

# Hepatitis C Viral Infection among Health Care Workers at Dialysis Centers in Khartoum State, Sudan

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**Abstract:** *Hepatitis C virus infection continues to be a major public health problem warranting high priority efforts for control and treatment. An observational, cross-sectional facility based study was conducted to measure the prevalence of HCV infection and to identify risk factors associated with HCV infection among health care workers at dialysis centres in Khartoum State, Sudan. A total of 109 participants were selected. It conducted through stratified random sampling. For the analysis, Z-test and Fisher's exact test were used. All participants in this study were tested for HCV marker (Anti-HC), the positive for Anti-HC was found to be 1.8% (2/109), which was found among nurses and medical engineers. The results showed association between Anti-HC positivity and blood transfusion, frequency of blood transfusion and exposure to sharp injuries, P values ( 0.003, 0.0001 and 0.029) respectively. **Conclusion:** prevalence rate of Anti-HC was found to be low in HCWs (1.8%). The prevalence rate was found among nurses and medical engineers. Blood transfusion, frequency of blood transfusion and exposures to sharp injuries to be risk factors with Anti-HC positivity.*

**Keywords:** HCV marker, Dialysis Centers (Units), health care workers, risk factors, Khartoum State, Sudan

## 1. Introduction

Hepatitis C virus infection continues to be a major public health problem. WHO estimates that HCV infection has an estimated worldwide prevalence of more than 500 million cases [1]. Approximately, 170 million people worldwide are chronically infected with hepatitis C virus (HCV) [2]. The health care workers (HCWs) are at risk of infection with blood borne pathogens through occupational exposure to blood and infectious body fluids [3]. Approximately 3 million percutaneous exposures to blood borne pathogens occur annually among 35 million HCWs worldwide. These injuries are estimated to result in 16,000 hepatitis C, 66,000 hepatitis B, and 200 to 5000 HIV infections. Over 90% of these infections are occurring in low-income countries, and most are preventable [4]. Low endemicity areas include North America, Western Europe and Australia, where anti-HCV anti-bodies <1.5%. Areas with intermediate endemicity include Mediterranean countries and Asia (Anti-HCV 1–2%), while the highest endemicity has been detected in Africa, South- Eastern Asia and Latin America (Anti-HCV >2%) [1]. HCV infections are strongly associated with hepatocellular carcinoma in Sudan, the prevalence of HCV was found to be 1.5% among the hepatocellular carcinoma patients in Sudan [5]. Seroprevalence rate of HCV among Sudanese in range (between 2.2% to 4.8%) [6]. In Omdurman-Sudan, a cross - sectional study was conducted showed the seroprevalence of HCV was zero (0.0%) HCWs [7].

Limited information regarding to HCV infection among Sudanese HCWs for this reason we conducted this study aims to measure the prevalence of HCV infection and to identify risk factors associated with HCV infection among health care workers at dialysis centres in Khartoum State, Sudan.

## 2. Materials and Methods

### 2.1 Study Area

Khartoum State is one of the 16 States of Sudan. Khartoum is the political capital and commercial centre of the Sudan with an area of 28165 Km<sup>2</sup>. It is located between latitudes 15° - 16° North and longitudes 34° - 31.5° East. Khartoum state can be divided into three geographical areas. The first area: start from Almogran and it lies through between two Nile (Blue and White Nile) until Aljazera state southern, it involve two locality (Khartoum and Jabal Alawlia). The second area: is located in the North side, between Blue Nile and river Nile, it involves North Khartoum locality and East Nile locality. The third area: is located in west White Nile and river Nile and it involve three localities (Omdurman, Umbada and Karari) [8], [9]. There are twenty public dialysis facilities in Khartoum State and the number of HCWs about nine hundred most of them are administrative, this facilities it serve about (2650) haemodialysis patients.

This study was observational, cross-sectional facility based study. It was conducted at ten dialysis centres (units) in Khartoum State. A total of 109 HCWs were selected. All of them agree to participate in the study.

### 2.2 Inclusion Criteria

HCWs contact with patients or with blood or other body fluids from patients in dialysis facilities (Medical officers, Physicians, Nurses, Para medicals, La.tech, attendance theatres and Medical engineers).

