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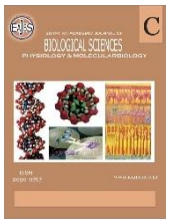

Role of Oxidative Stress Glutathione Peroxidase in the Detection of Patients with Echinococcus Granulosus

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ABSTRACT

Five ml blood samples were obtained from fifty recurrent Echinococcosis patients. A total of 50 serum samples were collected from patients with Echinococcus granulosus and 38 serum samples from healthy humans were taken from the Al-Furat AL-Awsat Hospital, Maternity and Children Teaching Hospital and Al-Diwaniyah Teaching Hospital in Al-Diwaniyah and from Specialized Hospital for Gastroenterology and Hepatology in AL-Najaf for the period from November 2022 to April 2023. The test was performed on 5 ml of venous blood, which was collected from each sample for ELISA test to detect the positivity of oxidative stress Glutathione peroxidase (GPX). The clinical assessment of the 50 patients (who confirmed to have Echinococcosis after giving positive results by ELISA) was revealed that the frequency of distribution of patients according to sex was (74%) females and (26%) males. The differences between females and males were statistically significant ($P < 0.05$, P-value= 0.001). The estimated incidence of Echinococcosis increased in the 21-40 years age group, with a significant difference ($P < 0.05$) in comparison with the other groups. The Distribution of Hydatid Cysts according to the site of the infection was the high rate of infection in the liver compared to other organs. The concentration level of GPX decreases in patients compared with the control with a significant difference at ($P \leq 0.05$). The concentration level of GPX decreased after the surgery compared with the before surgery and after surgery with a significant difference at ($P \leq 0.05$).

INTRODUCTION

Hydatid disease, a zoonotic parasitic infection, has a global impact on livestock, wildlife, and human populations (Deplazes *et al.*, 2017). Disease in both animal and human intermediate hosts is attributed to becoming infected with the larval stage of *Echinococcus*, including multiple species (Wilson *et al.*, 2019). Accidental getting of intermediate host status by humans can occur through fecal-oral transmission, which is facilitated by close proximity to definitive hosts, including domestic and wild canids. An additional mode of infection involves the consumption of embryonated eggs of the parasites, which can be present in food, water, soil, and fomites, as documented by Tamarozzi *et al.* (2020). Definitive hosts acquire infection through the ingestion of viable hydatid cysts present in the internal organs of intermediate hosts, which encompasses a wide range of mammalian species (Thompson, 2017; Mahdi Fakhar, *et al.*, 2021). The primary organs involved in this process are the liver, lungs, spleen, and heart, with occasional involvement of other organs. Due to the involvement of the liver and lungs of intermediary hosts in the life cycle of its larvae, they do not present significant issues during their early stages. Once they reach maturity, however, these organisms induce jaundice when they inhabit the liver.

Hepatic damage is associated with the development of digestive disorders, whereas the presence of cysts in other organ systems is known to contribute to the occurrence of disorders specific to those organs (Toparlak *et al*., 2000; Çinar *et al*., 2018). According to Eckert and Deplazes (2004), Budke *et al*. (2006), and Ahmadi and Bodi (2011), the incubation period of hydatid disease is characterized by a lengthy duration, requiring considerable time for detection by clinicians. The clinical manifestations of this disease are contingent upon factors such as the size, location, and proximity to adjacent organs. The onset of symptoms can vary significantly, with an incubation period spanning several months to years. In cases of hepatic hydatid cysts, patients may experience abdominal pain, hepatomegaly, cholestasis, biliary cirrhosis, and ascites. Conversely, pulmonary hydatid cysts can give rise to chronic cough, dyspnea, expectoration, hemoptysis, lung abscesses, and pleuritis. According to the studies conducted by Romig (2003), Jenkins (2005), and Tiaoying *et al*. (2005), hydatid cysts continue to pose a significant public health risk in regions endemic to this condition, including Mediterranean countries, The regions encompassing North and eastern Africa, Western and Central Asian China, South American, and Australia are of interest in this context. The occurrence of Echinococcus granulosus infection in humans in regions where it is prevalent exhibits a range of 1 to 10 new cases per 100,000 individuals annually (Spies *et al*., 2008). Various serological tests have been developed for the purpose of diagnosing (HD). While none of these methods can be considered the ultimate solution, they do offer additional data for the identification of cases and monitoring of patients post-treatment (Zhang *et al*., 2003). The enzyme-linked immunosorbent assay (ELISA) has been employed for the immunodiagnosis of hydatid disease, as demonstrated by Farag *et al*. (1975) and Afferni *et al*. (1984).

