

Effect of Tele-Nursing Education Intervention on Self-Efficacy and Quality of Life of Hemodialysis Patients

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Abstract: Background: Tele-nursing is a technology-based nursing service that was created to provide convenience health services for all patients with chronic diseases including hemodialysis patients. Purpose of the study was to examine the effect of tele-nursing education intervention on self-efficacy and quality of life of hemodialysis patients. **Design:** A quasi- experimental (study and control group) with pre and post research design was used. **Setting:** This study was conducted at kidney dialysis unit at AL Shuhada Central Hospital and kidney dialysis unit affiliated with the Association for the Preservation of the Holy Quran at Al Shuhada district, Menoufia Governorate, Egypt. **Sample:** A purposive sample of 100 hemodialysis patients who were assigned randomly into two equal groups (study group and control group 50 subjects for each one). **Instruments:-** A structured interviewing questionnaire including socio-demographic characteristics, medical history, clinical status as well as bio-physiological measurements, self- efficacy scale for hemodialysis patients and Kidney disease quality of life short-form questionnaire. **Results:** - There was a significant improvement in mean scores and levels of self-efficacy and quality of life at post-test1 and post-test 2 than pre-test of tele-nursing education intervention among the study group compared to the control group. **Conclusion:-** Tele-nursing education intervention was an effective method to improve hemodialysis patients' self-efficacy and quality of life among the study group compared to the control group. **Recommendations:** Tele-nursing educational intervention should be integrated in providing continuous care and follow-ups for hemodialysis patients.

Key words: *Hemodialysis, Quality of life, Self-efficacy, Tele-nursing educational intervention*

Introduction

Hemodialysis (HD) is a challenging process that requires frequent visits to dialysis facilities three times per week and alters the way patients live. Worldwide, 92% of HD patients

experience high symptoms burden as fatigue, decreased appetite; concentration and muscle cramps. The majority of these symptoms are distressing and negatively impact

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patients' quality of life (QoL). Additionally, HD is a time-consuming, expensive treatment that requires specific restrictions results in loss of independence, disruption of marriage, families, social lives and financial loss (Greenberg & Choi, 2021).

Hemodialysis lessens patients' self-efficacy, influences their confidence in dealing with their environment and life events. Also, patients undergoing HD are more prone to psychological problems as depression and low self-efficacy and wide problems of comorbidities that act as stressors affecting their self-efficacy, as a result identifying these stressors HD patients may be able to manage and enhance their self-efficacy thus improve treatment outcomes among HD patients (Ramezani et al., 2019).

Self-efficacy refers to patients' capacity to manage signs, symptoms, therapies, psychological effects, physical consequences and lifestyle changes associated with chronic diseases. Low self-efficacy among HD patients is linked to a higher risk of hospitalization and death. However, good self-efficacy is linked to improved quality of life. Hence, quality of life and self-efficacy may contribute significantly to treatment outcomes (Lee et al., 2021).

Quality of life is an overall assessment of a person's well-being which include physical, emotional and social dimensions, stress level, sexual function and self-perceived health status. End-stage renal failure is a chronic disease that has a negative impact on patients' health-related QoL due to associated impairment or to

limitations in their daily life's domains. Despite remarkable progress in the treatment of HD, the patients suffer from specific physical, psychological, economic and social problems that negatively affect their QoL (Thenmozhi, 2018).

Tele-nursing is one of tele-health methods that depend on information technology. Worldwide, understaffed wards, increased prevalence of chronic diseases and population aging, long distance from health facilities and changes in health policies have induced popularity of healthcare at home and tele-nursing to shift healthcare from hospital centered to community-centered care and from care centered to patient-centered care model (Yang et al., 2019).

Continuity of care is one of the important duties of nurses that may be facilitated through tele-nursing. Tele-nursing follow-ups are an important aspect of continuity of care that can be effective in facilitating treatment process. Also, nurses can provide many services through tele-nursing including patient triage, symptom management, education, counseling, control of using care tools, monitor HD patients' adherence to therapeutic regimen and review laboratory test results (Whitlow & Wallace, 2019).

Significance of the study

Hemodialysis (HD) is the most common treatment for end-stage renal disease (ESRD). Worldwide, HD is the most used renal replacement therapy compared to peritoneal dialysis and renal transplantation. The global prevalence of renal failure was estimated to be 0.07% about 5.3

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million people in 2017, with other estimates ranging as high as 9.7 million (Bikbov et al., 2020). Worldwide, about 89% of patients on dialysis receive HD (Pecoits-Filho et al., 2020). According to the most recent estimate which was made in 2019, the prevalence of HD in Egypt is 0.61 per 1,000 people, with an estimated incidence rate of 0.192 per 1,000 people (Egypt Renal Data System, 2020).

