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RESEARCH ARTICLE

THE EFFECT OF VIRTUAL EDUCATIONAL PROGRAM ON THE QUALITY OF LIFE AMONG PATIENTS WITH RENAL FAILURE

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Quality of Life, Renal Failure, and Virtual Educational Program.

Abstract

Background: Chronic renal failure significantly impairs patients' physical, psychological, and social well-being, leading to a reduced quality of life and increased dependency on long-term treatment such as dialysis.Virtual educational programs have emerged as an innovative approach to enhance patients' self-management skills, improve disease awareness, and promote better quality of life outcomes in this population.

The aim of the study: To assess the effect of a virtual educational program on the quality of life among patients with renal failure.

Research design: A quasi-experimental research design was used.

Setting: The study was conducted at the nephrology outpatient department clinics of King Saud Medical City in Riyadh, Saudi Arabia.

Subjects: A purposive sample of patients with stage III and stage IV renal failure was selected from those attending or following up at the study setting.

Tools: Two main tools were used: an interview questionnaire;

Tool (I): Structured Interview Questionnaire was divided into two parts. Part (I): Socio-demographic characteristics of patients,Part (II):Medical history,

Tool (II): Kidney Disease Quality of Life Scale. Results: The result of this study concluded that (2.61 ± 0.42, 2.58 ± 0.45, 2.66 ± 0.44, 2.49 ± 0.51. 2.55 ± 0.46, 2.72 ± 0.40, 2.60 ± 0.38) of the studied patients ' quality of life domains among kidney failure before6 months and (3.34 ± 0.46, 3.29 ± 0.48, 3.31 ± 0.47, 3.02 ± 0.52, 3.18 ± 0.49, 3.51 ± 0.45, 3.33 ± 0.41) after 6 months.

Conclusion: There was a significant improvementin patients'quality of life after the post-virtual health educational program.

Recommendations: Providing ongoing health educational programs for patients with renal failure in different age groups with different educational strategies.

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Introduction:-

Renal failure is a progressive and life-threatening condition characterized by the inability of the kidneys to adequately filter waste products, regulate fluid and electrolyte balance, and maintain overall homeostasis. As kidney

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function declines, patients experience a wide range of systemic complications such as uremia, anemia, hypertension, bone disorders, and fluid overload, which significantly increase morbidity and mortality rates. The chronic nature of the disease often necessitates long-term renal replacement therapies, such as hemodialysis or peritoneal dialysis, placing a substantial physical, psychological, and financial burden on patients and their families(Zhang et al., 2024). Quality of life in patients with renal failure is profoundly compromised due to the persistent symptoms of the disease, strict treatment regimens, dietary restrictions, and frequent hospital visits. Patients often experience fatigue, depression, anxiety, and social isolation, which negatively affect their daily functioning and emotional well-being. Moreover, dependence on dialysis and the limitations imposed by the disease reduce patients' ability to work, engage in social activities, and maintain normal life roles, making quality of life a central outcome in renal care management(Kampmann et al., 2023). Virtual educational programs represent an innovative and accessible approach to improving the quality of life among patients with renal failure. These programs utilize digital platforms to deliver structured health education, enhance disease-related knowledge, and strengthen self-care behaviours such as medication adherence, dietary management, and symptom monitoring. By overcoming barriers of time, distance, and healthcare accessibility, virtual education empowers patients to actively participate in their care, leading to improved clinical outcomes and better psychosocial adaptation to chronic illness (Al Shammari et al., 2024). Nurses play a pivotal role in the management of patients with renal failure through continuous education, counselling, and holistic care delivery. They are responsible for assessing patients' needs, providing individualized health education, and reinforcing self-management strategies to prevent complications and enhance adherence to treatment. In addition, nurses support patients psychologically by addressing anxiety, promoting coping mechanisms, and encouraging positive health behaviors. Within virtual educational programs, nurses act as facilitators and educators, ensuring effective communication, patient engagement, and ongoing evaluation of learning outcomes to improve quality of life (Vaidya &Aeddula 2024).

