



**Effect of Isolation Procedures and  
Infection Control Measures in HCV  
Seroconversion in Hemodialysis  
Patients**

*Thesis*

*Submitted for partial fulfillment of Master Degree in Internal  
Medicine*

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2019



دراسة تأثير إجراءات العزل ومكافحة العدوى على منع  
انتشار الإصابة بفيروس الالتهاب الكبدي الوبائي سي في  
مرضى الإستصفاء الدموى المنتظم

رسالة

توطئة للحصول علي درجة الماجستير

في الباطنة العامة

مقدمة من

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٢٠١٩

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

لسببائك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العظيم

صدق الله العظيم

سورة البقرة الآية: ٣٢



## **Acknowledgement**

*First and foremost thanks to **ALLAH**, the Most Merciful.*

*I would like to express my deep gratitude and appreciation to **Dr. Prof. Iman Ibrahim Sarhan** Prof. of Internal Medicine & nephrology Faculty of Medicine- Ain Shams University, for her continuous help and unlimited support.*

*I am greatly indebted and grateful to **Dr. Amr Mohamed Mohab Ibrahim** Lecturer of Internal Medicine & nephrology Faculty of Medicine - Ain Shams University, for his continuous encouragement to bring this work to the attempted goal.*

*I am greatly grateful to **Dr. Fatma Abd Elrahman** lecturer of internal medicine & nephrology faculty of medicine – Ain shams university, for her unlimited support and help in reviewing my work to bring it to the attempted goal.*

***Shady Khamis aly hussien***

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## *List of Abbreviations*

<b>APC's</b>	: Antigen presenting cells
<b>APRI</b>	: Ast to-platelet-index
<b>aRR</b>	: Adjusted relative risk
<b>AST, ALT</b>	: Aspartate transaminase , alanine transaminase
<b>BAFF</b>	: B cell-activating factor
<b>CC</b>	: Homozygous normal
<b>CDC</b>	: Centers for disease control
<b>CHC</b>	: Chronic hepatitis C
<b>CKD</b>	: Chronic kidney disease
<b>CT</b>	: Heterozygous
<b>DAAs</b>	: Direct-acting antivirals
<b>EIA</b>	: Enzyme immunoassay
<b>ER</b>	: Endoplasmic reticulum
<b>eRVR</b>	: Extended rapid virological response
<b>HBV</b>	: Hepatitis B virus
<b>HCV</b>	: Hepatitis C virus
<b>HD</b>	: Hemodialysis
<b>HGF</b>	: Hepatocyte growth factor
<b>HIV</b>	: Human immunodeficiency virus
<b>HR</b>	: Hazard ratio
<b>IDU</b>	: Injection drug use
<b>IFN</b>	: Interferon
<b>IL28B</b>	: Interleukin 28b
<b>INASL</b>	: Indian national association for study of the liver
<b>KDIGO</b>	: Kidney disease improving global outcomes
<b>LVPs</b>	: Lipoviral particles
<b>NAT</b>	: Nucleic acid testing
<b>NHANES</b>	: National health and nutrition examination surveys
<b>ORF</b>	: Open reading frame
<b>PEG</b>	: Pegylated
<b>PIs</b>	: Protease inhibitors
<b>PWID</b>	: People who inject drugs

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## *List of Abbreviations*

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<b>PWV</b>	: Pulse wave velocity
<b>RBV</b>	: Ribavirin
<b>RIBA</b>	: Recombinant immunoblotting assay
<b>RT-PCR</b>	: Reverse transcription - polymerase chain reaction
<b>RVR</b>	: Rapid virologic response
<b>SVR</b>	: Sustained virological response
<b>SVR</b>	: Sustained virologic response
<b>TT</b>	: Homozygous variant
<b>UTRs</b>	: Untranslated regions

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## ABSTRACT.

This study was performed to assess the effect of isolation procedures and infection control measures in HCV seroconversion in hemodialysis patients. This hospital-based cross-sectional observational study was conducted at the Department of Nephrology at elmaadi military hospital, Cairo, Egypt, from January 2015 to January 2017. 80 patients on regular hemodialysis known as HCV negative at the start of dialysis were divided into two groups ( 40 patients with equipment isolation only, 40 patients with equipment and personnel isolation on maintenance hemodialysis) were studied. After obtaining through medical history, blood samples was drawn for,liver function , serum Albumin, Viral Hepatitis HCV Ab and HCV-PCR every three months, Descriptive and inferential statistical analyses were performed using SPSS version 20.0 and Graph Pad Prism package; v.5.0. strict adherence to isolation and infection control measures were significant in lowering rate of HCV seroconversion among HD patients with asignificant p value  $>0.004$ .

