

Viral Hepatitis B&C In Hemodialysis Units: Preventive Practices Toward Machine, Equipment, Environment and Waste Management

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Abstract

Background: The ministry of health and population and infection control department has been using a scoring system to evaluate ongoing infection control programs in different hospitals. Through effective, this system could be revised and validated using current knowledge and evidence-based protocols and guidelines. Aim: The aim of this study was to assess preventive practices toward machine, equipment, environment and waste management that managed by hemodialysis nursing staffs with elderly viral hepatitis C and B in hemodialysis units.

Design: A descriptive exploratory design was utilized in the current study. Setting: The study was carried out in two hemodialysis units at Beni-Suef University Hospital and Elwasta General Hospital in Beni-Suef Governorate. Subjects: A convenient sample of 76 hemodialysis nurses, of whom 22 were men and 54 women.

Results: all (100%) of the dialysis nurses use a clean machine to start dialysis, while 48.7% clean the machine during dialysis session as needed. Additionally, 35% of them were incompetent regarding preventive practices related to practices toward machine & equipment in dialysis units. All (100.0% & 100.0%) of the dialysis nurses reported that, there is separate bathroom/toilets for staff, patients and air conditioning inside the unit, respectively. However, 55% of them were incompetent regarding preventive practices related to practices toward environment in dialysis units; 84.2% and 78.9% of the dialysis nurses place waste products in separate large plastic bags labeled with the unit's name and there is garbage collection and transfer limited duration consistent with the circumstances and the volume of work, respectively. In addition, 63.2% of them were incompetent regarding toward safe waste management.

Conclusion: there is statistically significant relation between dialysis nurses' practice and their years of experience in nursing field unit, nurses' experience in dialysis, and their attending training program for improving nursing skills.

Recommendations: Reinforce HDUs with nurses with Bachelor degree and postgraduate studies to serve as models and leaders.

Keywords: viral hepatitis b&c; hemodialysis; preventive practices

1.Introduction

The increasing burden of chronic illness is a significant challenge due to global population aging. By 2030, more than 1 billion people will be older than 60 years. Most of the seniors are affected by at least one chronic illness. It leads more than half of health care expenditures are related to the treatment of chronic conditions. Such situation may be seen as both a challenge and an opportunity for researchers and designers wishing to find solutions enabling elderly to retain independent living for as long as

possible [1]. Chronic kidney disease is defined as the presence of kidney damage presenting as abnormal albumin excretion or decreased kidney function, quantified by measured or estimated glomerular filtration rate, that persists for more than 3 months. Chronic kidney disease (CKD) refers to either an irreversible decline in renal functions. CKD ranges from simple micro albuminuria marked by the leakage of excessive protein to the urine due to damage of kidney tissues with 5 distinct stages to end

with end stage renal disease (ESRD) ESRD is considered a growing worldwide public health problem. Renal replacement therapy (RRT) in the form of renal transplant or renal dialysis is deemed essential for survival for patients with ESRD. Renal transplant is the most cost-effective approach that ensures a better quality of life yet not always available or affordable. Accordingly, renal dialysis is currently the most commonly adopted method [2]. Several actions can be taken to reduce risks associated with exposure to blood-borne pathogens (BBPs), including use of safe injection devices, needle stick programs, and safe disposal of sharps. HCWs that have a potential BBP exposure should be managed according to published guidelines. Such guidelines should be developed and distributed to all healthcare settings and updated on a regular basis. Hospitals must also have an adequate supply of HBV immunoglobulin on site to be administered prophylactically in case of a potential exposure [3]. The ministry of health and population (MOHP), infection control (IC) department has been using a scoring system to evaluate ongoing infection control (IC) programs in different hospitals. Through effective, this system could be revised and validated using current knowledge and evidence-based protocols and guidelines. Also, the development and validation of monitoring tools specific to IC practices would help prevent transmission of BBPs, especially in primary healthcare settings. Implementing a universal IC program in diverse healthcare settings, to include close monitoring and evaluation, will greatly increase the workload for the MOHP IC department. Delegating monitoring activities to an independent agency could alleviate this burden, along with the availability of updated, standardized monitoring tools and improved coordination with regulatory bodies [4].

2. Aim of the Study

The aim of this study was to assess preventive practices toward machine, equipment, environment and waste management that managed by hemodialysis nursing staffs with elderly viral hepatitis C and B in hemodialysis units.

3. Research Questions

- How dialysis nurses' practices toward machine and equipment in dialysis unit?
- How dialysis nurses' practices toward environment in dialysis unit?
- How dialysis nurses' practices toward safe waste management in dialysis Unit?
- Are dialyses nurses' personal characters having any effect on their total practices towards viral hepatitis B&C for elderly patients in dialysis units?

4. Setting and Subjects

To achieve the study's goal, a descriptive exploratory design was used. The investigation was carried out in two hemodialysis units at Beni-Suef University Hospital and Elwasta General Hospital in Beni-Suef Governorate. The study included 76 hemodialysis nurses, a convenient sample of the entire workforce.

