Autoimmune hepatitis in children:
A prospective study from a Tertiary Center in Upper Egypt

By

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Abstract

Background: The growing global prevalence of autoimmune hepatitis (AIH), an inflammatory liver disease of unknown cause in children, underscores the urgent need for comprehensive studies in Egypt. Specifically, research is deficient in characterizing the features and outcomes of pediatric AIH within Upper Egypt.

Objectives: To assess the clinical, laboratory, histological, and treatment-related aspects of AIH in children at Sohag University Hospital.

Patients and Methods: The study design was a prospective observational cohort, encompassing 24 pediatric patients (19 females, 5 males) diagnosed with autoimmune hepatitis (AIH) based on the International Autoimmune Hepatitis Group (IAIHG) scoring system. Patient recruitment occurred within the Department of Pediatrics, Sohag University Hospital, Sohag University, between August 2023 and July 2024.

Results: Among 24 children diagnosed with AIH, 22 had Type I, one patient had type II and one had seronegative AIH. Jaundice was the main presentation. Complete remission was achieved in 66.67% of patients, while 20.83% of patients had partial response and relapse occurred in12.5% of patients. Both hepatitis activity index and AIH score were significantly higher in patients who developed relapse compared to patients with partial and complete remission.

Conclusion: This study confirms that type 1 AIH as the primary form in children at our center, with female predominance(79.16%) and good treatment response(66.67%). Yet, the association between higher disease activity scores and relapse underscores the importance of vigilant monitoring and the necessity for expanded, long-term research.

Key words: Pattern, autoimmune hepatitis, children, Sohag University Hospital.

Introduction

Autoimmune hepatitis (AIH), a chronic inflammatory disease of unknown cause, poses a significant clinical challenge across all ages and demographics [(1)]. It is particularly concerning in children, where it often presents with increased severity compared to adults [(2)].

With a global annual incidence of 1.37 per 100,000 and a prevalence of 17.44 per 100,000, AIH shows a clear female predominance[(3)] . Its presentation is highly variable, from asymptomatic disease to life-threatening acute liver failure [(4,5)] .

Diagnosing AIH requires a comprehensive approach, including clinical assessment, biochemical analysis (elevated alanine aminotransferase(ALT), aspartate aminotransferase(AST), and immunoglobulin G(IgG) , along with autoantibodies), histological examination, and the exclusion of other liver pathologies[(6)] .

According to detected auto-antibodies, there are two types of juvenile AIH. Type 1 patients (AIH-1) are Sero-positive for ANA and/or anti smooth muscle antibody (anti-SMA), and type 2 patients (AIH-2) are Sero-positive for anti-liver kidney microsomal type 1 antibody (anti-LKM-1). Still, there is a third subtype of AIH that in which the patients are seronegative for auto-antibodies[(1)] . Tissue samples remain the cornerstone for diagnosis of AIH where typical histological features include interface hepatitis, portal/lobular lymphoplasmacytic infiltrate, hepatocyte rosetting and emperipolesis [(7,8)].

The primary treatment for autoimmune hepatitis (AIH) involves immunosuppressive therapy, typically initiated with prednisone, either alone or in combination with azathioprine[(9)] . For patients with corticosteroid-resistant fulminant hepatic failure or end-stage liver disease, liver transplantation is the recommended intervention [(10)]. However, there is a notable lack of data regarding the characteristics and outcomes of pediatric AIH in Egypt, particularly in Upper Egypt. To address this gap, this study aimed to assess the clinical, biochemical, and histopathological features, as well as treatment responses, in children diagnosed with AIH at Sohag University Hospital.

