Patient-Care Practices Associated with Increased Transmission of Hepatitis C Virus Infection among Hemodialysis patients

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Abstract: Aim of the study: this study was carried out to identify patient-care practices related to increased transmission of hepatitis c virus infection among hemodialysis patients. Setting: This study was conducted at hemodialysis unit in menofia university hospital and shebien el koom teaching hospital. Sample: The subjects of this study consisted of 177 renal failure patients. Tools: two tools were utilized for data collection. I. Patient's medical history: structure interview schedule: II: patient care practices observational sheet. The results revealed that patient-care practices associated with transmission of hepatitis C virus infection included fistula clamp, stethoscope reused for multiple patients without cleaning and disinfecting, unused syringe and alcohol swab at dialysis station not discarded between patients, dialysis machine monitor not decontaminated between patients and handling blood specimens in the same area or adjacent to medications and clean supplies. Conclusion: current study concluded that patient-care practices associated with transmission of hepatitis C virus infection included items reused for multiple patients without cleaning and disinfecting, unused clean supplies at dialysis station not discarded between patients, dialysis machine monitor not decontaminated between patients and handling blood specimens in the same area or adjacent to medications and clean supplies. Recommendation: Staff should ensure that hemodialysis-specific infection control practices are being implemented. Also hemodialysis-specific infection control practices should included in continuing education of all staff members.
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Key words: Patient-Care Practices, Hepatitis C Virus, and Hemodialysis.

1. Introduction

Hemodialysis is a life-saving technique that is used most commonly in patients with acute or chronic renal failure. It is used less commonly to remove drug following drug overdose, to restore electrolyte imbalances, or to remove fluid in states of fluid overload. Dialysis patients are at risk for contracting bloodborne infections, including hepatitis viruses, because of their immunosuppression and lengthy and repeated vascular access necessary for hemodialysis.[1]

The frequency of new hepatitis c virus (HCV) infections varies according to countries and hemodialysis centers. The prevalence of anti-HCV in chronic hemodialysis patients ranges between 10 and 20 % in the west, 7 % and 40 % in developed countries [2] and 40 and 85% in some developing countries [3].

As shown in table 1, information on the prevalence and incidence of HCV infection in patients on long term dialysis in developing countries is limited but single centre surveys show continued high prevalence and incidence rates [4]

Table (1): HCV infection among patients undergoing long- term dialysis in developing countries: prevalence rates

Country	Anti-HCV positive	Reference: year
Saudi Arabia	43.4% (86/198)	2004
Iran	24.8% (74/298)	2005
Turkey	19% (83/437)	2005
Morocco	76% (141/186)	2005
Tunisia	20% (79/395)	2006
Brazil	16.4% (180/1095)	2007
Sudan	23.7% (56/236)	2007

In Egypt, **Afifi & Abdel-Mohsen 2009**[5] found a prevalence of HCV antibodies in hemodialysis patients ranging from 52.3 to 82.3%. (See table 2)

Table (2): HCV infection among patients undergoing long- term dialysis in Egypt: prevalence rates

year	HCV prevalence in egypt
1996	52.3%
1997	60.2%
1998	55.5%
2000	62.0%
2003	64.3%
2004	82.3%
2008	52.1%

The high incidence and prevalence of HCV among dialysis patients can be attributed to several

risk factors, including the number of blood transfusion, lack of adherence to infection control practices in dialysis units, transmission through dialysis machines and ultrafiltrates [2]. Also the advancements of hemodialysis techniques have dramatically improved patients' survival of end-stage renal disease. As duration of hemodialysis is known as one of HCV infection risk factors, this increased survival has consequently led to an increased risk of getting infected by HCV among hemodialysis patients [6].

The prevalence of HCV infection in patients undergoing dialysis is persistently greater than that in the general population [7] being endemic in hemodialysis (HD) units around the world, predominantly in Mediterranean and developing countries of the Middle and Far East [8]. Nosocomial transmission of HCV infection has been reported to be a considerable route in modern hospital dialysis units [9]. This high prevalence of hepatitis C virus (HCV) infection in hemodialysis patients is of great concern because they have a higher rate of mortality than HCV-negative hemodialysis patients [10] so insights gained in the last decade include more accurate diagnostic testing for HCV in chronic kidney disease and prevention of nosocomial HCV transmission [11].