Purpose of the study:

The purpose of this study was to examine effect of tele-nursing education intervention on self-efficacy and quality of life of hemodialysis patients.

Operational definition:

▪ **Tele-nursing**

Defined as using smart phone and social network including Whats-app in providing nursing services whenever physical distance exists between the patients and the nurse.

▪ **Self-efficacy**

Patients ongoing attempts to regulate and contribute to health care maintenance for good health in their daily lives to improve disease management and diminish disturbances from disease through carefully chosen lifestyles.

▪ **Quality of life**

general well-being and satisfaction of patients, outlining negative and positive features of their life after disease including physical health, family and social relations, education, employment, wealth, safety, security,

freedom, religious beliefs and the environment.

Hypotheses:

- 1) Self-efficacy mean score of the study group who receive tele-nursing education will be higher than the control group.
- 2) Quality of life mean score of the study group who receive tele-nursing education will be higher than control group.

Methods

Research design:

A quasi experimental research design (study and control group) with pre and post- test was utilized to achieve the purpose of the study.

Research setting:

Hemodialysis unit at AL Shuhada Central Hospital and unit that is affiliated to the Association for the Preservation of the Holy Quran at Al Shuhada district, Menoufia Governorate.

Sample:

A purposive sample of 100 adult patients who are on hemodialysis were divided randomly into two equal groups (study group and control group 50 subjects for each one). According to the following criteria.

Inclusion criteria:

- Patients' age should range between 18 to < 60 years.
- Patients of both sexes should be receiving regular hemodialysis treatment
- Patients who are fully conscious and free from any life threatening conditions as cancer.

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- Patients should have the ability to read and write and use the internet and mobile phones by themselves or by family members.

Sample size and power of the study:

Epi website (Open Source Statistics for Public Health) was used, with the equation.

Sample size (n) = $[DEFF * Np(1-p)] / [(d2/Z21-\alpha/2 * (N-1) + p * (1-p))]$ with the following assumptions.

- Two sided confidence level of 95% = (1 - α).
- A power (1 - β) or (% chance of detecting) of 80%.
- Ratio of sample size, unexposed (control), exposed (study group) = 1%
- Percent of unexposed with outcome (awareness) = 15%
- Then the researcher entered one of four parameters which was % of exposed = 25 % and the others three parameters would be calculated by the Epi website program .

Instruments of the study:

The instruments used for data collection included the following:

Instrument one: Structured interviewing questionnaire concerned with:-

A. Socio-demographic

characteristic of the study subjects: - Including eight items such as name, age, telephone number, gender, educational level, occupation, income and residence.

B. Medical history of the study subjects:- Including 7 items

such as previous peritoneal dialysis, previous kidney transplant, suffer from any chronic disease, previous surgery, heredity disease, family member suffered from renal failure previously and family member suffer from kidney disease recently. The response of each item was in the form of yes or no.

C. Clinical status of the study subjects: - Including 16 items such as type of vascular access, how long ago started hemodialysis sessions, how many hours do hemodialysis sessions take, is hemodialysis schedule suitable, height, weight before hemodialysis session, weight after hemodialysis session, body mass index, and etc.....

Response to questions number one, twelve, thirteen, fourteen and fifteen was in the form of open-ended questions. While responses to questions two, five, six and seven were in the form of three options and response to question three was in the form of four options. Also, responses to questions number four and ten were in the form of yes or no and response to questions number eight, nine and eleven was in a form of five options.

Instrument two: Bio-physiological measurements:-

Including blood investigations as creatinine level, hemoglobin level, blood urea nitrogen, serum calcium and phosphorus level.

Instrument three. Self- efficacy scale for hemodialysis patients:-

This scale adopted from Lin et al., (2013). This scale consisted of 25 items divided into four domains:

- First domain concerned with autonomy included eight items from 1 to 8. It focused on subjects' confidence to express freely and comfortably their own concerns or questions about disease and treatment.
- The second domain concerned with self-integration included seven items from 9 to 15. It focused on subjects' confidence in adjusting their lifestyle and implementing recommended regimens and self-care activities in order to achieve a balanced life.
- Third domain concerned with problem solving included six items from 16 to 21. It focused on subjects' confidence to learn disease-specific information to achieve better disease control.
- The fourth domain concerned with seeking social support included four items from 22 to 25. It focused on subjects' confidence in seeking support from significant others to cope with their disease.

Scoring system

The scale's questions score ranged from 0 to 5, none = 0, little =1, sometime = 2, intermediate =3, most of time = 4 and all of the time = 5. Total score of this scale ranged from 0 -125. Self-efficacy score was categorized into three levels as low self-efficacy

was < 30% of total score, moderate self-efficacy ranged between 30% to 70% of total score and high self-efficacy was > 70% of total score.

Reliability of the instrument, Cronbach's alpha coefficient test for self- efficacy was 0.93 that indicated the instrument was reliable.