5. Tools of data collection:

The researcher created the interview questionnaire after studying reviews of the relevant national and international literature that linked to the study issue. There were principally two parts:

Part I: personal characteristics questionnaire sheet:

The researcher developed this section to gather information about the personal and professional characteristics of nurses, including nurses' attending training programs for improving nursing skills, experience in dialysis, and nurses' experience in nursing field.

Part II: checklist:

Using personal protective equipment, cleaning hands, keeping uniforms neat, using disposable syringes and needles, etc. are some of the general practices that nurses should follow when caring for patients in dialysis units to prevent viral hepatitis.

❖ **Scoring system:**

Scoring: The total score of a nurse's practice was calculated as "Done" receiving one point and "Not Done" receiving zero points. These results were added together to create a percentage score. It was divided into two categories: competent practices if the score was 80% or higher and incompetent practices if the score was 80% or lower.

5.1. Validity and reliability

To gauge how well the employed instruments actually measure what is intended to be measured, tool validity analysis was conducted. The tools' face validity and content were evaluated by a panel of five community health nursing experts from the nursing faculty at Beni-Suef University. Each expert was requested to review the instrument for clarity, topic coverage, and whether the included items are appropriate to accomplish the current study's goal. In the dialysis units, nurses' behaviour towards elderly patients with viral hepatitis B and C was 0.841.

5.2. Field Work

This phase began with a survey of the literature on the study's topics, both recent and historical, national and international, using books, papers, journals, and websites. To gather personal information, the self-administered questionnaire was given to the nurses who volunteered to take part in the study. Each nurse had to wait for a few minutes during each of the working shifts while the researcher clarified any ambiguous inquiries. Following that, a participant observational checklist was used to complete a practice assessment checklist about nurse general practice in order to stop the spread of hepatitis B&C in hemodialysis (HD) units. To accomplish this goal, the researcher personally observed each prospective nurse three times while she provided patient care; she had to be present during all HD shifts.

A pilot study was conducted on 10% of the entire study sample (8 nurses) in order to check the tools' applicability, effectiveness, and clarity as well as the fieldwork's viability and to look for any potential challenges that the researcher might encounter.

The study's data collection process takes five months. The study's data collection process began at the beginning of January 2022 and was finished by the end of May 2022. The researcher visited the HD unit at Elwasta General Hospital and Beni-Suef University Hospital. Nurses work three days a week from 9 am to 12 pm; one day per hospital.

5.3. Ethical & Administrative Considerations:

The scientific research ethical committee of the Faculty of Nursing at Beni-Suef University gave its clearance before the study was carried out. The researcher visited with the director of Elwasta General Hospital, affiliated with Beni-Suef University, to explain the purpose of the study and obtain their agreement. In order to get their consent to participate in the study and to explain the goals of the study to them, the investigator also met with nurses. They were told that the data collected was anonymous and confidential and would only be used for scientific study. The nurses were given the freedom to leave the research whenever they wanted.

The dean of the nursing faculty at Beni-Suef University wrote an official letter to the hospital serving the university, Elwasta General Hospital, requesting their permission to perform the study. To obtain their consent and assistance with data collection, this letter included the purpose of the study as well as copies of the data collection instruments.

5.3. Statistical Design:

The statistical analysis of the data was carried out using the SPSS 25 statistical package and the Microsoft Excel programme. For categorical data, descriptive statistics were reported as frequencies and percentages, and for quantitative data, as the arithmetic mean (X) and standard deviation (SD). Using the chi square test, qualitative variables were compared (X2). The following levels of significance of the results were taken into account: P-value > 0.05 Not Significant (NS), 0.05 Significant (S), and 0.01 Highly Significant (HS).

6. Results

Figure (1): Presents frequency distribution of the dialysis nurses according to their year of experience. It shows that 48.7% of the dialysis nurses have 2-5 years of experience in nursing field. Moreover, (57.9%) of the dialysis nurses have 2-5 years of experience in dialysis unit.