MATERIALS AND METHODS

Sampling of Cases Of Echinococcus Granulosus Patients:

This study was conducted from November 2022 to April 2023 at Al-Ameen Center for Research and Advanced Biotechnology / Imam Ali Holy Shrine. A total of 50 serum samples were collected from patients with Echinococcus granulosus and 38 serum samples from healthy humans, including females 74 % compared with 26% for males were taken from the Al-Furat AL-Awsat Hospital, Maternity and Children Teaching Hospital and Al-Diwaniyah Teaching Hospital in Al-Diwaniyah and from Specialized Hospital for Gastroenterology and Hepatology in AL-Najaf.

RESULTS

The clinical assessment of the 50 patients (who were confirmed to have Echinococcosis after giving positive results by ELISA) revealed that the frequency of distribution of patients according to sex was (74%) females and (26%) males as shown in Figure (1). The differences between females and males were statistically significant ($P < 0.05$, P-value= 0.001). The estimated incidence of Echinococcosis increased in the 21-40 years age group, with a significant difference ($P < 0.05$) in comparison with the other groups as shown in Figure (2). The Distribution of Hydatid Cysts according to the site of the infection was a high rate of infection in the liver (52%) compared with other organs as shown in Figure (3). From Table (1) it can be noted that the concentration level of GPX decreases in patients compared with the control with a significant difference at ($P \leq 0.05$). From Table (2) it can be noted that the levels of GPX concentrations in patients according to the location of the cyst were (128.506±2.05), (133.033±3.056), (143.153±10.527) and (129.616±12.515) in Liver, lung, kidney and another organ respectively, where the highest level was in the kidney. without any significant difference at ($P \leq 0.05$) suggesting that the cyst's location does not have a significant impact on GPX concentrations.

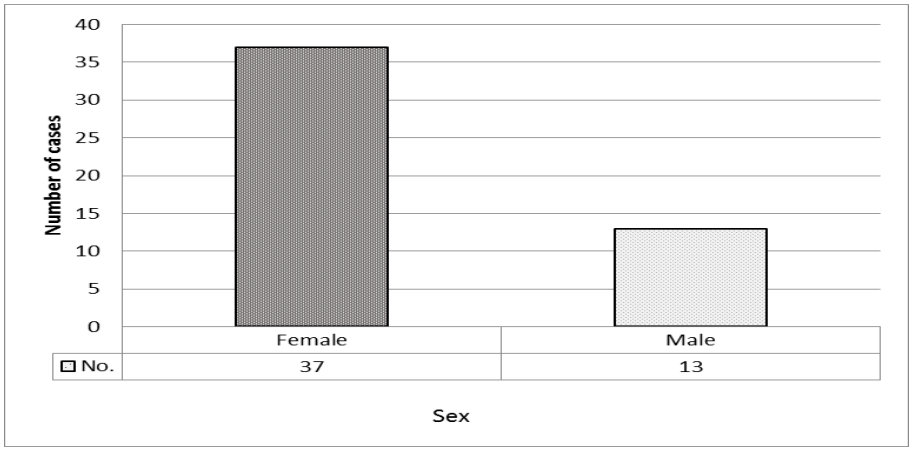

Fig. 1: The frequency of distribution of patients according to sex.

