas to non-epidemic hydatid disease areas:
   -Media
   -Social workers
   -Health workers
2. Conservative surgery is performed for patients in endemic areas.
3. Total or partial enucleation of the endocyst (germinal layer)

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