### 2.3 Data collection

Data were obtained from (109) HCWs. A pre-tested, pre-coded self administered questionnaire was used to collect socio-demographic characteristics (age, sex, education,

marital status, occupation and duration of the work), past medical history (blood transfusion, frequency of blood transfusion, surgical operation, exposure to needle stick, using shared razors and tattoos). Informed consent from the selected health care workers (HCWs) obtained.

### 2.4 Laboratory investigation

Under sterilized condition about (5 ml) of venous blood was taken from each participant through venepuncture using a vacutainer device (blood collection containers) (EDTA container), the samples was stored upright in an ice box (vaccine carrier) /refrigerator at a temperature of 2°-8° C and brought to laboratory of Microbiology at Faculty of Medicine, University of Khartoum at the end of the day. Then the sera were separated by centrifugation at 3000 rpm for 5 minutes and stored at -20° centigrade till testing. ELISA was used to screen Anti-HC.

### 2.5 Data analysis

Data were processed using the statistical package for social sciences (SPSS) for WINDOW version 19. For the analysis, binomial test (Z-test) for single proportion and some non-parametric tests such as Fisher's exact test were used, P-value of < 0.05 was considered statistically significant.

## 3. Results

A total of one hundred and nine HCWs were recruited to the study. Sixty nine of HCWS (65.1%) were female and (34.9%) were male. The age group 15-30 years represents 63.3% of participants, followed by the age group 31-45 years 38 (34.9%) and only 2 (1.8%) less than 15 years. Twenty seven of HCWs (24.8%) were married while 82 (75.2%) unmarried. Concerning educational level 81.7% of HCWs were university graduate, 12.8% were postgraduate, 4.6% secondary education and 1% primary education. Regarding the occupation 73 (67%) HCWs were nurses, 11 (10.1%) lab. Technician, 10 (9.2%) medical officers, 8 (7.3%) medical engineers, 4 3.7% Para medicals, 2 (1.8%) physician and 1% theatre attendance. Concerning to the duration of the work 60.5% of HCWs in 1-5 years followed by the duration 6 -10 years 15.6%, less than one year 14.7% and more than ten years 9.2%. The originally of health care workers 53.2% from the Central region of Sudan, 31.2% from Northern, 13.8% from Western and 1.8% from Eastern region of Sudan.

### 3.1 Socio-demographic characteristics associated with Anti-HC positivity

Table (1) shows the socio-demographic characteristics of HCW, from table the positive cases among female 2.8% (2/71). Regarding to the age group the two positive cases recorded in age group 15-30 years. Also the two positive cases among unmarried 2.4% (2/82). For the educational level the positive cases among graduate education 2.2% (2/89). Concerning to the occupation, the prevalence among medical engineers and nurses 12.5% and 1.4% respectively. With regard to the original residency, the prevalence of anti-HC was 6.7% (1/15) in Western region and the 2.9% (1/34) in Northern region.

### 3.2 Risk factors associated with prevalence of HCV among HCWs

Table (2) shows the prevalence of HCV infection among health care workers was associated with blood transfusion, frequency of blood transfusion and exposure to sharp injuries and mucous membranes (P value < 0.05) by Fisher's exact test.

**Table 1:** Demographic characteristics of HCWs and anti-HC positivity (n = 109)

Characteristic	Frequency		Anti-HC positive	
	No	%	No	%
<b>Study group</b>	109	100	2	1.8
<b>Sex</b>				
Male	38	34.9	0	0
Female	71	65.1	2	1.8
<b>Age group</b>				
<15 years	2	1.8	0	0
15-30	69	63.3	2	1.8
31-45	38	34.9	0	0
>45 years	0	0	0	0
<b>Residence</b>				
Eastern sudan	2	01.8	0	0
Western Sudan	15	13.8	1	0.9
Central Sudan	58	53.2	0	0
Northern Sudan	34	31.2	1	0.9
<b>Marital status</b>				
Married	27	24.8	0	0
Unmarried	82	75.2	2	1.8
<b>Educational level</b>				
Secoadry	6	05.5	0	0
Graduate	89	81.7	2	1.8
Postgraduate	14	12.8	0	0
<b>Occupational category</b>				
Clinicians	12	11	0	0
Nurses	73	67	1	0.9
Paramedical	05	4.6	0	0
Lab. Technician	11	10.1	0	0
Medical engineer	08	7.7	1	0.9
<b>Duration of the work</b>				
< one year	20	18.4	1	0.9
1-5	69	63.3	1	0.9
6-10	13	11.9	0	0
>10 years	07	4.6	0	0