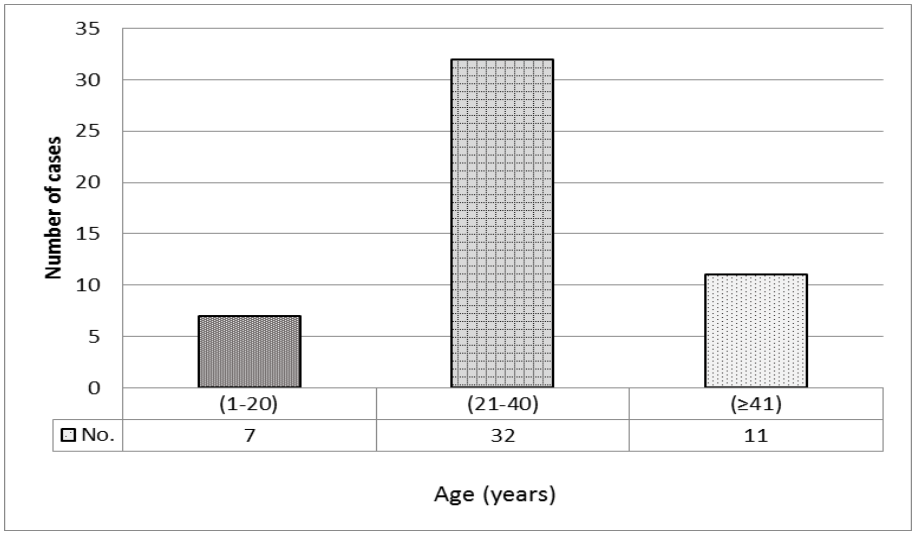

Fig. 2: The frequency of distribution of patients according to age

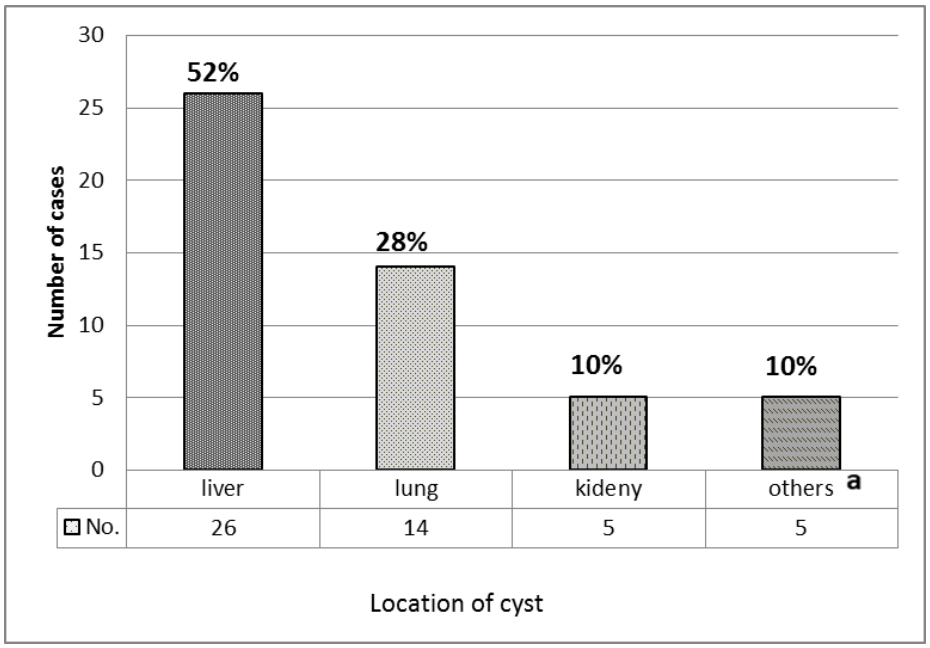

Fig. 3: The frequency of distribution of patients according to the location of the cyst.
[a]: there was one case in the ankle joint, shoulder, and esophagus, and two cases in the brain.

Table 1: GPX concentrations in (Control and patients).

Parameters	Groups		P-value
	Control N (38) Mean±SE	Patients N (50) Mean±SE	
GPX (U/ml)	138.492± 2.673	131.349± 2.095	0.035*

*significant difference at ($P \leq 0.05$). Independent samples t-tests for variables.

Table 2: GPX concentration in patients according to the location of cyst.

Parameters	Groups				P-value
	Liver N (26) Mean±SE	lung N (14) Mean±SE	Kidney N (5) Mean±SE	Others N (5) Mean±SE	
GPX (U/ml)	128.506±2.05[a]	133.033±3.056 [a]	143.153±10.527 [a]	129.616±12.515[a]	0.226

DISCUSSION

The study of Taher, (2009); and Al-Husseini, (2014); recorded infection rates of females and males of (70%, 30%), and (77.7%, 22.2%) respectively.