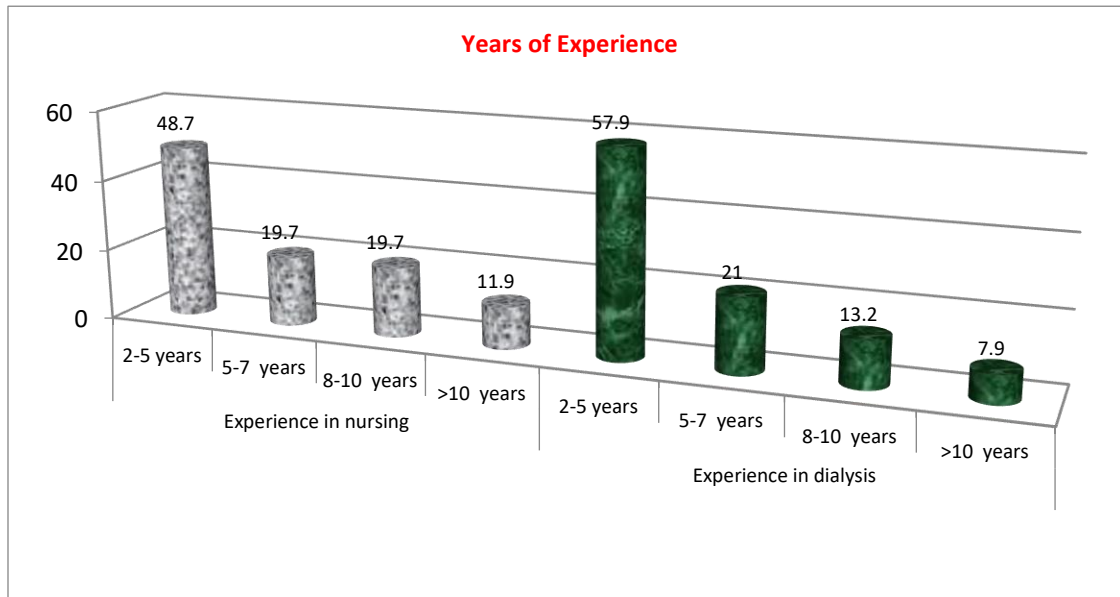


Figure 1: Presents frequency distribution of the dialysis nurses according to their year of experience

Figure (2): Presents frequency distribution of the dialysis nurses according to their attendance training programs. It shows that 69.7% of the dialysis nurses attend training programs for improving nursing skills, 54.7% of them attend two programs.

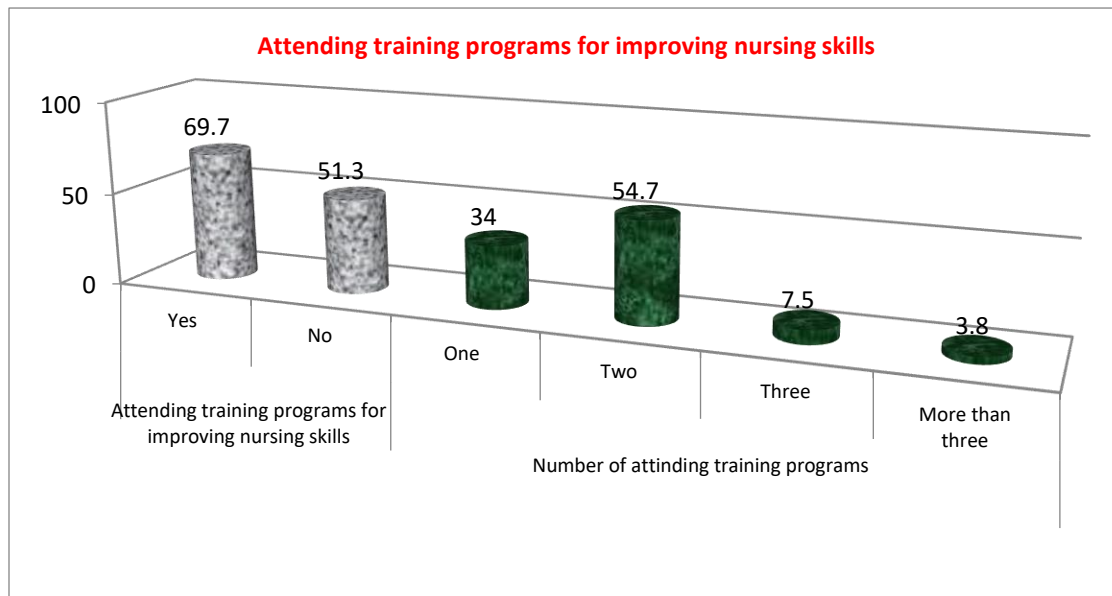


Figure 2: Frequency distribution of the dialysis nurses according to their attendance training programs

Figure (3): Dialysis nurses' practices according to their practices toward machine and equipment in dialysis unit. It illustrates that all (100%) of the dialysis nurses use a clean machine to start dialysis, while 48.7% clean the machine during dialysis session as needed.

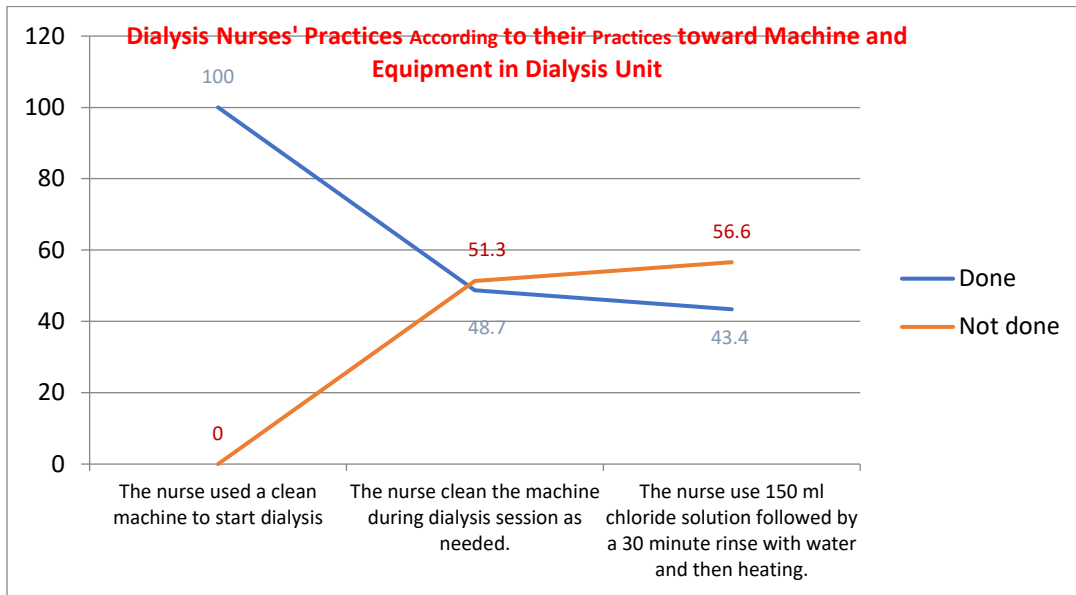


Figure 3: Dialysis Nurses' Practices toward Machine and Equipment in Dialysis Unit