Ethical consideration

- The study protocol was approved by the Medical Research Ethics Committee -Faculty of Medicine-Sohag University (Registration number: **Soh-Med-23-07-10MS**).
- Informed written consent was obtained from the parents/care giver of the children to participate in the study.
- Confidentiality of the patient data and results of the study were preserved
- The patient has the right to refuse or withdraw from the study at any time
- No conflict of interest regarding the study or publication
- Authors declared that there is no fund regarding the study or publication

Sample size Equation:

Based on previous research[11] the prevalence of AIH in children was 9.9 per 100000 (0.0099%) ,the sample size was calculated according to the following equation:

$N= Z^2\ p(1-p)/d^2$ (**Daniel, 1999**) [12]

N=desired sample size,

Z=the statistic corresponding to the level of confidence (1.96)

P=expected prevalence (0.0099)

d =precision (d is considered 0.05 to produce good precision and smaller error of estimate)

The sample size by the equation was at least 15 patients and we increased to 24 patients to overcome dropout

Inclusion Criteria:

- Children below 18 years
- Both males and females
- Children diagnosed with AIH during the study period

Exclusion Criteria:

- Patients with viral hepatitis
- Patients with drug induced hepatitis
- Patients with AIH after liver transplantation

Study procedure:

From August 2023 to July 2024, a prospective observational study was conducted at the Pediatric Gastroenterology & Hepatology unit, Pediatric Department, Sohag University Hospital. Children under 18 years diagnosed with AIH using the revised IAIHG criteria[13], were included. IAIHG criteria for diagnosis of AIH include a group of parameters (gender, IgG level , autoantibodies , suspected hepatotoxic drugs, exclusion of viral hepatitis and findings of liver histology, response to therapy), each parameter was given a score . Before treatment IAIHG score above 15 indicated definite AIH, and 10–15 probable AIH and if response to therapy included , the definite AIH score will be above 17 [13]. In this study the IAIHG score was obtained before starting immunosuppressive therapy.

Each patient underwent a detailed assessment including the followings:

I-Comprehensive medical history including symptoms of acute hepatitis with vigorous exclusion of hepatotoxic drug exposure

II-Meticulous clinical examination including anthropometric measurement, general and systematic examination with emphasis on abdominal examination

III-Abdominal ultrasonography for assessment of presence of hepatomegaly, splenomegaly or ascites

IV- Laboratory evaluation including

- Complete blood picture (CBC) was measured by automated blood cell counter analyzer Sysmex XN 1000 (Sysmex Corporation, Kobe, Japan).
- Liver function tests (bilirubin, albumin, total protein, Alanine aminotransferase, Aspartate aminotransferase, gamma glutamyl transferase) were measured by Diazo method, Colorimetric assay and kinetic method, respectively, on Cobas c311 Chemistry Analyzer System (Roche Diagnostic, GmbH, Mannheim, Germany).
- Prothrombin time and concentration were measured by Dade Innovin, Thromborel S Kit on automated blood coagulation analyzer Sysmex CS 1600 (Sysmex Corporation, Kobe, Japan)
- Viral markers: Hepatitis A virus (HAV IgM) , Hepatitis B surface antigen (HBsAg) , Hepatitis B Core (HBc Ab), Hepatitis C antibody (HCV Ab), Epstein-Barr Virus (EBV IgM) ,and Cytomegalovirus (CMV IgM) , using Architect i1000SR System (Abbott Diagnostic, USA).
- Serum total immunoglobulin G on Cobas c311 Chemistry Analyzer System (Roche Diagnostic, GmbH, Mannheim, Germany).
- Specific investigation for AIH: antibodies profiles were determined for all patients, with specific testing for ASMA, ANA, and LKM-1. Positive titers were defined as ≥1:20 for ANA and ASMA and ≥1:10 for LKM-1(5,14). AIH was categorized as type 1 (ANA and/or ASMA positive) or type 2 (LKM-1 positive) based on these findings. Autoantibodies were detected in serum samples using an enzyme-linked immunosorbent assay. The absorbance O.D. was measured at 450 nm using Thermo Fisher Scientific Multiskan EX Microplate Reader (Thermo Fisher Scientific Oy, FI-01621 Vantaa, Finland).
- Liver biopsy, performed after coagulation profile correction, was evaluated for portal and lobular inflammation, interface hepatitis, rosetting, and emperipolesis, using Covelli et al.'s [8] Also, hepatitis activity index and fibrosis staging were assessed according to Ishak et al. [15] .