Several diagnostic tests currently are available for the diagnosis of HCV. Serologic detection of antibody to HCV antigens by enzyme-linked immunosorbent assay (ELISA) remains the initial test for HCV diagnosis in chronic kidney disease. The first and second generation tests lead to frequent false- negative results; the third generation ELISA test however is more specific and sensitive in patient chronic kidney disease [12]. If the ELISA test is negative (does not find the antibody), the patient is assumed to be free of HCV. It takes several weeks (up to six months) for antibodies to develop after the initial infection with HCV, so this screening test may miss a few newly-infected individuals. The ELISA test for HCV antibody is not perfect and may sometimes be positive in people who are not currently infected. Thus, if the ELISA test for HCV antibody is positive, additional testing is done to confirm the diagnosis with another type of test for the antibody [11].

Although the serological diagnosis of HCV in chronic kidney disease is now accurate, management decisions however requires confirmation of viremia and identification of specific genotype as well as assessment of viral load. The recombinant immunoblot assay (RIBA) testing in chronic kidney disease has generally been surpassed by polymerase chain reaction (PCR) based technology which has been extensively evaluated in patients with chronic kidney disease especially in hemodialysis population. Samples for HCV-RNA testing should be obtained prior to hemodialysis procedure; heparin used can interfere with PCR technique. In addition, the hemodialysis procedure can lower HCV RNA levels [13].

Testing for RNA is useful in determining whether or not a patient has circulating virus in the blood (viremia). Hence, it can be used to confirm that a positive ELISA truly reflects active hepatitis C virus infection. RNA testing also should be done in individuals who may have been recently exposed to HCV. HCV RNA testing is more sensitive (that is, will detect more cases) than the conventional ELISA testing in this setting. The reason for this greater sensitivity is that it may take a person several weeks after exposure to HCV to develop the antibodies, whereas HCV RNA becomes detectable one to three weeks after exposure [14].

To prevent transmission of both bacteria and bloodborne viruses in hemodialysis settings, the Centers for Medicare and Medicaid Services (CDC) recommends that all single-use injectable medications and solutions be dedicated for use on a single patient and be entered one time only. Medications packaged as multidose should be assigned to a single patient whenever possible. All parenteral medications should be prepared in a clean area separate from potentially contaminated items and surfaces. In hemodialysis settings where environmental surfaces and medical supplies are subjected to frequent blood contamination, medication preparation should occur in a clean area removed from the patient treatment area. Proper infection control practices must be followed during the preparation and administration of injected medications [15].

All dialysis providers are advised to follow official CDC recommendations regarding Standard Precautions and infection control in dialysis settings [15, 16]. Specifically, CDC has recommended the following: "Intravenous medication vials labeled for single use, including erythropoietin, should not be punctured more than once. Once a needle has entered a vial labeled for single use, the sterility of the product can no longer be guaranteed [16].

Aim of the study

The aim of this study was to identify patient-care practices related to increased transmission of hepatitis c virus infection among hemodialysis patients.

Research question

What is the patient-care practices related to increased transmission of hepatitis C virus infection among hemodialysis patients?

2. Material and method

Materials

Research design

Descriptive research design was utilized in this study.

Setting

The study was conducted at hemodialysis unit in Menofia University Hospital and Shebien El Koom Teaching Hospital. The data was gathered from October 2011 to May 2012.

Subjects

The subjects of this study consisted of all patients on hemodialysis units in selected setting (177 renal failure patients, 56 in Menofia University Hospital and 121 in Shebien El Koom Teaching Hospital). Subjects were eligible for the study if they had chronic renal failure, on hemdialysis, at least 18 years of age, be mentally and physically able to communicate with research staff, and willing to participate in the study.

Tools

Tool I: Patient's medical history: structure interview schedule:

It was developed by the researcher based on the reviewing of relevant literature. It was used to assess patients past history of risk factors associated with hepatitis C virus infection. It consisted of 2 parts:

Part 1: socio-demographic characteristics: Demographic data were collected from patient's medical record and interview. The demographic variables include age, gender, educational level and occupation.

Part 2: Clinical variables: It includes patient past history of injecting drug use, Diabetes Miletus, Hepatitis B virus vaccine, hepatitis B positive, Sexual transmitted disease, Receiving blood transfusion before 1993, Kidney transplantation before 1993, Performing surgery, House hold contact with HCV case, Duration of hemodialysis , Frequency of dialysis /week, No of attending hemodialysis unit, and diagnosis of hepatitis C positive .

