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Hepatitis C Virus and infertility

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Abstract

Infertility is defined by inability to conceive after one year or more of unprotected sexual intercourse. Its causes by several causes including viruses such as Hepatitis C Virus. Hepatitis C Virus is sexually transmitted virus effect on reproductive system in male and female and caused infertility. The aim of study was to finding the correlation between Hepatitis C Virus and infertility. Case control study using ELISA technique for 90 serum samples, 50 patients with infertility (males and females) selected from private laboratories in Al-Nasiriya city from November 2021 to February 2022. Inclusion criteria of subjects include male and female patients who have infertility with age range 16-46 years old. The diagnosis was based on the clinical and laboratory examinations under the supervision of a specialist physician. The control group included 40 adults per some (males and females) who have children and look healthy. Both patients and control group received a set of questions. The results showed mean age of patients and control in this study was 30.62 with higher infertility rate 43-46 years old. The results detection of anti–HCV IgM antibody the infection percentage in male was highest (92.00%) than in female. On the other hand, detection of anti–HCV IgG antibody appear the infection in female was greater (24.00%) than in male. Hepatitis C Virus (HCV) considered as risk factor to cause infertility in male and female by affecting reproductive functions in both sexes.

Keywords: ELISA, Hepatitis C virus, infertility.

i. Introduction

Infertility is defined as one year or more unprotected sexual intercourse without pregnancy. It has a significant impact on a couple's quality of life, as well as their careers, daily routines and sexual and nonsexual relationships. (1)

A personal tragedy for millions of couples worldwide is their inability to conceive. Infertile people have a sense of failure, loss, and alienation due to the accompanying personal and social matters. Infertility has been a more widespread issue over the past 30 years due to sociological trends including the tendency for marriage at a later age and the rising usage of contraception (2). There are two types of infertility: primary and secondary, primary infertility are individuals who have never given birth before while, secondary infertility is the occurrence at least one pregnancy without it occurring again (3).

In addition to the types infertility can result from a wide range of circumstances including hormonal imbalances, physical causes, environmental variables, lifestyle choices, hereditary factors, and sexually transmitted disease (STDs) (4).

Hepatitis C virus (HCV) can cause acute and chronic hepatitis that eventually result in permanent liver damage and hepatocellular cancer (5). HCV is spread by sexual intercourse and contact with infected blood (6). HCV replication correlated with sperm apoptosis, necrosis and the worsening of all functional sperm parameters (7), reduced fertility index and increase sperm diploidy indicate that sperm apoptosis and necrosis play a significant role in an infertile patients

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(8). HCV infection has been associated with defect sperm mitochondrial membrane potential, chromatin compaction, and DNA fragmentation were all significantly altered. HCV infection has been linked to sperm abnormalities such as diminished motility, aberrant morphology, and a lower sperm count (9).

ii. Subject and methods

The present study is based on Enzyme-linked immune sorbent assay (ELISA) in to detect of both IgM and IgG antibody against HPV. A total number of 50 patients with infertility (males and females) that selected from private laboratories in Al-Nasiriya city from November 2021 to February 2022.

Inclusion criteria of subjects include male and female patients who have infertility with the age range of 16-46 years old. The diagnosis was based on the clinical and laboratory examinations under the supervision of specialist physician. The control group include 40 adults (males and females) who have children and look healthy. Both patients and the control group received a set of questions.

Sample collection and ethical approval

Five ml of venous blood was taken from patients and the control group. Blood was collected in coagulate gel tubes and left to clot at room temperature, then centrifuged at 3000 rpm for 10 minutes to separate the serum, the serum sample was separated in 2.0 ml Eppendorf tubes for serological tests. Serum samples were frozen at (-20C) in laboratories until delivered to the working laboratory at Pathological Analysis Department at College of Science, University Thi-Qar.

This study was subjected to the qualification of ethical consideration and according to the form prepared for this purpose by the Iraqi Ministry of Health. Also, the research got to agreement by the committee of ethical standards at the College of Science, University of Thi-Qar, one of the colleges belonging to the Ministry of Higher Education and Scientific Research Iraq. In addition, informed consent was obtained from all patients and healthy persons before taking samples.

iii. Statistical analysis

The statistical analysis of this case-control study performed with the statistical package for social sciences (SPSS) 20.0. Numerical data were tested for normality testing using Shapiro-Wilk test found that the data were abnormally distributed. The data described as median and 5-95 confidence interval and Mann–Whitney U test used for comparison between two groups. Categorical data were described as count and percentage. The lower level of accepted statistically significant difference is bellow or equal to 0.05.

Relative risk used to estimate the potential risk of pathogen associated with incidence of disease.

iv. Results

Age and sex groups

The current study includes 90 patient divided into 50 patients who have infertility and 40 with healthy reproductive control. The age range of infertile patients included in this study was 16-46 years old, with an age mean of 30.62 years old. The results showed that 95% of infertility occurs within age 43-46 years old while only 5% of infertility lay within age 16-20 years old.

Regarding control group, those patients were selected to be within the age group of patients to exclude the effect of age to get a viral infection. However, the mean of age for control group was 28.30 years old and statistically there were no significant differences between patients and control regarding the age ($P = 0.774$), (Table1).