Following the diagnosis of AIH, treatment commenced with oral prednisolone at 2 mg/kg/day (maximum 60 mg/day), continued until remission. Remission was defined as the resolution of symptoms and normalization of aminotransferases. [14,15]. The prednisolone dose was then gradually tapered by 5–10 mg weekly, based on clinical and aminotransferase levels, over 4–8 weeks to a maintenance dose of 2.5–5 mg/day. Weekly liver function tests facilitated dose adjustments and minimized steroid side effects. Azathioprine was added if aminotransferase levels plateaued or if significant prednisolone side effects occurred, starting at 0.5 mg/kg/day and increasing to 2.0–2.5 mg/kg/day until biochemical control was achieved [1].

Relapse was indicated by any elevation of ALT and/or AST post-remission, and treatment failure was defined as the inability to achieve normal liver function [16,17].

The study reported patient outcomes as remission, partial remission or relapse. Patients were followed clinically and with serum transaminase measurements: weekly during induction, monthly during maintenance, and at 3–6 month intervals post remission during the one year study period.

Statistical analysis

Data were collected in Microsoft Excel and statistically analyzed using SPSS 16.00. Categorical data are reported as percentages. Continuous variables are described using mean and standard deviation for normally distributed data, and median with interquartile range for non-normally distributed data. A p-value less than 0.05 was considered statistically significant.

Results

This prospective observational study included 24 children (19 females and 5males) diagnosed with acute autoimmune hepatitis during the study period in department of pediatrics, Sohag University Hospital, Sohag University

Table (1): Distribution of Patients' characteristics in the studied patients.

	All patients N=24	**Male N= 5**	**Female N= 19**	**P-value**
Age (years) Mean ±SD	6.37 ±2.51	5.8 ±1.78	6.52 ±2.69	0.57
Weight (kg) Mean ±SD	20.18 ±4.92	20 ±4.3	20.23 ±5.18	0.92
Height (cm) Mean ±SD	113.14 ±13.32	120.9 ±9.2	111.10 ±13.67	0.14
BMI (kg/m^2) Mean ±SD	15.64 ±1.93	16.18 ±1.64	13.55 ±1.64	**0.004***
Residence				
Urban	12 (50%)	3 (60%)	9 (47.37%)	0.63
Rural	12 (50%)	2 (40%)	10 (52.63%)	
Consanguinity				
Positive	14 (58.33%)	4 (80%)	10 (52.63%)	0.26
Negative	10 (41.67%)	1 (20%)	9 (47.37%)	
Family history of liver disease	4 (16.67%)	1 (20%)	3 (15.78%)	0.82

P value >0.05: Not significant, * P value <0.05 is statistically significant, p<0.001 is highly significant, SD: standard deviation.

this table shows insignificant difference regarding **Patients' characteristics**,except BMI is significantly lower in females than males,

Table (2): Clinical presentations of the studied patients.

Presentation	Number (%)	Males(n=5)	Females(n=19)	P value
Jaundice	22 (91.67%)	5 (100%)	17 (89.5%)	0.449
Dark urine	13 (54.16%)	4 (80%)	9 (47.36%)	0.193
Vomiting	11 (45.83%)	3 (60%)	8 (42.1%)	0.475
Nausea	8 (33.33%)	2 (40%)	6 (31.57%)	0.722
Abdominal pain	13 (54.16%)	3 (60%)	10 (52.6%)	0.769
Malaise	6 (25%)	1 (20%)	5 (26.3%)	0.722
Anorexia	10 (41.67%)	2 (40%)	8 (42.1%)	0.932
Edema	4 (16.67%)	0 (0.0%)	4 (21.1%)	0.261
Abdominal distention	4 (16.67%)	1 (20%)	3 (15.8%)	0.822
Hematemesis	3 (12.5%)	1 (20%)	2 (10.5%)	0.569
Splenomegaly	8 (33.33%)	2 (40%)	6 (31.57%)	0.722
Hepatomegaly	16 (66.67%)	3 (60%)	13 (68.4%)	0.722
Encephalopathy	4 (16.67%)	1 (20%)	3 (15.8%)	0.822
Itching	11 (45.83%)	3 (60%)	8 (42.1%)	0.475