Tool II: patient care practices observational sheet:

It developed by the researchers to observe the present study setting and compare the patient care practices with the ideal international standard. It includes two parts:

Part 1: characteristic of the study setting:

Observations were conducted on the facility to assess if there is isolated nurse for hepatitis C positive, isolated room for hepatitisC positive, isolated hemodialysis machines for hepatitis C positive, number of hand washing sinks in each room, Clean utility room or area, Dirty utility room or area, Medication preparation room, test newly admitted hemodialysis patient for hepatitis c, Frequency of testing for hepatitis c after admission, External disposable transducer filters were discarded between each patient, all disposable items were placed in a plastic bag to prevent leakage.

Part 2: patient care practices: it includes observation of disinfection of environmental surface at the dialysis station, disinfection of the dialysis machines, handling of supplies and equipment after patient use, how medications were prepared and distributed, how blood specimens were handled, and appropriate hand washing and gloving changing.

Method:

Preparation phase:

1- Official letter from the faculty of nursing was delivered to the responsible authorities of hospitals and approval to conduct this study was obtained after explaining the aim of the study.
2- Tool was developed by the researcher after extensive review of the relevant literature. It was tested for face and content validity by three experts in the field of medical surgical nursing, faculty of nursing, Menofia University, and two experts in the field of medicine, faculty of medicine, Menofia University.
3- Reliability: A test retest method was used to determine stability and internal consistency of the measurement over the time. The researcher administered the same instrument to study subjects on two occasions; the two occasions were separated by two weeks. The scores on the repeated testing are compared. This comparison is expressed through correlation coefficient alpha (r= 0.90).
4- A pilot study was conducted prior to data collection on 10% of the study sample. This was performed in order to test the clarity and applicability of the tool and to determine obstacles that may be encountered during data collection. It also helped to estimate the time needed to fill the form and necessary modifications were done. Some questions were excluded from the tool because they are not used as; nurses wear and change masks, protective eye wear and water proof gown. The two hemodialysis units use isolated machine for hepatitis c positive patients so the question; the hemodialysis machine for HCV-positive patients were used after chemical hot water disinfection for the HCV-negative patients; was excluded. Also the two hemodialysis units do not have medication preparation room so the questions; medication prepared in centralized area outside treatment area and medication cart used to distribute injectable medications in treatment area; were excluded from the tool.

5- Patients verbal agreement to participate in the study was obtained after explanation of the purpose of the study. Each patient was reassured that confidentiality and privacy will be maintained.

Implementation phase:

Data were collected over a period of eight months from October 2011 to May 2012. All patients at hemodialysis unit in Menofia University Hospital and Shebien El Koom Teaching Hospital who agreed to participate in the study. Then they were interviewed individually at hemodialysis unit in Menofia University Hospital and Shebien El Koom Teaching Hospital. The researcher educated 4 internships in order to help in data collection. A structured interview with patients was utilized in order to fill out the study tool I part 1 and 2. The interview was conducted by introducing the researcher and the internships themselves to the patients and the nurses and giving them simple explanation about the aim of the study and assured them information will be confidential and will be used only for the purpose of the study. An observation technique was utilized to fill out study tool II part 1 and 2. The researcher assessed each patient individually for collecting all data tools. It took about 2 to 3 hours. Data was collected through meeting subjects once according to the attendance policies of the hemodialysis unit.

Statistical analysis

Upon completion of data collection, each variable in the study tools was manually scored. Computerized data entry and statistical analysis were fulfilled using the statistical package for social sciences (SPSS). Descriptive statistics were first applied (e.g., frequency, percentage, mean and standard deviation). Tests of significance were used to compare study group using chi square test, P-values, which were less than 0.05, were considered as statistically significant.

3. Results

Table (3): Baseline characteristics of the study setting

variables	Hemodialysis unit	
	Menofia university hospital	**Shebien El-Koom Teaching Hospital.**
number of patients (177)	56	121
umber of nurses (50)	20	30
patient to nurse ratio (4:1)	3:1	4:1
Number of shifts	3	3
Hepatitis c positive patients	35	55
isolated nurse for hepatitis c positive	Yes	Yes
isolated room for hepatitis c positive	No	Yes
isolated hemodialysis machines for hepatitis c positive	Yes	Yes
number of hand washing sinks in each room	2	4
Clean utility room or area	Yes	yes
Dirty utility room or area	Yes	Yes
Medication preparation room	No	No
test newly admitted hemodialysis patient for hepatitis c	Yes	yes
Frequency of testing for hepatitis c after admission	Every 3 months	Every 3 months
External disposable transducer filters were discarded between each patient.	Yes	Yes
all disposable items were placed in a plastic bag to prevent leakage	yes	yes

Table 3 revealed that the number of studied patients at Menofia University Hospital was 56 nursed by 20 nurses and the number of hepatitis c positive patients was 35. Shebien El-koom Teaching hospital had 121 patients nursed by 30 nurses and number of hepatitis c positive patients was 55. Both hospitals had isolated nurses and machines for hepatitis c positive, clean utility room, dirty utility room, and test newly admitted hemodialysis patients for hepatitis c virus and then testing them every 3 months.