Instrument four:.. Kidney disease quality of life short-form (KDQOLSf):-

It was adopted from Elamin et al., (2019). It contained 36 items and was classified into five subscales. First subscale contained physical component subscale (PCS), it included six items ranging from 1 to 6. Second subscale was concerned with mental components subscale (MCS). It included six items from 7 to 12. The third subscale included burden of kidney disease subscale which contained four items from 13 to 16. The fourth subscale was concerned with symptoms and problems list subscale. It included twelve items from 17 to 28. The fifth subscale was concerned with the effect of kidney disease subscale it included eight items from 29 to 36.

Scoring system

Kidney Disease Quality of Life Short-Form (KDQOLSf) is different likert points in varied subscale. Grand total scores ranged from 0 to 131. Higher score reflected high quality of life and low score reflected low quality of life. Total QoL score was categorized into three levels (e.g. low QoL when the subjects achieved <30% of the total score, moderate QoL when the subjects achieved from 30% to 70% of total

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score and high QoL when the subjects achieved >70% of total score).

Reliability of the instrument, Cronbach's alpha coefficient test for kidney disease quality of life short form was 0.90 that indicated the instrument was reliable.

Validity of data collection instruments:-

The validity of the study instruments was determined by three panels of professor doctor in the fields of community health nursing, community medicine; medical and surgical nursing. Changes were made in response to the panel's suggestions regarding the accuracy of the statements and the relevance of the contents.

Ethical consideration: -

- A written approval of Ethical Research Committee obtained from Faculty of Nursing, Menoufia University.
- Oral and written informed consent was obtained from the study subjects. The subjects who agreed to participate in the study were assured about confidentiality and anonymity of the study. They were informed about their right to withdraw from the study at any time without giving a reason. Also, the purpose of the study was clarified for the subjects by the researcher.

Pilot study: -

Before starting data collection, a pilot study was carried out on 10% of the sample size (10 patients) that met the

criteria of the study to assess clarity, applicability, feasibility of the study and time needed to fill the tool. The average time taken for completing questionnaire was about 25-30 minutes. The needed modifications were done as revealed from the pilot study. The subjects of the pilot study were excluded from the study sample.

Procedure for data collection: -

- A letter was submitted from the dean of the Faculty of Nursing, Menoufia University to directors of kidney dialysis unit including the purpose and methods of data collection.
- Data were collected throughout four months starting in February and completed in May 2023.
- After obtaining written and informed consent from kidney dialysis units' directors to conduct the study, the researcher made formal contact with the head nurses at kidney dialysis units to identify actual number, age of hemodialysis patients at each unit and schedule of hemodialysis sessions.
- The study sample were selected according to inclusion criteria then were assigned randomly to the study and the control group according to the settings of the study.
- The study group randomly was assigned to kidney dialysis unit at AL Shuhada Central Hospital and the control group was assigned to kidney dialysis unit affiliated with the Association for the Preservation of the Holy Quran at Al Shuhada district.

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- Hemodialysis sessions were held from 6 a.m. to 10 a.m., 11 a.m. to 3 p.m., and 3 p.m. to 7 p.m. at the study group's setting.
- Hemodialysis sessions were held from 7am to 11am, second session from 11am to 3pm at the control group's setting.
- The researcher met with the study subjects face to face and gave them a brief summary of the study purpose and procedure for data collection.
- During pre-phase of the study, data collection were extended from the beginning of February to the middle of February, 2023, from the control group, while from the middle of February to the beginning of March, 2023, from the study group.
- The average number of patients from which data are collected each time was 8 subjects.
- The data obtained during the pre-phase were used as a base for educational intervention.
- The researcher began to communicate with the study group online through Whats-Apps.
- The study group was divided into five groups on Whats-App, each group included ten patients.
- The educational intervention aimed to improve hemodialysis patients' self-efficacy, quality of life and tele-nursing awareness and practice.
- The researcher first sent a soft copy of the booklet to the study group as a guide including important information about problems that hemodialysis patients suffer from, simple equation for a better life with hemodialysis, importance of follow-up, how to accept your health condition and how to spend the free time.
- Each patient in the study group received three educational sessions through WhatsApps with an average time for each session of 10 - 20 minutes and patients were allowed to send any question from 8 a.m. to 8 p.m. every day.
- Before any session, the researcher sent a power point related to defined element followed by audio recordings and text messages to clarify content of power point.
- First session was about advantages and disadvantages of hemodialysis and problems associated with hemodialysis as shortness of breath, hyperkalaemia, hyper parathyroid hormone, anemia, headache, high and low blood pressure, constipation, sleep disturbance, nausea, loss of appetite, bone pain, muscle cramps and vascular access complications.
- Second session was about quality of life, aimed to improve quality of life of hemodialysis patients including domains of quality of life, factors affect quality of life, simple equation for a better life with hemodialysis, importance of follow-up and how to enjoy the life.
- Third session was about new tested therapeutic modalities for hemodialysis as artificial kidney implantation and wearable artificial kidney.