Clinically; the majority of cases (90%) presented with jaundice while hepatomegaly was reported in about two third of cases and dark urine was reported in 54% of cases. Less commonly, the patients complained of repeated vomiting, itching, splenomegaly, abdominal distention and lower limb edema (Table 2). Of note that four cases had arrived to emergency unit with hepatic encephalopathy and three cases had arrived with hematemesis.

Table (3): Comparison of laboratory findings before treatment in the studied patients regarding sex .

Mean ±SD	Male(n= 5)	Female(n= 19)	P-value
HB (g/dL)	9.92 ±1.92	10.76 ±2.24	0.45
WBCs (/mm3)	6.46 ±1.42	7.27 ±1.72	0.34
PLT (/mm3)	268 ±65.92	236.42 ±62.39	0.32

INR	1.68 ±0.34	1.57 ±0.5	0.64
PT (sec)	15.52 ±1.21	19.31 ±6.14	0.19
Total bilirubin (mg/dl)	12.64 ±6.87	8.22 ±5.9	0.16
Direct bilirubin (mg/dl)	10.56 ±6.2	6.77 ±5.32	0.18
Indirect bilirubin (mg/dl)	2.08 ±0.94	1.44 ±0.79	0.13
AST (IU/l)	898.8 ±588.8	763.05 ±469.2	0.58
ALT(IU/l)	901.2 ±583.4	801.1 ±480.6	0.69
GGT (IU/l)	92.4 ±2.7	102.3 ±54.9	0.69
ALP (IU/l)	626.4 ±134.7	556.15 ±133.2	0.3
Total proteins (g/dl)	7.91 ±1.72	7.57 ±1.3	0.63
Globulin (g/dL)	3 ±0	2.88 ±0.32	0.41
Albumin (mg/dl)	3.06 ±0.8	3.01 ±0.51	0.86
IgG (mg/dl)	2508.85 ±1633.5	2675.52 ±1220	0.8

P value >0.05: Not significant, P value <0.05 is statistically significant, p<0.001 is highly significant, SD: standard deviation,

Laboratory investigations showed that all patients had prolonged INR and prothrombin time with no significant difference between males and females. Hemoglobin levels and WBC count were higher in females than males while platelet counts were slightly higher in males than females. However, the differences were not statistically significant (Table 3).

Liver function tests at time of presentation revealed elevated transaminases and direct hyperbilirubinemia in all cases. In addition, immunoglobulin G was elevated in all cases with no significant difference between male and females (Table 3). Regarding viral serology, all patients had negative HAV IgM, CMV IgM, Ebstein virus IgM, HBsAg and HCV Ab.

Table (4) Types of AIH

	No(%)	Male	Female	P value
AIH type 1	22	3	19	0.069
AIH type 2	1	0	1	
Seronegative AIH	1	1	0	

P value >0.05: Not significant, P value <0.05 is statistically significant

According to auto antibodies profile, 22 patients (19 females) were positive for ASMA/and or ANA (AIH type I), one patient was positive for LKM-1 Ab (AIH type II) and one patient was

negative for autoantibodies (seronegative AIH) and diagnosed by liver biopsy in addition to clinical findings and elevated transaminases and immunoglobulin G. (Table 4)

Table (5): Histopathological findings in the study patients.