Figure (4): Dialysis nurses' practices according to their total practices toward machine and equipment in dialysis unit. It illustrates that 35% of them were incompetent regarding preventive practices related to practices toward machine & equipment in dialysis units.

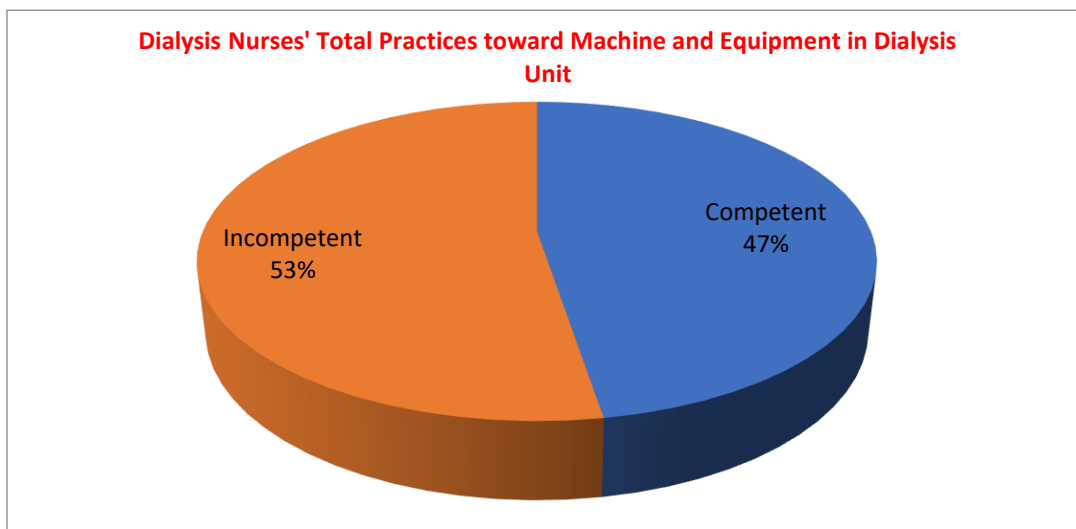


Figure (4): Dialysis Nurses' Total Practices toward Machine and Equipment in Dialysis Unit

Table (1): Presents nurses' practices according to their practices toward environment in dialysis unit. It illustrates that all (100.0% & 100.0%) of the dialysis nurses reported that, there is separate bathroom/toilets for staff, patients and air conditioning inside the unit, respectively. Also,

85.5% and 86.8% of them prepare and distribute medications from a centralized area; a medication supply cart that moves from patient to patient is prohibited and use linens and bellows in a vehicle intended for that and the vehicle was covered, respectively.

| Items | Done | | Not done | |
|--|------|------|----------|------|
| | No | % | No | % |
| There is a special area for staff to eat and drink. | 55 | 72.4 | 21 | 27.6 |
| There are separate bathroom/toilets for staff and patients. | 76 | 100 | 0 | 0.0 |
| There is air conditioning inside the unit. | 72 | 100 | 0 | 0.0 |
| Clean equipment is not used in other areas outside the unit. | 25 | 32.9 | 51 | 67.1 |
| The nurse cleans equipment used by more than one patient (e.g., Sphygmomanometer) with disinfectant before taking it to or using it with other patients. | 40 | 52.6 | 36 | 47.4 |
| The nurse prepares and distributes medications from a centralized area. | 65 | 85.5 | 11 | 14.2 |

| | | | | |
|--|-----------|-------------|----|------|
| The nurse cleans or supervises cleaning of machine surfaces, patient chairs, and other surrounding furniture and equipment such as infusion pump, with sodium hypochlorite following each patient treatment. | 42 | 55.3 | 34 | 44.7 |
| The nurse changed or supervised changing linens and bellows between each patient. | 42 | 55.3 | 34 | 44.7 |
| The nurse transfer used linens and bellows in a vehicle intended for that and the vehicle was covered. | 66 | 86.8 | 10 | 13.2 |

Table 1: Frequency distribution of the dialysis nurses according to their practices toward environment in dialysis units. (n=76).