Table 4 illustrated that the total number of studied patients was 177; more than half of them (50.8%) were hepatitis c virus positive and more than one third of them (39.5) became hepatitis c virus positive after hemodialysis.

Table 4: Prevalence of hepatitis Cvirus among hemodialysis patients

Hepatitis c virus	chronic hemodialysis patients	
	No (177)	%
Prevalence of hepatits c		
Hepatitis c positive	90	50.8
Hepatitis c negative	87	49.2
Total	177	100
Time of acquiring hepatitis c virus infection		
Hepatitis c negative	87	49.2
Hepatitis c positive before hemodialysis	20	11.3
Hepatitis c positive after hemodialysis	70	39.5
Total	177	100

Table 5 comparison between hepatitis c virus positive and negative cases among hemodialysis patients regarding demographic characteristics.

Demographic data	Hepatitis c positive (NO 90)		Hepatitis c negative (NO 87)		X^2	p-value	OR	95%CI
	NO	%	NO	%				
Sex								
Male	55	61.1	45	51.7	1.59	>0.05	1.48	0.81-2.66
Female	35	38.9	42	48.3				
Education								
Low education	61	67.8	24	27.6	28.63	<0.001	5.52	2.9-10.53
Higher education	29	32.2	63	72.4	28.63			
Occupation								
Not working	40	44.4	43	49.4	0.44	>0.05	0.82	0.45-1.48
Worked	50	55.6	44	50.6				
Age (years)	Mean SD		Mean SD		T test	p-value		
	48.46±12.58		44.43± 14.89		1.94	>0.05		

Table 5 showed that there was statistically significant difference between hepatitis c positive and negative groups with regard to education with p value < 0.001. There was no statistically significant difference between hepatitis c positive and negative group with regard to other demographic characteristics (age, sex, occupation).

Table (6): Comparison between hepatitis C virus positive and negative cases among hemodialysis patients regarding risk factors associated with hepatitis c virus infection

Risk factors	Hepatitis c positive (NO 90)		Hepatitis c negative (NO 87)		X^2	p-value	OR	95%CI
	NO	%	NO	%				
Receiving blood transfusion before 1993	16	17.8	15	17.2	0.01	>0.05	1.04	0.48-2.25
Kidney transplantation before 1993	4	4.6	0	0	4.23	<0.05	-	-
Performing surgery	42	46.7	36	41.4	0.5	>0.05	1.24	0.68-2.25
House hold contact with HCV case	28	31.1	0	0	32.15	<0.001	-	-
Duration of hemodialysis								
< 10 years	41	45.6	87	100	65.49	<0.001	-	-
≥ 10 years	49	54.4	0	0				
Frequency of dialysis /week								
twice	20	22.2	0	0	21.79	<0.001	-	-
Third	70	77.8	87	100				
No of hemodialysis units attended								
One	20	22.2	59	67.8	37.73	<0.001	0.14	0.07-0.27
≥2	70	77.8	28	32.2				

It was evident from table 6 that there was statistically significant difference between hepatitis c positive and negative groups with regard to kidney transplantation before 1993, house hold contact with hepatitis c virus case, duration of hemodialysis , frequency of dialysis / week and attending dialysis at more than one centre with p-value < 0.05, < 0.001, < 0.001, < 0.001, < 0.001 respectively. There was no statistically significant difference between hepatitis c positive and negative group with regard to other risk factors (blood transfusion before 1993 and performing surgery).

Table (7): Comparison between hepatitis C virus positive and negative cases among hemodialysis patients regarding patient past history of associated disease

patient past history	Hepatitis c positive (NO 90)		Hepatitis c negative (NO 87)		X^2	p-value	OR	95%CI
	NO	%	NO	%				
Injecting drug use	38	42.2	13	14.9	16.05	<0.001	4.16	2.02-8.57
Diabetes Miletus	13	14.4	22	25.3	3.28	>0.05	0.49	0.23-1.07
Hepatitis B virus vaccine	17	18.9	3	3.4	10.52	<0.001	6.52	1.84-23.15
Sexual transmitted disease	4	4.4	0	0	3.96	<0.05	-	-

N.B: no patient had positive hepatitis B virus

It was clear from table 7 that there was statistically significant difference between hepatitis c positive and negative groups with regard to injecting drug use and hepatitis B virus vaccine and history of sexual transmitted disease with p value < 0.001, < 0.001, < 0.05 respectively . There was no statistically significant difference between the two groups with regard to other past history of associated disease (Diabetes Miletus).