The studies by Al-Mukhtar and Qasim, (2017) confirmed that the rate of infection of females amounted to (8%), while males were less by a lesser rate of (2.86%) of the total number of examined samples amounted to 480 cases, just 24 cases were positive. Also, the study (Baraak, 2014) indicated, that females are more likely to have the hydatid cyst than males, as the percentage of females is 60%, whereas the percentage of infection in males is 40% for the groups of patients chosen from the country.

The incidence of CE exhibited a statistically significant disparity between females and males, aligning with the outcomes reported in previous research studies (Khan *et al.,* 2020). Based on the study conducted by AL-Masoudi *et al.* (2021), it was observed that out of the total 53 patients diagnosed with CE, 37 individuals (56.9%) were identified as female, while the remaining 16 individuals (43%) were identified as male.

(Ismail *et al.*, 2023) record that the present study encompassed a cohort of individuals diagnosed with hydatid disease, who were admitted to the "Al-Sadr" General Hospital during the period spanning from January 1, 2020, to December 31, 2020. The total number of patients included in this study amounted to 58. Based on the research findings, it has been determined that rural areas exhibit the highest prevalence of this particular ailment, with the peasantry emerging as the demographic group most significantly impacted among females. The rationale behind this phenomenon can be attributed to the inherent characteristics of their agricultural and livestock-related activities. The results of the study also indicated that the prevalence of infection is higher among females compared to males.

The reason for the higher incidence in youth than other ages may be due to the activity of this group in farming and social work being closer contact to pathogens, maybe breed of pets and eating food from public restaurants furthermore silence of cyst development and long incubation period of hydatidosis by Al-Husseini, (2014) and Baraak, (2014) may be due to differences in categories distribution.

Hydatid disease is an exceptional parasitic problem that exhibits the ability to proliferate and thrive in various anatomical locations within the human body. This condition presents a diverse range of clinical presentations, which are contingent upon the developmental stage of the parasite, the

presence of associated complications, and the specific tissues affected (Dilli *et al.*, 2011).

The most commonly involved organ is the liver (59 - 75%) and others include lung (27%), kidney (3%), bone (1 - 4%), and brain (1 - 2%) (Yuksel *et al.*, 2007).

The results showed that the liver was more affecting organ in comparison to other organs this result agreed with previous studies on human hydatidosis by Taher, (2009) and Baraak, (2014) in Iraq which recorded rates of 61.8%, 55.6%, 76.67% and 50% respectively; as well it matches the study of Brundu *et al.*, (2014) in Italy and Zhang *et al.*, (2015) in China which recorded 83.6% and 95.08% respectively.

(Omidinia *et al*., 2020) showed that in Alborz Province the most infected organ was the liver 21 (80.8%) followed by lungs 4 (15.4%) and one case of pelvic cyst 1 (3.8%).

Glutathione peroxidase (GPx) plays a crucial role in intracellular defense mechanisms against various harmful stimuli, such as oxidative stress (Nima *et al.*, 2020). According to Baskol *et al.* (2007), it serves the purpose of preserving the sulfhydryl (-SH) groups within proteins by maintaining them in a reduced state, thereby safeguarding these groups from undergoing oxidation. The observed decline in GPx activity among the patients in this study can be attributed to the oxidative stress induced by lipid peroxidation and the subsequent reduction in GPx levels, which serves as an endogenous antioxidant.

The study observed by (Atambay *et al.*, 2007) found that the GSH activity was decreased in hydatid cyst patients (p=0.001) which was the GPx level were 24.95 ± 6.55µmol/L in the control group and was 11.31 ± 3.80 µmol/L in hydatid cyst patients. (Kilic *et al*., 2010) showed that the plasma glutathione peroxidase (GPx) levels in the patients group were found to be significantly lower compared to the control group ($p < 0.001$).

Conclusion

1. The prevalence rate of Echinococcosis is significantly higher among the 21-40 years age group.
2. The prevalence of hydatidosis was higher in females than males.
3. The hydatid cysts were mostly observed in the liver rather than another organ.

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