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- Data were collected for first post-test after one week of the educational intervention.
- Follow-up was conducted 3 months later
- The control group did not receive any instructions during data collection procedure, but received routine care at hemodialysis unit.
- For ethical consideration the researcher provided the control group with the educational booklet at the end of the study.

Statistical analysis:

Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 22. Graphics were done using excel program. Quantitative data were presented by mean (X) and standard deviation (SD). It was analyzed using student t- test for comparison between two means, and ANOVA (F) test for comparison between more than two means. Qualitative data were presented in the form of frequency distribution tables, number and percentage. It was analyzed by chi-square (χ^2) test. Level of significance was set as P value \leq 0.05 for all significant tests.

Results:

Table (1) shows that the majority of the control and the study groups are older than 40 years as the age between 40 to 49 years represented (32% and 48% respectively). Mean age of the control group is 42.80 ± 9.2 years and of the study group is 42.9 ± 9.2 years. No statistical significant difference between both groups was found. Regarding to occupation, 42% of the control group did not work compared

to 50% in the study group. Also, 62% of the control group and 52% of the study group did not have enough income. Moreover, 60% of the control group and 80% of the study group lived in the rural areas with no statistical significant difference between both groups.

Table (2) shows that all of the control and the study groups (100%) not performed peritoneal dialysis before and most of the control group (92%) and the study group (94%) not transplanted any kidney before.

Also, most of the control group (94%) and the study group (96%) suffer from other chronic diseases, hypertension is the main disease that affected their kidney function for 36.2% of the control group and 50% of the study group and most of both the control and the study groups (96%) not performed any surgery before with no significant difference between both groups.

Regarding to hereditary diseases, 56% of the control group have hereditary diseases while 52% of the study group have not any hereditary diseases. Also, the table reveals that hypertension is the most hereditary disease for 71.4% of the control group and 70.8% of the study group with no significant difference between both groups.

Moreover, most of the control and the study groups (94%, 98% respectively) have no family member suffered from renal failure before and most of the control and the study groups (98%) have no family member suffered from renal failure recently with no significant difference between both groups.

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Table (3) illustrates that mean duration of hemodialysis for the control and the study groups are 3.8 ± 0.6 year and 3.3 ± 0.7 years respectively with significant difference between both groups. Also, mean duration of hemodialysis sessions for the control and the study groups are 3.4 ± 1.7 hours and 3.8 ± 1.8 hours respectively with no significant difference between both groups.

Moreover, 96% of the control group and 100% of the study group have arterio-venous fistula and 100% of the control group receive hemodialysis three times per week and 90% of them received it for four hours for each session. Also, 98% of the study group receive hemodialysis three times per week and 50% of them receive it for four hour for each session with no significant difference between both groups.

Also, all of the control and the study groups (100%) consider hemodialysis schedule suitable for them and 98% of the control group and all of the study group (100%) consider it is very important to follow hemodialysis schedule because it is the only treatment for renal failure with no significant difference between both groups.

Furthermore, 50% of the control group and 60% of the study group attended all sessions during the last month. Regarding main reason for absence, 64% of the control group were busy with other thing while 50% of the study group not attended due to pain or other diseases with no significant difference between both groups.

Moreover, 76% of the control group and 78% of the study group diminished duration of hemodialysis sessions during the last month and 31.6% of the control group diminished sessions due to cramps and hypotension while 53.8% of the study group diminished sessions due to hypotension with no significant difference between both groups.

Table (4) reveals that mean value of the height of the control and the study groups are 170.4 ± 7.3 and 172.5 ± 10.1 (cm) respectively while weight's mean value before hemodialysis session for the control and the study groups are 71.8 ± 11.4 and 76.7 ± 14.5 (Kg.) respectively as well as weight's mean value after hemodialysis session of the control and the study groups are 69.9 ± 11.5 and 74.5 ± 14.7 (Kg.) respectively. Also, 64% of the control group and 66% of the study group have normal body mass index with no significant difference between both groups.

Table 5 shows that there is clinical reduction of creatinine mean value among the study group from 8.6 ± 1.9 (mg/dl) at pre intervention to 8.2 ± 2.8 at post1 intervention to 7.9 ± 3.1 at post2 tele-nursing education intervention compared to the control group with no statistical significant difference between both groups ($p=0.51$, $p=0.21$).

Also, there is statistical significant reduction of urea mean values among the study group from 145.5 ± 35.6 at pre intervention to 130.5 ± 33.4 at post1 intervention to 122.7 ± 30.2 (mg/dl) at post2 tele-nursing education

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intervention compared to the control group ($p < 0.03$, $p < 0.0001$).