Histopathological features	**Number (%)**	**Males(n(%)**	**Females(n(%)**	**P value**
Interface hepatitis	11 (45.33%)	1 (20%)	10 (52.6%)	0.193
Lymphocytic infiltrates	19 (79.16%)	5 (100%)	14 (73.7%)	0.197
Hepatocyte rosette formation	17 (70.83%)	4 (80%)	13 (68.4%)	0.612
Emperipolesis	4 (16.6)	1(20%)	3(15.8%)	0.73
Piecemeal necrosis	15 (62.5%)	4 (80%)	11 (57.9%)	0.364
Hepatitis activity index(Mean±SD)	7.67 ±1.24	7.4±1.3	6.9±2.4	0.694
Fibrosis stage - F0 - F1 - F2 - F3	 4 (16.6%) 12(50%) 4(16.6%) 4(16.6%)	 1 (20%) 3 (60%) 1 (20%) 0 (0.0%)	 3 (15.8%) 9 (47.4%) 3 (15.8%) 4 (21.1%)	0.738

P value >0.05: Not significant, P value <0.05 is statistically significant

Histopathological findings of liver biopsies of all patients were compatible with autoimmune hepatitis. Among the cohort, the main finding was portal and lobular lympho-plasmocytic infiltrate that has been detected in all investigated tissue samples. Other findings that favored diagnosis of autoimmune hepatitis including hepatocyte rosette formation and emperipolesis (hepatocytes engulfing lymphocyte) were detected in 70.83% and in 16.6%, respectively. Piecemeal necrosis (interface hepatitis) was observed in 62.5% (Table 5 and Figure 1). Hepatitis activity index (HAI) and degree of liver fibrosis were evaluated according to Ishak Method[15] **.**The mean hepatitis activity index (scale 0-18 according to Ishak method) was 7.67 ±1.24 (Table 5). The activity index was higher in males compared to females (7.4 ±1.34 versus 6.94 ±2.4), however, this difference was not statistically significant (P-value=0.68). Regarding fibrosis stage (scale 0-6 according to Ishak method), two third of cases had no or minimal fibrosis (F0-1) and the remaining cases had mild to moderate fibrosis (F2-3).