**Table 2:** Risk factors of anti- HC positivity among HCWs (n = 109)

Factors	Frequency		Anti-HC positive		P. value
	No	%	No	%	
<b>Study group</b>	109	100	2	1.8	
<b>Blood transfusion</b>					
Yes	06	05.5	2	1.8	0.003*
No	103	94.5	0	00	
<b>Frequency of blood transfusion</b>					
< 5 times	4	66.7	0	00	0.001*
5-10	2	33.3	2	1.8	
>10 times	0	00	0	00	
<b>Surgical operations</b>					
Yes	32	29.4	1	0.9	0.051
No	77	70.6	1	0.9	
<b>Sharp injuries</b>					
Yes	34	31.2	2	1.8	0.029*
No	75	69.8	0	00	
<b>Using shared razors</b>					

Yes	29	26.6	0	00	0.390
No	80	73.4	2	1.8	
<b>Tattoos</b>					
Yes	07	06.4	0	00	0.708
No	102	93.6	2	1.8	

\*Result is significant at P value < 0.05

#### 4. Discussion

Available data suggest that HCV has become the most common cause of acute hepatitis in dialysis patients and dialysis staff members. Health-care workers are at high risk of contracting blood borne infections in their daily work through needlestick injuries. Of the 35 million health-care workers worldwide, 3 million experience percutaneous exposure to blood pathogens each year: 2 million are exposed to hepatitis B virus (HBV), 0.9 million to hepatitis C virus (HCV) and 170,000 to HIV. As a result of these injuries, 150,000 health-care workers contracted HCV, 70,000 HBV and 500 HIV. More than 90% of these infections occur in developing countries [10].

The prevalence of HCV infection (anti-HC positive), among HCWs was 1.8% (2/109). This result was higher compared with prevalence of anti-HC among health care workers in Sudan (Omdurman) which was found zero (0.00%) [7], also the prevalence of HCV in this study was lower than that found among Sudanese population (2.2%-4.8%) [6], also was lower compared with the prevalence of HCV in HCWs in Saudi Arabia 9.7% [11].and in Italy 3.4% [12].

The positive cases of HCV were observed among female. Regarding to the age group the infection rate recorded among age 15-30 years. Concerning the original residence, the prevalence rate was recorded in Western and Northern region, this is because the disease was endemic in West and south region and this is consistent with that recorded by [13].

Regarding to occupation, the prevalence was observed among nurses and medical engineers, the results revealed the more HCWs are subjected to contact with blood and body fluids of patients the more likely is the chance for them to be infected. This result is similar with found in previous study revised in Brazil by [14].

There was association between the blood transfusion, frequencies of blood transfusion and HCV infection in this study, which was found to be significant ( $P$  value = 0.002 & <0.0001) respectively. The result agreement with findings of some studies from different countries, in Saudi Arabia by [15]. India by [16] and in Kosova [17].

The results of this study showed that was a relationship between the exposure to sharps, skin and mucous membrane (needle stick) and anti-HC positivity which was found to be statistically significant ( $P$  value = 0.034). This agrees with other findings recorded in Pakistan by [18] and in South Korea by [19].

#### 5. Acknowledgements

The authors would like to express utmost gratitude to Dr. Wafaa Obied, Director of Training, Information and

Researches Management, National Center For kidney Diseases & Surgery, Ministry of Health, Republic of Sudan, for assistance during the period of study. We are thankful to the staff in the dialysis centers at Khartoum State (Sudan) for their unlimited help. We are especially grateful to the team of data collectors. The authors would like acknowledge to the DAAD for financial support in development to this project.