Table (1): Distribution of patient and control groups according to the age

		Study groups	
		Patient	Control
Age (years)	Mean	30.62	28.30
	Standard Deviation	6.87	4.54
	Median	30.00	28.00
	Percentile 05	20.00	19.50
	Percentile 95	43.00	35.00
P value		0.774 NS	

NS: None significant differences

Infertile patients divided into male and female and the results showed presence of infertility in (50%) of female and (50%) of male in the present study. (Table2).

Table (2): Correlation between sex and age of patient and control groups

		Study groups		p value	relative risk
		Patient	Control		
HCV IgM	Positive	36	18	0.009*	1.7 (1.1-2.7)
		72.00%	45.00 %		
	Negative	14	22		
		28.00%	55.00 %		
HCV IgG	Positive	6	3	0.367 NS	1.2 (0.7-2)
		12.00%	7.50%		
	Negative	44	37		
		88.00%	92.50 %		

NS: None significant differences

*: significant differences

Result of viral diagnosis

Detection of Anti–HCV IgM and IgG Antibodies

Detection of anti–HCV IgM and IgG antibody appear to be higher in percentage (72.00%, 12.00%) respectively than in control and the results showed significant differences between patients and control groups regarding detection of HCV IgM antibody (P=0.009*) but, results indicate to no significant differences between patients and control depending on detection HCV–IgG antibody (P=0.367^{NS}). Relative risk was higher in anti-HCV IgM (RR=1.7), (Table 3).

The results indicate that to detect of anti–HCV IgM antibody the infection percentage in males was higher (92.00%) than in females. On the other hand, the detection of anti–HCV IgG antibody appears the infection in female was greater (24.00%) than in male. Relative risk appear in male greater (RR=6.3) than in female depending on detection of anti-HCV IgM antibody whereas, in an anti-HCV IgG was higher in female (RR=1.3), (table 4 and table 5).

Table (3): Detection of Anti–HCV IgM and IgG antibody in patients and control group

		Sex			
		Female		Male	
		Patient	Control	Patient	Control
Age (years)	Mean	27.88	28.15	33.36	28.45
	Standard Deviation	6.41	5.59	6.30	3.30
	Median	28.00	28.50	32.00	28.00
	Percentile	50%		50%	
P value		0.894^{NS}		0.022*	

NS: none significant differences

*: significant differences

Table (4): Comparison between male and female of infertile patients regarding detection of Anti–HCV IgM antibody

NS: none significant differences

		Female		Male	
		Patient	Control	Patient	Control
HCV IgM	Positive	13	12	23	6
		52.00%	60.00%	92.00%	30.00%
	Negative	12	8	2	14
		48.00%	40.00%	8.00%	70.00%
p value		0.408 NS		<0.001**	
relative risk		0.86 (0.5-1.46)		6.3 (1.7-23.5)	

NS : none significant differences

**: high significant differences

Table (5): Comparison between male and female of infertile patients regarding detection of Anti–HCV IgG antibody

		Female		Male	
		Patient	Control	Patient	Control
HCV IgG	Positive	6	3	0	0
		24.00%	15.00%	0.00%	0.00%
	Negative	19	17	25	20
		76.00%	85.00%	100.00%	100.00%
p value		0.358 NS			
relative risk		1.3 (0.7-2.2)			

NS: none significant differences

v. Discussion

Infertility is a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse (10).

HCV primarily affects liver cells, but it can also have an impact on other tissues and organs, including the skin, eyes, joints, immune system, neurological system, kidney and even male germ cells (11).

The main way that HCV causes infertility is by damaging the sperm membrane, which limits the sperm's ability to move and unite with the ova (12).

The current study indicates to the percentage of anti-HCV antibodies in both patients and control groups. The results showed the detection of anti-HCV IgM in 72% and anti-HCV IgG in 12% of patients. In the same manner, the present study showed detection of anti-HCV antibodies in (92%) of males patients more than in females (52%). These findings were same in previous studies performed in Iran in 2018, Male participants had anti-HCV antibody significantly higher prevalence 19.46% than female (13), the same was detected in a study conducted in Yazd, Iran where the percentage of anti-HCV was in 20 from 47 of male patients and HCV effect on sperm count (42.55%) of infertile male (14). Also, same findings were detected in Brazil in 2002, which indicate to presence anti-HCV in men 3.7% and anti-HCV in women 3.2% of infertile patients (15).

A study in Ahvaz, Iran in 2012, showed opposite finding by presence of anti-HCV in female (0.8%) more than in male (0.4%) (16).

Hepatitis C viruses detected in men with testicular, accessory gland, urethral infections and also found in their semen in both symptomatic and asymptomatic. The virus linked to lower sperm concentration, motility and poor sperm quality (17). HCV infection causes changed sperm characteristics such as reduced motility, aberrant morphology and lower sperm count. However, Viral particles can be found in seminal plasma and other cell fractions but spermatozoa do not contain viral particles (18).

HCV seropositivity has been associated with poor ovarian response to stimulation and the HCV-positive women appeared to have a reduced response to hormonal stimulation. HCV infection in women was associated with weak responses to exogenous gonadotropin stimulation, which in turn increased the likelihood of apoptosis and decreased the rate of ovarian follicle formation (19).

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