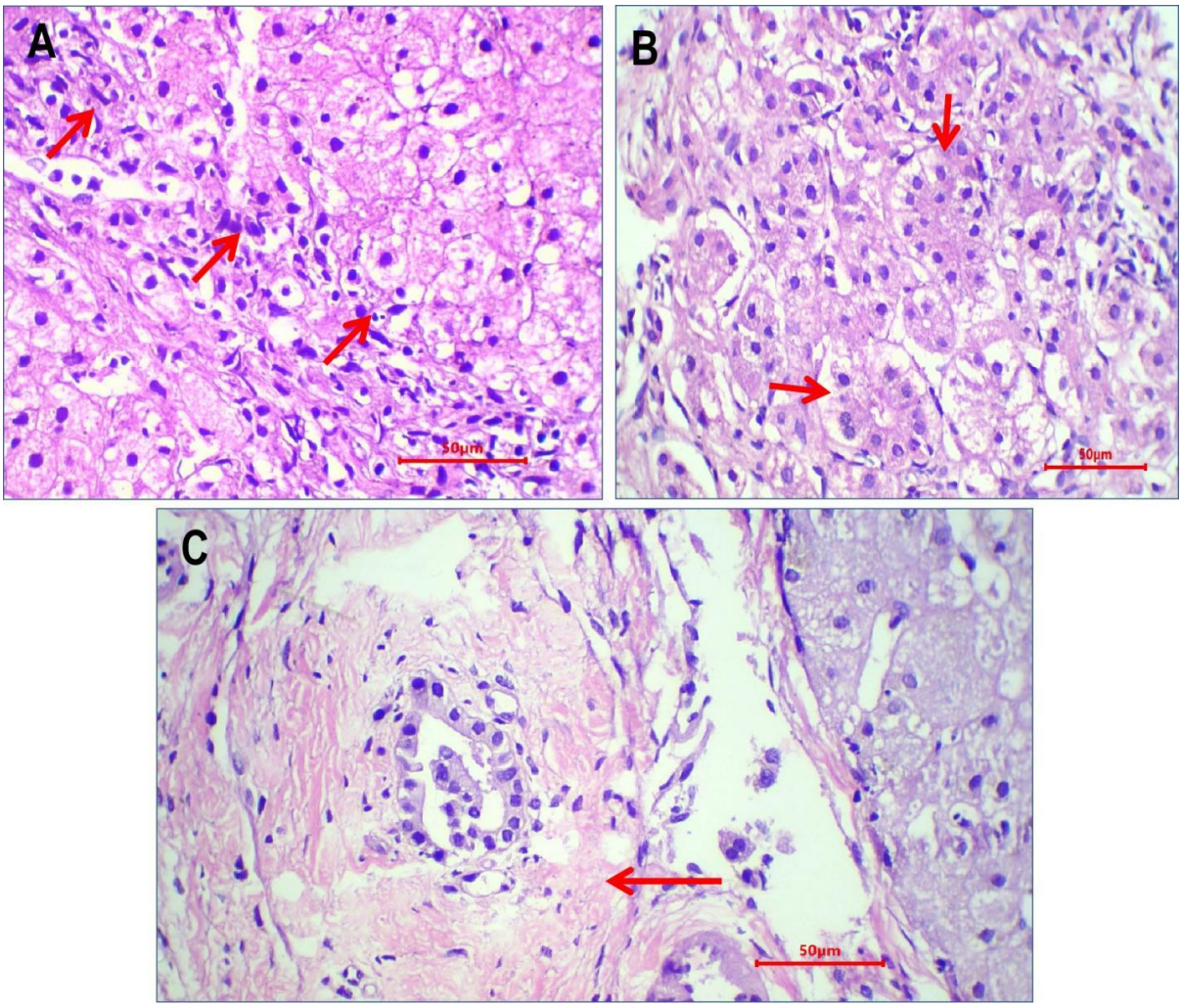

Figure 1: Histological findings of investigated cases: Sections of liver tissue of different cases with autoimmune hepatitis showed lympho-plasmocytic infiltration of portal areas with interface hepatitis (A, arrows), hepatocyte rosette formation (B, arrows), and fibrous expansion of portal tract; F1 (C, arrow). H&E stain; magnification is x400 for all.

According to IAIHG score, probable AIH was diagnosed in 20 cases (15 females) and definite AIH was diagnosed in 4 cases (all were females). Females had a significantly higher AIH score compared to males, indicating more severe disease (13.47 ±2.14 versus 11.2 ±1.09, *p* value=0.03).

Table (6): Distribution of Liver function test (LFTs) before and after treatment in the studied group.

Mean ±SD	Before treatment	After treatment	P-value
Liver function test (LFTs)			
Total bilirubin (mg/dl)	10.43±5.4	3.47±1.3	**< 0.001**
Direct bilirubin (mg/dL)	8.66±5.1	1.68±0.47	**< 0.001**
Indirect bilirubin (mg/dL)	1.76±0.9	1.70±0.8	0.81
AST (IU/l)	830.9±521.4	80.5±43.2	**< 0.001**
ALT(IU/l)	851.15±497.2	94.26±47.9	**< 0.001**
GGT (IU/l)	97.35±29.1	53±16.01	**< 0.001**
ALP (IU/l)	591.25±157.1	191.1±22.8	**< 0.001**

P value >0.05: Not significant, P value <0.05 is statistically significant, p<0.001 is highly significant, SD: standard deviation

Regarding treatment, 8 cases (33.33%) received prednisolone alone and in 16 patients (66.67%) received combined prednisolone and azathioprine drugs due to incomplete response to prednisolone alone. Regarding outcome, treatment was effective for most patients, with 16/24 (66.67%) achieving complete remission, while partial remission was achieved in 5/24(20.83%) and relapse occurred in 3/24 (12.5%). There was highly significant decrease in all liver function parameters except indirect bilirubin in comparison to the level before treatment (Table 6).

Four patients with acute liver failure (encephalopathy) achieved remission on medical treatment. In addition, patient with negative autoantibodies (diagnosed clinically and by elevated transaminases and liver biopsy) was improved on medical treatment and achieved complete remission. Complications of treatment occurred in one patient in the form of Cushinoid facies due to prednisolone administration that improved after gradual withdrawal of the drug.