**Key word:** Isolation, Infection, Measures, seroconversion, HCV

## **Introduction**

Hepatitis C infection is a major public health threat. Since its discovery in 1989, the hepatitis C virus (HCV) has been shown to be responsible for a chronic infection in up to 80% of infected people, with a possible evolution to major complications including cirrhosis and primary hepatocellular carcinoma.

It has been evaluated that hepatitis C virus was involved in 27% of cirrhosis a 25% of hepatocellular carcinoma worldwide. According to the geographic area, 10% to 90% of liver transplants are due to complicated chronic hepatitis C (*Bruggmann et al., 2014*).

HCV is a RNA mono-stranded enveloped virus belonging to the Flavivirus family. Eleven genotypes are currently recognized with many subtypes within a same genotype. The infidelity of the HCV RNA-dependent RNA polymerase is mainly responsible for the huge variability of the viral genome, leading to the constitution of a quasi-species in chronically infected subjects (*Pozzetto et al., 2014*).

This variability together with a poor understanding of the pathophysiology of chronic HCV infection explains the present inability at developing an effective prophylactic vaccine (*Honegger et al., 2014*).

The prevalence of HCV infection is historically high in patients attending hemodialysis units.

In developed countries, a significant decrease was observed in this population during the last decades: from 10.4% in 1995 to 7.8% in 2002 in the United States (*Pozzetto et al., 2014*); from 13.5%, 42% and 20% in 1991 to 6.8%, 30% and 16% in 2000 in Belgium, France and Italy, respectively (*Fabrizi et al., 2008*). While in Egypt the prevalence is 14.9% (*Pozzetto et al., 2014*).

A meta-analysis of HCV incidence rates in hemodialysis patients showed an overall estimation of 1.47 per 100 patient-years with extremes ranging from 0.00 to 8.05; the country's development level together with initial prevalence were able to explain 68% of the observed heterogeneity (*Su et al., 2013*).

Although blood transfusions may have contributed to propagate HCV in hemodialysis patients, the discontinuation of this practice did not interrupt the emergence of new cases.

The role of nosocomial transmission of HCV has been assessed by molecular analysis that demonstrated the genomic identity of HCV strains within patients of the same unit (*Patel et al., 2010*). Environmental contamination by HCV-positive blood and insufficient adherence to hygienic measures were incriminated in such

units where the exposure to blood is omnipresent (*Girou et al., 2008*).

The role of blood is also illustrated by the higher incidence of HCV infections in patients attending hemodialysis units than in those under peritoneal dialysis or hemodialysed at home. By contrast, neither the use of hemodialysis machines dedicated to HCV infected patients nor isolation of these patients were shown as determinant for preventing new contaminations within the unit (*Fabrizi and Martin, 2010*).

It is important to note that HCV infection is an independent predictor of mortality in hemodialysis patients. This finding stresses the need to reinforce the hygienic measures and to monitor at least annually the markers of HCV infection in this population.

For hemodialysis patients already contaminated by HCV, treatment vary according to the presence of cirrhosis or not where the new medications like QUEREVO plus RIBAVIRINE, if tolerable, show the new trend for treating infected patients ( **Barsoum et al .,2017**).

## **Aim of the work**

To evaluate the effect of Infection Control Measures and isolation procedures in HCV seroconversion in Hemodialysis Patients..

# Hepatitis C Virus

## **Virology**

HCV, a member of the Hepacivirus genus within the Flaviviridae family, has a viral genome consisting of single-stranded RNA with positive polarity that is approximately 9.5 kb long (*Choo et al., 1991*). Untranslated regions (UTRs) located at the 5' and 3' ends of the genome flank a single open reading frame (ORF), which encodes a polyprotein of approximately 3000 amino acids (*Choo et al., 1991*).

The polyprotein is processed by viral and cellular proteases that produce mature viral structural and non structure proteins. Structural proteins, including the core protein and envelope glycoprotein 1 (E1) and E2, are encoded in the N-terminal region of the ORF, whereas NS proteins, including NS1, NS2, NS3, NS4B, NS5A and NS5B, reside in the C-terminal region (Figure 1). HCV core protein is not only a component of the viral nucleocapsid but also a multifunctional protein that modulates viral and cellular gene expression (*Piñeiro and Martinez-Salas, 2012*).

The assembly of HCV requires a platform of cellular lipid droplets and interactions between NS5A and the core protein (*Masaki et al., 2008*) (Figure 2). Thus, most HCV-associated metabolic alterations in hosts involve HCV core