Moreover, there is clinical increase of hemoglobin mean values of both the control and the study groups at post1 and post2 tele-nursing education intervention compared to pre intervention with no statistical significant difference between both groups ($p = 0.16$, $p = 0.29$).

Also, among the study group, there is a statistical significant reduction of phosphorus mean value from 4.2 ± 1.5 at pre intervention to 4.8 ± 1.8 at post1 intervention to 4.4 ± 0.6 (mg/dl) at post2 tele-nursing education intervention compared to the control group ($p < 0.0001$).

Furthermore, among the study group, there is statistical significant increase of calcium mean values from 7.7 ± 1.5 at pre intervention to 8.0 ± 0.83 at post1 intervention to 8.5 ± 0.6 (mg/dl) at post2 tele-nursing education intervention compared to the control group ($p < 0.001$).

Table 6 highlights that there is highly statistical significant improvement in total mean score for each domain of self-efficacy as well as total self-efficacy mean score among the study group compared to the control group at post1 and post 2 ($p < 0.0001$). Total self-efficacy mean score increased from 39.3 ± 6.8 at pre intervention to 53.9 ± 11.6 at post1 intervention to

82.1 ± 10.6 at post 2 tele-nursing education intervention and the difference is highly statistically significant among the study group compared to the control group ($P < 0.0001$). On the contrary, the control group total self-efficacy mean score did not indicate any improvement at all intervention phases.

Table (7) highlights that there is highly statistical significant improvement in total mean score for each subscale for quality of life as well as total quality of life mean score at post1 and post 2 tele-nursing education intervention among the study group compared to the control group ($p < 0.0001$). Total mean score of quality of life increased from 52.1 ± 4.9 at pre intervention to 65.3 ± 5.2 at post1 intervention to 80.6 ± 5.4 at post2 tele-nursing education intervention and the difference is highly statistically significant among the study group compared to the control group ($P < 0.0001$). On the contrary, the control group's total quality of life means score not present any improvement at all phases of the intervention. This result approved the second hypothesis of the current study that stated "Quality of life level and mean score of the study group who receive tele-nursing education will be higher than the control group".

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Table (1): Distribution of the studied patients according to their socio -demographic characteristics (N = 100)

Socio demographic characteristics	Control group		Study group		χ^2 / LR	P value
	No.	%	No.	%		
Age (years):						
20-	3	6	4	8	3.3	0.34 NS
30 -	15	30	11	22		
40 -	16	32	24	48		
50- <60 years	16	32	11	22		
Mean \pm SD	42.8 \pm 9.2 Y		42.9 \pm 9.2 Y		t= 0.03	0.97
Gender:					0.36	0.54 NS
Male	24	48	32	64		
Female	26	52	18	36		
Occupation:					2.4	0.59 NS
Not work	21	42	25	50		
Housewives	21	42	19	38		
Employee	1	2	5	10		
Free business	7	14	1	2		
Income:					1.2	0.31 NS
Enough	31	62	26	52		
Not enough	19	38	24	48		
Residence:					1.9	0.16 NS.
Urban	20	40	10	20		
Rural	30	60	40	80		
Total	50	100	50	100		

Table 2: Distribution of studied patients according to medical history pre intervention, post1 and post2 intervention (N=100)

Medical history	Control group		Study group		χ^2 / LR	P value
	No.	%	No.	%		
Performing peritoneal dialysis before:					NA	NA*
No	50	100	50	100		
Transplant a kidney before:					0.15	= 0.69 NS
Yes	4	8	3	6		
No	46	92	47	94		
Suffered from other chronic disease:					LR=0.21	= 0.64 NS
Yes	47	94	48	96		
No	3	6	2	4		
Type of chronic diseases affect kidney function:	(n=47)		(n=48)		LR=8.5	= 0.13 NS
Hypertension	17	36.2	24	50		
Diabetes mellitus	4	8.5	4	8.3		
Both hypertension and diabetes mellitus	6	12.8	6	12.5		
Hypertension and hepatitis C virus	18	38.3	6	12.8		
Others*	2	4.2	8	16.7		
Surgery before:					0.0	=1.0 NS.
Yes	2	4	2	4		
No	48	96	48	96		
Hereditary disease:					0.64	= 0.42 NS
Yes	28	56	24	48		
No	22	44	26	52		
Type of hereditary diseases:	(n=28)		(n=24)		5.5	= 0.06 NS
Hypertension	20	71.4	17	70.8		
Diabetes mellitus	8	28.6	4	16.7		
Both hypertension and diabetes mellitus	0	0	3	12.5		
Family member suffered from renal failure before:					Fisher	= 0.61 NS
Yes	3	6	1	2		
No	47	94	49	98		
Family member suffered recently from kidney disease:					Fisher	=1.0 NS
Yes	1	2	1	2		
No	49	98	49	98		
Total	50	100	50	100		