Table (7): Relation between Hepatitis activity index and AIH score and treatment response,

	Treatment response			**P value**
	Complete remission(n=16)	**Partial(n=5)**	**Relapse(n=3)**	
Hepatitis activity index(Mean± SD)	6.69±1.7	8.28±2.3	8.63±3.5	**0.046***
AIH score Mean± SD	12.11 ± 3.3	12.46±2.04	14.5±1.5	**0.039***

P value >0.05: Not significant, * P value <0.05 is statistically significant, p<0.001 is highly significant, SD: standard deviation.

Both hepatitis activity index and IAIHG score of AIH were significantly higher in patients who developed relapse compared to patients with partial and complete remission (Table 7).

Discussion

AIH, an idiopathic progressive inflammatory hepatic disorder, can progress to cirrhosis and liver failure in the absence of treatment [(17)]. Significantly, only one study to date has investigated pediatric AIH in Upper Egypt [(18)]. To address this knowledge gap, this research was designed to evaluate the clinical, biochemical, and histopathological characteristics, as well as the treatment outcomes, of children diagnosed with AIH at the Department of Pediatrics, Sohag University Hospital, Sohag University.

In our prospective observational study involving 24 children with AIH, the mean age at presentation was 6.3 ± 2.5 years. This age distribution is comparable to that reported in other studies[(5,18,19)].Female sex is a well-established risk factor for autoimmune hepatitis (AIH), with a high prevalence among females, representing roughly three-quarters of affected individuals [(20)] . In this study, 79% of the patients were females, which aligns with the reported female predominance in previous studies, such as Altamimi et al. [(19)] (75%) and Mogahed et al. [(5)] (64.7%).

A significant finding of this study was the 58.3% positive consanguinity rate, exceeding those reported by Behairy[(21)] (24%) and Schmutz et al. [(22)] (0%), likely attributable to the high prevalence of consanguineous marriage in Upper Egypt. Additionally, 16.6% of our patients had a family history of liver disease, a finding consistent with Smolka et al. [(23)] (25%) and Arcos-Machancoses et al. [(11)] (29.0%).

Gender comparisons revealed no significant differences in age, weight, or height, but a lower BMI in females. Consanguinity and family history did not differ by gender, mirroring Malakar et al. [24].

Jaundice was the predominant presenting symptom in our study, affecting 91% of AIH patients. Hepatomegaly was observed in approximately two-thirds, and dark urine in 54%. Less common symptoms included recurrent vomiting, pruritus, splenomegaly, abdominal distension, and lower limb edema. Notably, four patients presented with hepatic encephalopathy and three with hematemesis. These findings are consistent with Schmutz et al. [22], who reported 90% jaundice and 87.5% hepatomegaly. Altamimi et al. [19] also found jaundice (75%) as the most common symptom, followed by emesis and abdominal distension (43.8%).

All our patients had prolonged INR and prothrombin time, with no gender differences, aligning with Malakar et al. [24] , Behairy [21] , and Abu Faddan et al. [18] .Our study showed minor, non-significant differences in hematological parameters between genders, with females having slightly higher hemoglobin and WBC counts, and males slightly higher platelet counts, consistent with Behairy [21] and Abu Faddan et al. [18] .

All AIH patients in our study had elevated transaminases, direct hyperbilirubinemia, and IgG, with no significant gender differences, mirroring Malakar et al. [24] and Behairy [21] .

The diagnosis of AIH relies on a combination of clinical, biochemical (elevated IgG), serological (autoantibodies), and histological criteria [6] . AIH is categorized into type 1 (ASMA and/or ANA positive) and type 2 (anti-LKM-1 positive) based on autoantibody profiles[2] .

Our study revealed that 22 patients had type1 AIH, one had type 2, and one had seronegative AIH. This pattern is consistent with Mogahed et al. [5] (70.5% type 1, 26.4% type 2, one seronegative) and Abu Faddan et al. [18] (73.5% type 1, 26.5% type 2). Dehghani et al., [25] in their study of 68 AIH patients, reported a broader distribution with 36 patients type 1, 6 type 2 , and 26 seronegative cases. El-Din Elshazly et al. [26] reported 75% type 1 and 25% type 2. However, Behairy[21] and El-Koofy et al. [27] reported exclusively type 1 AIH in their Egyptian studies, highlighting regional variations.