4. Discussion

Hepatitis C virus infection is a major health problem among dialysis patients in developing countries. The higher prevalence in developing countries in comparison with developed countries reflects many factors including socioeconomic factors, bad infection control measures, and the use of blood transfusion instead of Erythropoietin to treat anemia and the higher prevalence of HCV infection among the general population in developing countries. [5].

The most important finding of this study was the identification of specific patient- care practices related to an increased prevalence of hemodialysis- associated hepatitis c virus infection, indicating that hepatitis c virus transmission in these setting can be reduced or prevented by modifying these practices.

As regard to baseline characteristics of the study setting, the current study showed that patient to nurse ratio was 4:1, isolated nurse, isolated room, isolated hemodialysis machines for hepatitis c positive patients and frequency of testing for hepatitis c after admission every 3 months. This result was matching to some extend with **Kumar et al 2011 [17]** who recommended the use of dedicated dialysis equipment, spaces, nursing staff, separate washing areas and screening of the patients once in 3 months, for preventing cross infection.

Regarding to the prevalence of hepatitis c virus among hemodialysis patients, the present study revealed that among 177 hemodialysis patients, 90 patients (50.8%) were hepatitis c virus positive. Hepatitis c virus positive were present in only 20 patients (11.3%) prior to the dialysis, and 70 patients (39.5) acquired the antibodies during the course of the study. These findings agree with **Diordievic et al 2000 [18]** who mentioned that high prevalence of hepatitis c virus infection, over 50% was demonstrated in hemodialysis unit. These results contradicted with **Kumar et al 2011[17],** who found among the 145 patients on hemodialysis, 18 patients (12.4%) were found to be anti-hepatitis c virus positive. Anti-hepatitis c virus antibodies were present prior to the dialysis in only eight of the patients and ten of the patients acquired the antibodies during the course of the study.

With respect to demographic characteristics of the subjects, this study noticed that there was no statistical significant difference between hepatitis c positive and negative patients regarding to age, sex, and occupation. These findings are in accordance with **Saxena et al 2003 [19]** who assured that there was no significant relationship of anti hepatitis c virus positively with age or sex. The current study revealed that low education is risk factors of hepatitis c positive and this may be because of the low educated patients may be unable to understand and apply infection control measure for prevention of transmission of hepatitis c virus.

Table (8): comparison between hepatitis C virus positive and negative cases among hemodialysis patients regarding patient care practices observed in study facility with recommended practices given for reference.

Patient care practice		Hepatitis c positive (NO 90)		Hepatitis c negative (NO 87)		X^2	p-value	OR	95%CI
recommended	Observed in study facility	NO	%	NO	%				
Avoid sharing equipment and supplies between patients. Items taken into the dialysis station should be disposed of, dedicated for use only on a single patient, or cleaned and disinfected before taken to a clean area or used on another patient.	Items reused for multiple patients (fistula clamp, stethoscope) without cleaning and disinfecting	32	35.6	11	12.6	12.63	<0.001	3.81	1.77-8.2
	Unused clean supplies (syringe and alcohol swab) at dialysis station not discarded between patients	61	67.8	24	27.6	28.63	<0.001	5.52	2.9-10.53
	Items that cannot be cleaned and disinfected (adhesive tape) should be dedicated for use only on a single patient.	6	6.7	4	4.6	0.36	>0.05	1.48	0.4-5.4
Disinfection of patient care station. Clean and disinfect the dialysis station between patients. Give special attention to cleaning control panels on the dialysis machine. Discard all fluid and clean and disinfect all surfaces.	Dialysis machine monitor not decontaminated between patients	61	67.8	24	27.6	28.63	<0.001	5.52	2.9-10.53
	Clean and disinfect of environmental surface at the dialysis station (beds, chairs, and tables) before the beginning of next cession.	6	6.7	4	4.6	0.36	>0.05	1.48	0.4-5.4