Figure (5): Dialysis nurses' practices according to their total practices toward environment in dialysis unit. It illustrates that 55% of them were incompetent regarding preventive practices related to practices toward environment in dialysis units

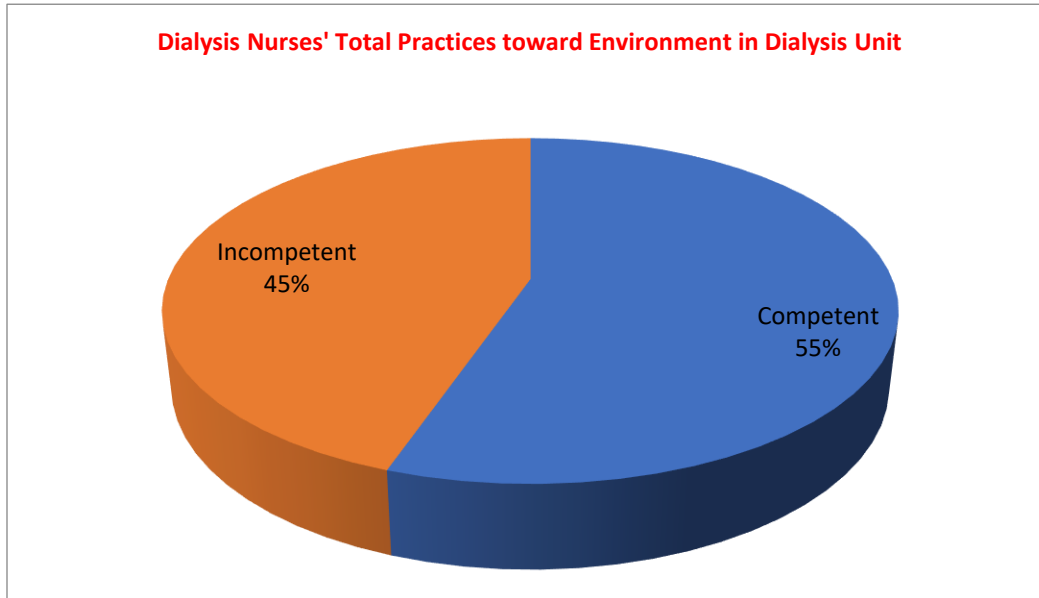


Figure 5: Dialysis Nurses' Total Practices toward Environment in Dialysis Unit

Table (2): Presents nurses' practices according to their practices toward safe waste management in dialysis Unit. It illustrates that 84.2% and 78.9% of the dialysis nurses place waste products in separate large plastic

bags labeled with the unit's name and there is garbage collection and transfer limited duration consistent with the circumstances and the volume of work, respectively.

| Items | Done | | Not done | |
|---|-----------|-------------|-----------|-------------|
| | No | % | No | % |
| The dialysis nurses' places waste products in separate large plastic bags labeled with the unit's name | 64 | 84.2 | 12 | 15.8 |
| The nurse ensures that large waste bags are sent to the designated place for it verbally | 40 | 52.6 | 36 | 47.4 |
| The nurse ensures that waste bags are not filled more than three quarter full. | 17 | 22.4 | 59 | 77.6 |
| The nurse is able to verbalize hygiene systems methods and materials used and the role of each officer | 45 | 59.2 | 31 | 40.8 |
| The nurse can verbalize awareness regarding the seriousness of the infection and name 2 ways of preventing infection in hospitals. | 51 | 67.1 | 25 | 32.9 |
| The nurse washes and disinfects well all equipment before storing. | 32 | 42.1 | 44 | 57.9 |
| Sharps containers located as close as practical to the use area | 57 | 75.0 | 19 | 25.0 |
| Garbage collection and transfer limited duration consistent with the circumstances and the volume of work | 60 | 78.9 | 16 | 21.1 |
| Cleaning of garbage receptacles after disposal of the waste occur regularly | 27 | 35.5 | 49 | 64.5 |
| Daily cleaning routines followed with the correct use of detergents and disinfectants | 52 | 68.4 | 24 | 31.6 |
| There allocation and discrimination of the cleaning equipment and tools for each region e.g., red buckets and tools for bath rooms, and other blue for patient rooms. | 15 | 19.7 | 61 | 80.3 |

Table 2: Frequency distribution of the dialysis nurses according to their practices toward safe waste management (n=76).

Figure (6): Dialysis nurses' practices according to their total practices toward safe waste management in dialysis unit. It illustrates that 63.2% of them were incompetent regarding toward safe waste management.