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Table (3): Distribution of studied patients according to clinical status pre intervention, post1 and post2 intervention (N=100)

Clinical status	Control group		Study group		χ^2 / LR	P
	No.	%	No.	%		
Duration of hemodialysis: $\bar{x} \pm SD$ Year	3.8± 0.6		3.3 ±0.7		t=3.7	P<0.0001 HS
Duration of each session: $\bar{x} \pm SD$ Hours	3.4 ± 1.7 hours		3.8 ±1.8 hours		t=0.58	0.56 NS
Vascular access: Fistula Catheter	48 2	96 4	50 0	100 0	X2=2.1	P=0.16 NS
Receiving hemodialysis treatment per week: Two times Three times	0 50	0 100	1 49	2 98	X2=1.0	P=0.32 NS
Suitability of hemodialysis schedule: Yes	50	100	50	100	NA	NA
Importance of following dialysis schedule: Moderate important. Very important	1 49	2 98	0 50	0 100	LR=1.4	0.024 NS
Reasons for its importance: Only treatment for renal failure	50	100	50	100	NA	NA
Extent of difficulty: No difficulty Moderate difficulty	49 1	98 2	50 0	100 0	LR=1.4	0.23 NS
Absent from hemodialysis session, last month: No absent Once absent Twice absent	25 18 7	50 36 14	30 18 2	60 36 4	LR=3.4	0.18 NS
Main reason for absence: Pain or other diseases. Busy with other thing	(n=25) 9 16	36 64	(n=20) 10 10	50 50	X2 =0.0	1.0 NS
Decreasing duration of hemodialysis session, last month: Yes No	38 12	76 24	39 11	78 22	X2 =0.0	1.0 NS
Main reasons for decreasing duration of hemodialysis session: Cramps Bathroom use Hypotension Hypertension	n=(38) 12 3 12 11	31.6 7.9 31.6 28.9	(n=39) 8 0 21 10	20.5 0 53.8 25.6	LR=7.5	0.06 NS
Total	50	100	50	100		

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Table 4: Distribution of studied patients according to anthropometric measures pre intervention, post1 and post2 intervention (N=100)

Anthropometric measures	Pre-intervention				Test of Significant Independent t test	P Values
	Control group		Study group			
	Mean± SD	Mean± SD	Mean± SD	Mean± SD		
Height: X ± SD (cm.)	170.4 ± 7.3		172.5 ±10.1		1.2	0.25 NS
Weight before hemodialysis session: X ± SD (Kg.)	71.8±11.4		76.7 ±14.5		1.90	0.06 NS
Weight after hemodialysis session: X± SD (Kg.)	69.9±11.5		74.5±14.7		1.74	0.08 NS
BMI Levels:	n=50	%=100	n=50	%=100	LR=3.1	P=0.22 NS
Normal weight (18.5 – 24.9 kg/m2)	32	64	33	66		
Over weight(25 – 29.9 kg/m2)	18	36	15	30		
Obesity (30 – 34.9 kg/m2)	0	0	2	4		
Total	50	100	50	100		

Table 5: Distribution of studied patients according to values of creatinine, urea, Hb, phosphorus and calcium pre intervention, post1 and post2 intervention (N=100)

Laboratory data	Pre-intervention		Post 1-intervention		Post 2-intervention		Test of Significant -P Values		
	Control group	Study group	Control group	Study group	Control group	Study group	T test	T test	T test
	Mean± SD	Mean ± SD	Mean ± SD	Mean ±SD	Mean ± SD	Mean± SD	P1	P2	P3
Creatinine : X ± SD (mg/dl)	8.2 ±2.4	8.6 ±1.9	8.2 ±2.0	8.2 ±2.8	8.9 ±1.5	7.9 ±3.1	t=0.35 p= 0.7	t=0.7 p=0.5 1	t=1.3 p=0.21
Urea: (mg/dl) X ± SD	141.3±30.5	145.5 ±35.6	143.8±29.8	130.5 ±33.4	144.9±24.7	122.7 ±30.2	t=0.62 p= 0.53	t=2.1 p<0.0 3	t=4.0 p<0.000 1
Hb : X± SD (g/dl)	9.5 ±1.4	10.4 ±1.5	9.9 ±1.2	10.5 ±1.2	10 ±0.8	10.7 ±0.7	t=1.3 p= 0.12	t=1.4 p=0.1 6	t=1.1 p= 0.29
Serum phosphorus : X± SD (mg/dl)	4.8 ±1.2	4.2 ±1.5	5.0 ±1.1	4.8 ±1.8	5.2 ±0.7	4.4 ± 0.6	t=0.92 p= 0.35	t=4.9 p<0.0 001	t= 4.8 p<0.000 1
Serum calcium: X± SD (mg/dl)	9.4 ±1.3	7.7 ±1.5	7.8 ±1.1	8.0 ±0.83	7.5 ±0.9	8.5 ±0.6	t=1.2 p=0.23	t=0.83 p=0.4 0	t=4.7 p<0.001