	Disinfect the outer surface of the dialysis machine	3	3.3	2	2.3	0.17	>0.05	1.47	0.24-8.99
Separation of clean and dirty areas. Clean area should be clearly separated from contaminated areas where used supplies and equipment are handled. Do not handle and store medications or clean supplies in the same or adjacent area to where used equipment or blood sample are handled.	Handling blood specimens in the same area or adjacent to medications and clean supplies	38	42.2	13	14.9	16.05	<0.001	4.16	2.02-8.57
Hand washing and glove changing. Wear disposable gloves when caring for the patient or touching the patient's equipment at the dialysis station; remove gloves and wash hands between each patient and station.	Hand washing before gloving	46	51.1	44	50.6	0.01	>0.05	1.02	0.57-1.84
	Wash hands immediately after gloves are removed	90	100	81	93.1	6.43	<0.05	0.47	0.4-0.56
	Wear gloves	90	100	81	93.1	6.43	<0.05	0.47	0.4-0.56
	Change gloves between each patient	20	22.2	16	18.4	0.4	>0.05	1.27	0.61-2.65

NB Medication cart are not used to distribute injectable medications in treatment area

It was evident from table 8 that patient-care practices associated with transmission of hepatitis C virus infection included items reused for multiple patients (fistula clamp, stethoscope) without cleaning and disinfecting, unused clean supplies (syringe and alcohol swab) at dialysis station not discarded between patients, dialysis machine monitor not decontaminated between patients and handling blood specimens in the same area or adjacent to medications and clean supplies (odds ratio (OR) 3.81 , 5.52, 5.52 and 4.16 ; 95 % confidence interval (CI), 1.77-8.2, 2.9-10.53, 2.9-10.53, and 2.02-8.57 respectively).

Regarding to the duration of hemodialysis (dialysis ≥ 10 years considered risk factors) the current study revealed that there was statistical significant difference between hepatitis c positive and negative patients. these results were on line to some extend with **Crneiro et al 2001**[20] who demonstrated that patients on hemodialysis for more than three years had a 13.6 fold greater risk of hepatitis c- positively compared to subjects with less than one year hemodialysis treatment. Also other surveys have suggested the length of time on hemodialysis as a risk factor for HCV seropositively. [21, 22, 23, 24]

El-Amin et al 2007 [3] , **Sypsa, et al 2005** [25], **Sivapalasingam et al 2002** [26] , **Stramer 2007** [27] could not recognize blood transfusion as independent risk factors in hepatitis c virus spread among hemodialysis subjects. This finding is in accordance with the current study that have demonstrated that there was no statistical significance difference between hepatitis c positive and negative regarding blood transfusion.

The current study revealed there was statistical significant difference between hepatitis c positive and negative patients regarding to that kidney transplantation and dialysis in more than 2 units. These findings are in accordance to some extend with el amin et al 2007 [3] who stated that history of organ transplantation and **Ocak et al 2006** [28] who mentioned that dialysis in multiple centre are associated with hepatitis c virus positively.

This study showed that there was no statistical significant difference between hepatitis c positive and negative patients regarding to diabetes Miletus. These findings in contrast with **Nakayama et al 2000** [29] who stated that diabetes Miletus is factor that has been suggested to be associated with hepatitis c virus positively.

With regard to patient-care practices it was observed in this study facility that patient-care practices associated with transmission of hepatitis C virus infection included items reused for multiple patients (fistula clamp, stethoscope) without cleaning and disinfecting, unused clean supplies (syringe and alcohol swab) at dialysis station not discarded between patients, dialysis machine monitor not decontaminated between patients and handling blood specimens in the same area or adjacent to medications and clean supplies. This results are in agreement to some extend with **Shimokura et al 2011** [30] who reported that patient care practices associated with increased prevalence of hemodialysis associated hepatitis c virus infection by univariate analysis included using tape from rolls carried in staff pockets for multiple patients, inconsistent cleaning of machine monitors between patients, and handling blood specimens in or adjacent to areas used for medications or clean supplies.

Conclusions

The researcher concluded that patient-care practices associated with transmission of hepatitis C virus infection included items reused for multiple patients without cleaning and disinfecting, unused clean supplies at dialysis station not discarded between patients, dialysis machine monitor not decontaminated between patients and handling blood specimens in the

same area or adjacent to medications and clean supplies.

Recommendations

Staff should ensure that hemodialysis-specific infection control practices are being implemented, especially reusing items only if cleaned and disinfected, unused clean supplies at dialysis station must discard between patients, dialysis machine monitor must decontaminated between patients and prohibiting handling blood specimens in the same area or adjacent to medications and clean supplies. Also hemodialysis-specific infection control practices should included in continuing education of all staff members.

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