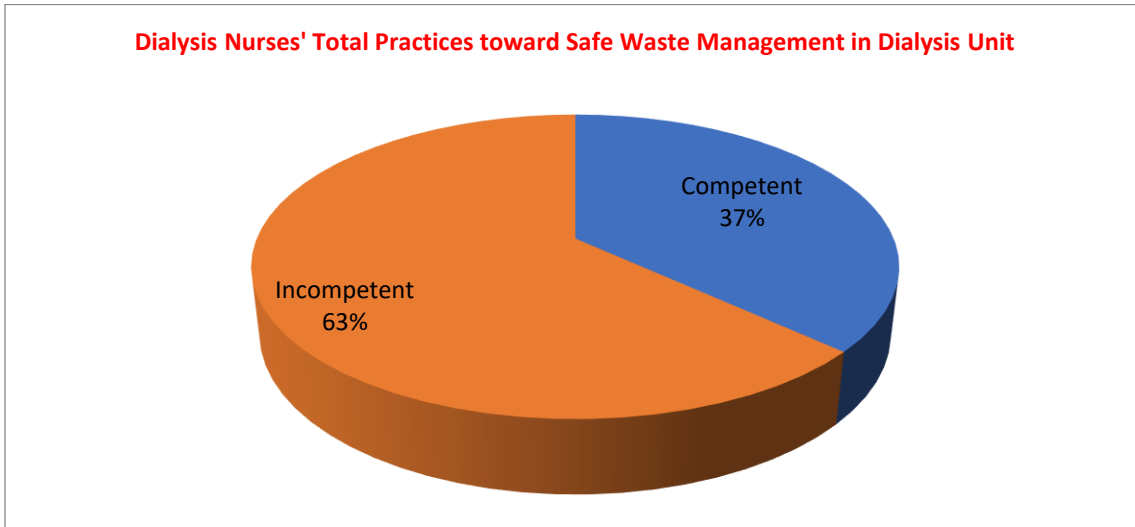


Figure 6: Dialysis Nurses' Total Practices toward Safe Waste Management in Dialysis Unit

Figure (7): presents relationship between experience in nursing field and their total practices towards viral hepatitis B&C for elderly patients in dialysis units. It shows that there is statistically significant relation between dialysis nurses' practice and their years of experience in nursing field unit at $P < 0.05$.

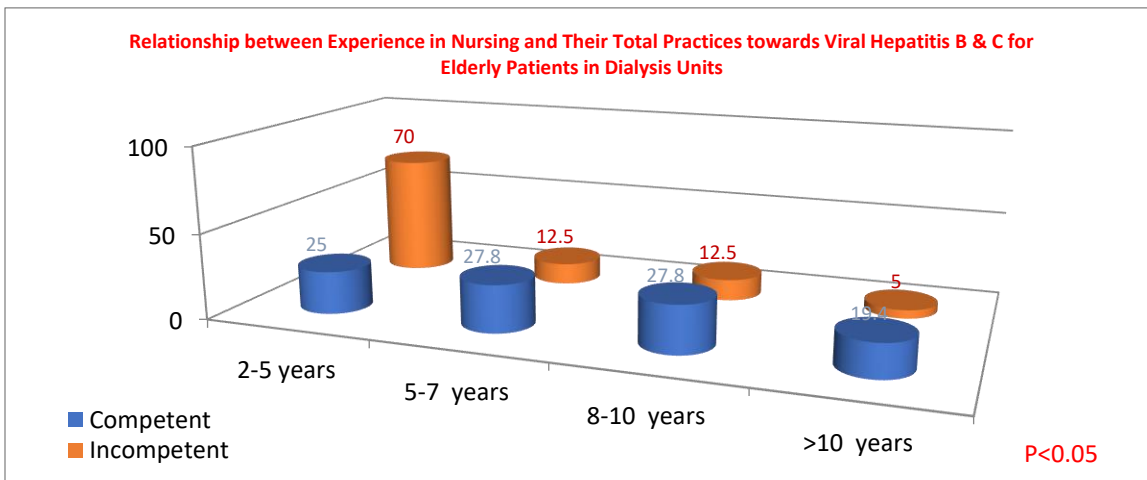


Figure 7: Relationship between Experience in Nursing and Their Total Practices towards Viral Hepatitis B & C for Elderly Patients in Dialysis Units

Figure (8): presents relationship between dialysis nurses' experience in dialysis and their total practices towards viral hepatitis B & C for elderly patients in dialysis units. It shows that there is statistically significant relation between dialysis nurses' practice and their years of experience in dialysis unit at $P < 0.05$.

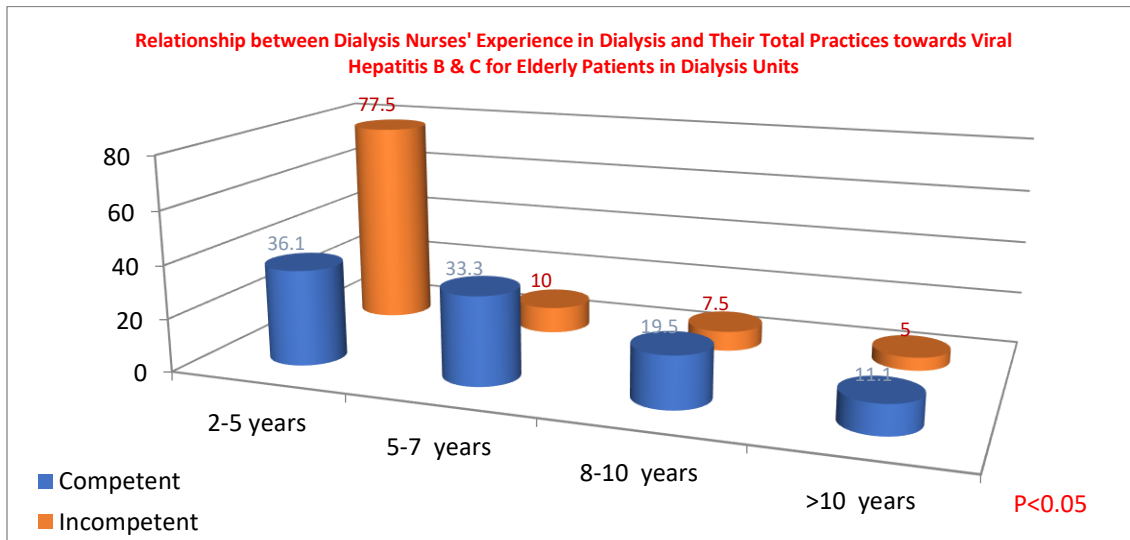


Figure 8: Relationship between Dialysis Nurses' Experience in Dialysis and Their Total Practices towards Viral Hepatitis B & C for Elderly Patients in Dialysis Units