Liver biopsy is crucial in AIH for diagnostic confirmation, excluding other

etiologies, and assessing fibrosis and disease severity[6] . Typical histological features include interface hepatitis, portal inflammation, plasma cells, hepatocyte rosettes, and emperipolesis[28]. Our cohort's histopathological findings strongly supported AIH diagnosis, with lymphoplasmacytic infiltrates in all patients, hepatocyte rosettes in 70.8%, emperipolesis in 16.6%, piecemeal necrosis in 62.5%, interface hepatitis in 45.3%, and variable fibrosis. These findings are consistent with Altamimi et al. [19], who reported AIH-consistent biopsies, with interface hepatitis in 81.3%, lymphocytic infiltrates in 62.5%, lymphoplasmacytic portal infiltrates in 43.8%, and hepatocyte rosettes in 12.5%. Both studies observed variable fibrosis, with our cohort having two-thirds with F0-F1 fibrosis and the rest with F2-F3, mirroring Altamimi et al.'s [19] observations of no fibrosis to advanced fibrosis.

According to the IAIHG score for AIH, probable AIH was diagnosed in 20 cases (15 females), and definite AIH was diagnosed in 4 cases (all were females). Notably, females in our cohort had a significantly higher IAIHG score compared to males(13.47 ± 2.14 versus 11.2 ± 1.09 ($p = 0.03$) . This finding suggests that females with AIH in our study may experience more severe liver involvement compared to their male counterparts, as reflected by the higher IAIHG scores. These results align with existing literature, where female patients tend to present with more aggressive forms of autoimmune hepatitis, which could explain the difference in the disease severity scores observed between the sexes. However, Malakar et al. [24] , found no significant difference in AIH severity between males and females. Also, Al-Chalabi et al. [29] noted that while females tend to have a higher immune response in autoimmune hepatitis, this does not necessarily correlate with increased disease severity or worse outcomes. On the other hand, Floreani et al. [30] observed that male patients tend to suffer from more severe liver injury compared to females.

The treatment regimen proved to be effective for the majority of patients, with 66.67% achieving complete remission, 20.83% achieving partial remission, and 12.5% experiencing a relapse during the study period. Our findings were consistent with Abu Faddan et al. [18] who observed complete remission in 67.6% of patients and partial remission in 17.6%, and relapses occurred in 20.7% of patients. Additionally, Behairy[21] found that prednisone, with or without azathioprine, led to complete

remission in 52% of patients, though relapses were seen in 48% of cases. Also, El-Koofy et al. [27] , reported that treatment with prednisone and/or azathioprine effectively reduced inflammation in 33% of their patients, with 33.3% achieving complete remission, 10% achieving partial remission, and 56.7% experiencing relapses.

Interestingly, both the hepatitis activity index (HAI) and the IAIHG score of AIH were significantly higher in patients who developed relapse compared to those who achieved partial or complete remission. These findings are consistent with the study by Takahashi et al.[31] , which identified both disease activity and treatment regimen as major risk factors for relapse in AIH. In contrast, Bahçeci et al. [32] did not find a direct association between the AIH score and relapse. This probably due variation of age of studied patients.

Limitations

The findings of this study should be interpreted with caution due to limitations such as a small sample size, its single-center setting, and a relatively brief follow-up period. To strengthen the evidence base and identify predictors of adverse events, future research should focus on conducting larger, multi-center studies with prolonged follow-up.

Conclusion

This study confirms that type 1 AIH is the predominant subtype among children referred to Sohag University Hospital, with female predominance and good treatment response. Nevertheless, the association between higher disease activity scores and relapse underscores the importance of vigilant monitoring.

Recommendation:

We recommend multicenter studies with extended follow-up period to support results of this study

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