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Table 6: Distribution of studied patients according to self-efficacy domains' mean scores pre intervention, post1 and post2 intervention (N = 100)

Self- efficacy domains	Pre intervention		Post1 intervention		Post 2 intervention		P1	P2	P3
	Control group	Study group	Control group	Study group	Control group	Study group			
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD			
Autonomy (8 items)	15.2±4.2	14.0±2.7	15.2±4.2	19.5±3.6	15.2±4.2	25.9±4.2	t =1.6, P=0.11	t =6.5, P<0.0001	t =19.2, P<0.0001
Self- integration (7items)	11.9±2.3	11.7±2.5	11.9±2.3	14.7±3.3	11.9±2.3	22.4±3.1	t =0.61, P=0.54	t =13.5, P<0.0001	t =7.2, P<0.0001
Problem solving (6items)	7.8±2.5	8.1±1.8	7.7±2.5	12.3±2.7	7.8±2.5	19.2±2.1	t =0.76, P=0.44	t =17.3, P<0.0001	t =9.5, P<0.0001
Social support (4 items)	5.3±1.7	5.5±1.8	5.3±1.7	10.4±3.1	5.3±1.7	14.6±2.2	t =0.77, P=0.43	t =12.2, P<0.0001	t =18.6, P<0.0001
Mean of total self-efficacy (25items)	40.2 ±7.1	39.3±6.8	40.2 ±7.1	53.9±11.6	40.2 ±7.1	82.1±10.6	t =0.64, p=0.52	t =22.3, p<0.0001	t =45.5, p<0.0001

P1=Comparison between mean score of self-efficacy among the study and the control groups at pre tele-nursing education intervention.

P2= Comparison between mean score of self-efficacy among the study and the control groups at post1 tele-nursing education intervention.

P3=Comparison between mean score of self-efficacy among the study and the control groups at post2 tele-nursing education intervention.

Table 7: Distribution of studied patients according to quality of life subscales' mean scores pre intervention, post1 and post2 intervention (N = 100)

QoL Subscales and total QoL	Pre intervention		Post1 intervention		Post2 intervention		P1	P2	P3
	Control group	Study group	Control group	Study group	Control group	Study group			
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD			
Physical health	3.0±1.2	3.4±1.1	3.0±1.2	6.2±1.2	3.0±1.2	8.9±1.1	t =1.7, P=0.08	t =12.4, P<0.0001	t =24.7, P<0.0001
Mental health	5.3±1.4	5.4±1.1	5.3±1.4	8.0±1.6	5.3±1.4	10.3±1.6	t =0.39, P=0.70	t =8.8, P<0.0001	t =15.9, P<0.0001
Burden of kidney disease	4.0±0.7	4.0± 0.0	4.0±0.7	6.7±0.9	4.0±1.7	9.5±1.1	t =0.19, P=0.8	t =16.0, P<0.0001	t =29.3, P<0.0001
Symptoms and problems of kidney diseases	25.4±4.3	26.2±2.3	25.4±4.3	28.4±2.4	25.4±4.4	32.6±2.4	t =1.2, P=0.23	t =4.3, P<0.0001	t =10.1, P<0.0001
Effect of kidney disease on daily life	14.5±4.7	14.1±2.1	14.5±4.7	16.0±2.3	14.5±4.7	19.3±1.9	t =0.48, P=0.62	t =2.1, P<0.04	t =6.7, P<0.0001
Mean of total quality of life	52.3±9.4	52.1±4.9	52.3±9.4	65.3±5.2	52.2±9.4	80.6±5.4	t =0.13, p=0.89	t =19.5, p<0.0001	t =48.3 p<0.0001

P1=Comparison between mean score of quality of life among the control and the study groups at pre tele-nursing education intervention.

P2= Comparison between mean score of quality of life among the control and the study groups at post1 tele-nursing education intervention.

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P3=Comparison between mean score of quality of life among the control and the study groups at post2 tele-nursing education intervention.

Discussion

Caring for hemodialysis (HD) patients is intensive and expensive as HD alters the life of the patients dramatically. Tele-nursing may improve access and efficiency of HD care for the patients in their own homes or from remote facilities leading to improvement in the patients' competency and ability to function (Rosner et al., 2017). Thus, the purpose of the current study was to examine effect of tele-nursing education intervention on self-efficacy, quality of life and adherence to therapeutic regimen of patients with hemodialysis.