Figure (9): presents relationship between dialysis nurses' attending training programs for improving nursing skills and their total practices towards viral hepatitis B & C for elderly patients in dialysis units. It shows

that there is highly statistically significant relation between dialysis nurses' practice and their attending training program for improving nursing skills, at $P < 0.01$.

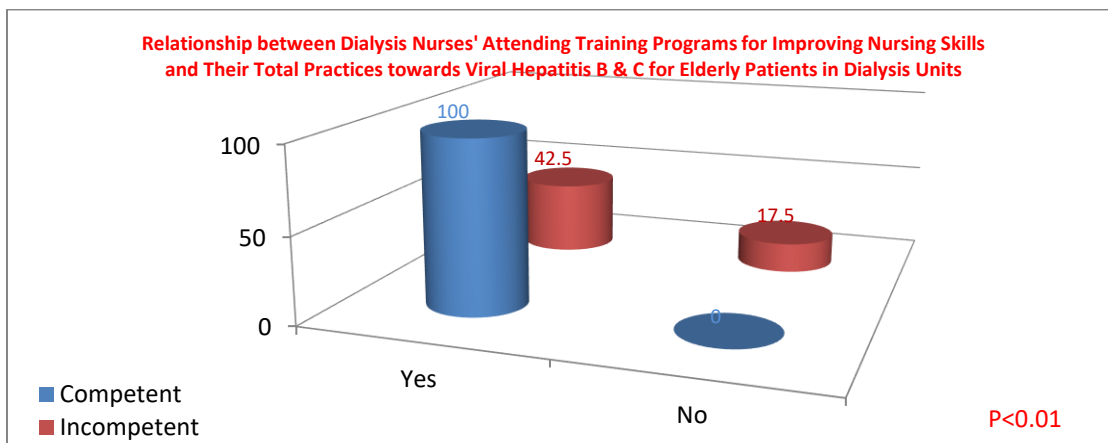


Figure 9: Relationship between Dialysis Nurses' Attending Training Programs for Improving Nursing Skills and Their Total Practices towards Viral Hepatitis B & C for Elderly Patients in Dialysis Units

7. Discussion

Infection control and prevention is the responsibility of the nurse, and represents an integral element of patients' safety programs. It encompasses the processes and activities, which identify and reduce the risks of acquiring and transmitting endemic or epidemic infections among individuals. Therefore, nurses should have professional and ethical responsibilities to make sure that their knowledge, skills regarding infection control are up-to-date, and they practice safely and competently at all times [5].

Most nurses care for older people during the course of their careers. In addition, the public looks to nurses to have knowledge and skills to assist people to age in health. Every older person should expect to receive care provided by nurses with competence in gerontological nursing. Gerontological nursing is not only for a specialty group of nurses. Knowledge of aging and gerontological nursing is core knowledge for the profession of nursing [6].

As regard nurses' practices toward machine & equipment, environment and safe waste management results showed that minority of studied nurses only observed to the great majority of the dialysis nurses use a

clean machine to start dialysis and, respectively. While, less than two thirds of them did not use 150 mL chloride solution followed by a 30-minute rinse with water and then heating. In addition, the great majority of the dialysis nurses reported that, there are separate bathroom/toilets for staff, patients and air conditioning inside the unit, respectively. Also, the great majority of them prepares and distributes medications from a centralized area; a medication supply cart that moves from patient to patient is prohibited and use linens and bellows in a vehicle intended for that and the vehicle was covered, respectively. Furthermore, the great majority of the dialysis nurses place waste products in separate large plastic bags labeled with the unit's name, there is garbage collection, and transfer limited duration consistent with the circumstances and the volume of work, respectively. While, more than three of them ensure that waste bags are not filled more than three quarter full and HIV status and participate in agenda cleaning such as a special cleanliness date, respectively. Regarding dialysis nurses' practices according to their practices toward machine and equipment in dialysis unit, results illustrated that all of the dialysis nurses use a clean machine to start dialysis, while 48.7% cleans the machine during dialysis session as