#### References

- [1] Gogos, C.A., Fouka, K.P., Nikiforidis, G., Avgeridis, K., Sakellaropoulos, G., Bassaris, H., Maniatis, A. and Skoutelis, A. (2003). Prevalence of hepatitis B and C virus infection in the general population and selected groups in South-Western Greece. *European Journal of Epidemiology* 18: 551-557.
- [2] Sabry, A., El-Dahshan, K., Mahmoud, K., El-Husseini, A., Sheashaa, H. and Abo-Zenah, H. (2007). Effect of hepatitis c virus infection on haematocrit and haemoglobin levels in Egyptian haemodialysis patients. *Eur J Gen Med*; 4(1): 9-15.
- [3] Talaat, M., Kandeel, A., El-Shoubary, W., Odenschatz, C., Khairy, I., Oun, S. and Mahoney, F. J. (2001). Occupational exposure to needle sticks injuries and hepatitis B vaccination coverage among health care workers in Egypt. *AJIC*; 31(8): 469-474.
- [4] Kermode, M., Jolley, D., Langkham, B., Thomas, S.M. and Crofts, N. (2005). Occupational exposure to blood and risk of blood borne virus infection among health care workers in rural north Indian health care settings. *Am J Infect Control* 2005; 33:34-41.
- [5] Omer, R.E., Veer, P.V., Kadaru, A. M.Y., Kampman, E., El Khidir, I. M., Fedail, S. S. and Kok, F. J. (2001). The role of hepatitis B and hepatitis C viral infections in the incidence of hepatocellular carcinoma in Sudan. *Transactions of the royal society of tropical medicine and hygiene*; 95: 487-491.
- [6] Mudawi, H. M. (2008). Epidemiology of viral hepatitis in Sudan. *Clinical and Experimental Gastroenterology*: 19-13.
- [7] Nail, A., Eltiganni, S. and Imam, A. (2008). Seroprevalence of Hepatitis B and C among healthcare workers in Omdurman Sudan. *Sudan JMS*;3: 201-206.
- [8] Elmukashfi, T.A., Ibrahim, O.A., Elkhidir, I.M., Bashir, A.A. and Awad Elkarim, M.A. (2012). Socio-Demographic Characteristics of Health Care Workers and Hepatitis B Virus (HBV) Infection in Public Teaching Hospitals in Khartoum State, Sudan. *Global Journal of Health Science*; Vol. 4, No. 4; 2012.
- [9] Ministry of Health (MOH), Khartoum state (2008). Report on polio campy. Khartoum, Sudan, September.
- [10] M. Tadesse and T. Tadesse, (2010). Epidemiology of needlestick injuries among health-careworkers in Awassa City, Southern Ethiopia. *Tropical Doctor* April; 40: 111-113.
- [11] El-Hazmi, M. M. and Al-Majid, F.M. (2008). Needlestick and sharps injuries among health care workers: A 5-year surveillance in a teaching center in Saudi Arabia. *Biomedical Research*; 19 (2): 133-140
- [12] Catalani, C., Biggeri, A., Gottard, A., Benvenuti, M., Frati, E. and Cecchini, C. (2003). Prevalence of HCV infection among health care workers in a hospital in

- central Italy. *European Journal of Epidemiology* 19: 73–77, 2004.
- [13] Mudawi, H.M., Smith, H.M., Rahoud, S.A., Fletcher, I.A., Saeed, O.K. and Fedail, S.S. (2007). Prevalence of hepatitis B virus infection in the Gezira state of central Sudan. *Saudi J Gastroenterol*; 13:81–3.
- [14] Ciorlia, L.A.S and Zanetta, D.M.T. (2005). Hepatitis B in Healthcare Workers: Prevalence, Vaccination and Relation to Occupational Factors. *The Brazilian Journal of Infectious Diseases*; 9(5):384-389
- [15] Abul Kashem, N. I., Mohamad, M., Ramzy, M., Nemma, J. M., Karim, R.D. and Tayaab, A. (2003). Hepatitis C Virus among Haemodialysis Patients in Najaran: Prevalence is more among Multi-Center Visitors. *Saudi J Kidney Dis Transplant*; 14 (2): 206-211.
- [16] Murthy, K. K., John. GT., Abraham, P., Talaulikar, GS, Thomas, P.P. and Jacob, C.K. (2003). Profile of hepatitis B and hepatitis C virus infections in dialysis and renal transplant patients 1997-2001; CMCH Vellore. *Indian J Nephrol*; 13:24-28
- [17] Telaku, S., Fejza, H., Elezi, Y. and Bicaj, T. (2009). Hepatitis B and C in dialysis units in Kosova. *Virology Journal*; 6 (72).
- [18] Sarwar, J., Gul, N., et al (2008). Seroprevalence of hepatitis B and hepatitis C in Health Care Workers in ABBOTTABAD. *J Ayub Med Coll Abbottabad*; 20(3).
- [19] Oh, H.S., Yi, S.E. and Choe, K.W.(2005). Epidemiological characteristics of occupational blood exposures of healthcare workers in a university hospital in South Korea for 10 years. *Journal of Hospital Infection*; 60: 269–275.