Regarding anthropometric measures of the studied patients with hemodialysis, the current study finding revealed that two thirds of the control and the study groups' body mass index (BMI) was normal ranged from 18.5 - 24.9 kg/m². This finding was consistent with the study finding conducted in Iran by Rajabfreydani et al., (2021) who examined "The effect of tele-nursing on adherence to diet in patients underling hemodialysis" also, Fakhri El Khoury et al., (2020) reported that more than half of hemodialysis patients' BMI were between 20-25 kg/m².

Pertaining to biochemical investigations, the current study findings showed that, there were statistical significant reduction of phosphorus and urea as well as statistical significant increase of calcium mean values among the study group compared to the control group

after tele-nursing education intervention ($p < 0.0001$). The current study findings matched up with the study finding conducted in Korea by Park & Lee (2021) who studied "Randomised controlled trial of a smartphone application-based dietary self-management program on haemodialysis patients" They illustrated that among the study group there was statistical significant reduction of phosphorus and urea mean values after the intervention ($p < 0.001$). Also, the study findings were consistent with the study findings conducted in Iran by Arad et al., (2021) who examined "Do the patient education program and nurse-led telephone follow-up improve treatment adherence in hemodialysis patients?" showed that there was a significant reduction in urea and phosphorus mean values as well as significant increase in mean value of calcium among the study group after the intervention compared to the control group ($p < 0.001$).

Regarding hemodialysis patients' self-efficacy, the current study findings showed that before the intervention, there was no statistically significant difference in self-efficacy between the study and the control groups, but the difference was highly significant among the study group compared to the control group after tele-nursing education intervention ($P < 0.0001$).

The current study findings came in agreement with Poorgholami & Jahromi, (2016) who examined

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“Effects of self-care education with telephone follow-up on self-efficacy level in hemodialysis patients” They showed a significant increase in self-efficacy score in the study group after the intervention that reflected the positive effects of telephone follow-up in enhancing self-efficacy and improvement of the disease.

Also, the current study findings were in line with the study finding conducted in Iran by Hosseini et al., (2023) who studied “The effect of an educational app on hemodialysis patients’ self-efficacy and self-care” They showed that total self-efficacy mean score after the intervention was significantly higher than pre-intervention score indicating the effectiveness of the app.

Regarding hemodialysis patients’ quality of life (QoL), the current study revealed that, there was statistically significant improvement in QoL mean score from 52.1 ± 4.9 at pre intervention to 65.3 ± 5.2 at post1 to 80.6 ± 5.4 at post2 tele-nursing education intervention among the study group compared to the control group. These findings were consistent with the study findings conducted in Iran by Borzou et al., (2020) who studied “The effect of telephone follow-up on quality of life in hemodialysis patients” and showed that there was a significant increase in QoL mean score increased from 52.33 ± 14.37 to 57.89 ± 12.02 after the intervention among the study group compared to the control group.

Also, the current study findings showed that after tele-nursing education intervention among the study group there was significant statistical

improvement in QoL dimensions in terms of physical health, mental health, effect of kidney disease on daily life, burden of kidney disease; symptoms and problems of kidney diseases. These findings matched up with the study finding conducted by Borzou et al., (2020) showed that there was a significant statistical improvement in QoL dimensions among the study group after the intervention.

Moreover, these findings were consistent with the study finding conducted in Jordan by Al-Azab & Khader, (2016) who examined “Tele-nephrology application in rural and remote areas of Jordan” They showed that there was statistical significant increase in QoL mean score from 33.1 to 45.0 after tele-nephrology consultations (consultations might result in better health state and overall enhancement of QoL.

Also, Al-Azab & Khader (2016) illustrated that there were significant increase in the mean scores of symptoms and problems subscale and effects of kidney disease on daily life subscale as a result of tele-consultations, patients were less bothered by itchy or dry skin, faintness, dizziness, lack of appetite, fluid limits, diet restrictions and stress caused by kidney disease.

Furthermore, these findings came in agreement with the study findings conducted in Japan by Hayashi et al., (2017) who examined “Testing the feasibility and usability of a novel smartphone-based self-management support system for dialysis patients” showed that QoL mean score of the study group was improved from 75.0

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to 84.4 after the intervention while the control group mean score not improved over time.

Conclusion

Based on the findings of this study, it was concluded that there was a significant improvement in mean scores and levels of self-efficacy and quality of life after tele-nursing education intervention among the study group compared to the control group.

Recommendations

Based on the study findings, the following important recommendations are proposed:

- Integrating tele-nursing practice should be integrated in providing continuous care and follow-up for HD patients.
- framework should be developed for governance of various aspects of tele-nursing as ethical and legal compatibility, clinical factors and compliance to ensure sustainability.
- Hemodialysis patients should be provided with necessary knowledge and skills to improve self-efficacy and quality of life.
- Further randomized controlled trials that compare varying elements and strategies for delivering tele-nursing practice for HD patients are needed.

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