needed. This is in accordance with **Choi (2019)** who mentioned that medications provided in multiple-use vials, and those requiring dilution using a multiple-use diluent vial, should be prepared in a dedicated central area and taken separately to each patient. Items that have been taken to the dialysis station should not be returned to the preparation area [7]. Moreover, regarding equipment management, Single-use items required in the dialysis process should be disposed of after use on one patient. No disposable items should be disinfected after use on one patient. Items that cannot be disinfected easily (for example, adhesive tape, tourniquets, and cloth covered blood pressure cuffs) should be dedicated to a single patient. The risks associated with the use of physiologic monitoring equipment (e.g., blood pressure monitors, weight scales, access flow monitors) for groups of patients should be assessed and minimized [8]. Concerning dialysis nurses' practices according to their total practices toward machine and equipment in dialysis unit, the results illustrate that 35% of them were incompetent regarding preventive practices related to practices toward machine & equipment in dialysis units. Al Qahtani (2021) mentioned that All equipment, including the front of the dialysis machine, should be considered contaminated after a patient dialysis session. emphasized that cleaning and disinfecting non-critical surfaces in patient-care areas are part of standard precautions, and it is important for frequently touched surfaces, especially those closest to the patient, that are most likely to be contaminated (e.g., HD chairs, HD machines, carts, bedrails, bedside tables, commodes, doorknobs, sinks, surfaces and equipment in close proximity to the patient). Non-disposable instruments (scissors, hemostats, clamps, etc.) which have no contact with sterile tissue or mucous membranes may become contaminated during the procedure [9]. As regard nurses' practices according to their practices toward environment in dialysis unit, results of the current study illustrates that all of the dialysis nurses reported that, there is separate bathroom/toilets for staff, patients and air conditioning inside the unit, respectively. Also, majority of them prepare and distribute medications from a centralized area; a medication supply cart that moves from patient to patient is prohibited and use linens and bellows in a vehicle intended for that and the vehicle was covered, respectively. This is in accordance with that reported: there is a cleaning schedule and is applied to the followings: housekeeping surfaces (e.g., floors, walls, and sinks) cleaned with MOH approved detergent/ disinfectant using double/ or triple bucket technique or scrubbing machines. Housekeeping equipment is kept clean and dry after use. Health care personnel demonstrate appropriate technique for management of blood and/or body fluids **Wilson J, (2020)**. Appropriate PPE, e.g., gloves, masks, gowns and protective eyewear, worn by housekeepers during their routine activities [10]. Nurses are responsible for cleaning of all environmental surfaces in patient areas except floors, walls, ceiling and bathrooms. Dialysis machine, bed, chair, and supply tray (including tourniquet, antiseptics and blood pressure cuff and stethoscopes) receive adequate cleaning and disinfection between patients. Disinfect all external surfaces with 500-ppm sodium hypochlorite or comparable disinfectant after every patient [11]. Regarding the total level of practice concerned with equipment and waste management that prevent HCV infection implemented in HDU, results of the studied subjects were alarming. Nearly all disinfection procedures regarding no disposable items (as trays, blood pressure cuffs, stethoscopes, etc.) and potentially contaminated surfaces were not done totally. Dedication to single patient items that cannot be disinfected easily (as adhesive tape, tourniquets) was not applied. As regard to waste management; the investigator noticed the insufficient number of sharp containers, which was often kept opened. Present study findings are consistent with **Elsatar & Elhefnawy (2020)** study entitled as "patient-care practices associated with increased transmission of viral hepatitis infection among hemodialysis patients" [12]. results revealed that patient-care practices associated with transmission of viral hepatitis infection contains several outbreaks; as 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 (**David, 2021**)_have also results consistent with this [13]. Regarding total level of practices towards viral hepatitis B & C for the elderly patients in the dialysis, units the current study finding revealed that a large percent (89.5% and 55.3%) of the dialysis nurses were competent regarding preventive practices related to viral hepatitis in dialysis unit and practices toward the environment, respectively. In addition, less than three quarters (71.1% and 52.6%) of them were incompetent regarding general preventive practices related to dialysis unit and practices toward machine & equipment, respectively. Moreover, less than two-thirds (63.2%) of them were incompetent regarding toward safe waste management. Furthermore, more than half (52.6%) of the dialysis nurses were incompetent regarding practices towards viral hepatitis B & C for the elderly patients in the dialysis units.

Regarding nurses' practices according to their practices toward safe waste management in dialysis unit, the results revealed that most of the dialysis nurses place waste products in separate large plastic bags labeled with the unit's name and there is garbage collection and transfer limited duration consistent with the circumstances and the volume of work, respectively. This is in line with **Stefania (2020)**; who mentioned that all types of waste containers are available in sufficient number and placed in easily accessible sites and away from traffic. Sharp items (e.g., needles, scalpel blades and broken metal instruments) are placed in an appropriate sharp's container (puncture resistant, color-coded, and leak-proof). Used needles are not manipulated or recapped and are promptly disposed into sharp containers. Staff sticks to the approved policies of proper medical waste segregation (no dangerous medical waste or sharps are observed outside specified containers) Medical waste bags and sharp boxes are $\frac{3}{4}$ filled. Occupational Health all hemodialysis unit employees are screened for Hepatitis B, Hepatitis C and HIV [14].

8. Conclusion

There is statistically significant relation between dialysis nurses' practice and their years of experience in nursing field unit, nurses' experience in dialysis, and their attending training program for improving nursing skills.

9. Recommendation

- [1]. Conducting standards educational program that emphasize on improving knowledge level regarding prevention of viral hepatitis transmission in HDUs in order to raise awareness and correct misconceptions.
- [2]. Reinforce HDUs with nurses with Bachelor degree and postgraduate studies to serve as models and leaders.

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