Significance of Study:-

The CKD is a significant public health concern, with 8%–16% of the world's population affected. It is characterized by a need for close monitoring, poor health outcomes and a high economic burden for society as well as for the individual. The world's population is growing older, and with CKD prevalence rising in parallel with age, an increasing number of people will continue to need monitoring and treatment with dialysis (Nygård et al., 2022). The CKD is an important public health concern that has an increasing global prevalence and negatively affects people's quality of life, affecting more than 750 million people worldwide. It develops due to many known or unknown causes, such as diabetes mellitus, arterial hypertension, obesity, ageing, and an unhealthy diet. The disease is characterized by chronic, progressive, and irreversible nephron loss. The morbidity and mortality rates of CKD can be lowered through meticulous treatment. Renal replacement therapies such as peritoneal dialysis, hemodialysis, and kidney transplantation are applied for end-stage renal disease (Bağriaçik& Dikmen, 2024). Globally, the prevalence of CKD is 9.1%, and there were 697.5 million cases of CKD (all stages) reported worldwide, while in the Kingdom of Saudi Arabia, the prevalence of CKD is 5.7%, according to an epidemiological study, which represents a high burden on health care systems (Alghamdi et al., 2023).Therefore, it is important to assess the effect of a virtual educational program on the quality of life among patients with renal failure.

Aim of the study:-

The present study aimed to assess the effect of a virtual educational program on the quality of life among patients with renal failure through the following objectives:

1-Assessing quality of life among three- and four-stage renal failure patients before a virtual educational program.
2- Design an educational program based on the basic assessment for three- and four-stage renal failure patients.
3- Implement the virtual educational program for three- and four-stage renal failure patients.
4- Evaluate the effect of a virtual educational program for three- and four-stage renal failure patients on their quality of life.

Research Hypothesis:-

At the end of the study, renal failure patients who receive the virtual educational program will have a better quality of life after implementing the program

Subjects and Methods:-

Technical Item: The methodology section covers such details as the study's design, participants, and methods for collecting data.

Research design: A quasi-experimental research design was used to assess the effect of a virtual educational program on the quality of life of patients with renal failure
Setting: The study was conducted at the nephrology outpatient department and virtual clinics of King Saud Medical City in Riyadh, Saudi Arabia.
Subjects: A purposive sample of patients with stage III and stage IV renal failure was selected from those attending or following up at the study setting. The sample size was calculated using Cochran's equation ($n_0 = Z^2pq/e^2$). A confidence level of 95% ($Z = 1.96$), a margin of error of 5%, and an estimated proportion of 50% were used to determine the minimum required sample size. Based on this calculation, the required sample size was 190 patients. According to the nephrology outpatient clinic statistics at King Saud Medical City, 373 patients with CKD stage III and IV were eligible during the study period. A total of 130 participants were recruited at baseline, and 119 completed the six-month follow-up and were included in the final analysis.

Inclusion Criteria:-

The study included patients who met the following criteria:-

1. They had stage III or stage IV renal failure .
2. They were able to read and write .
3. They agreed to participate in the study .
4. They had a mobile phone with the WhatsApp application installed.

Tools of data collection:-

Data were collected using two main tools. The tools were used in a pre-post format to assess patients before the implementation of the virtual educational program and again after six months in order to evaluate the effect of the intervention on their quality of life.

Tool I: Structured Interview Questionnaire:-

A structured self-administered interview questionnaire was developed by the researcher after reviewing relevant literature and guidance related to questionnaire design and validation. This tool was designed to obtain baseline information about the patients and was divided into two parts .

Part I: Sociodemographic characteristics:-

This part was used to collect personal and background data about the patients. It included variables such as age, marital status, residence, education level, and other related demographic characteristics. These data were important for describing the study sample and for identifying personal factors that might influence quality of life outcomes among patients with renal failure .

Part II: Medical history:-

This part was used to assess the patients' current and past medical history. It included items related to the history of chronic diseases, comorbidities, medication adherence, and other health-related factors. This section helped in forming a clear clinical profile of each patient and provided essential information that could affect the patient's perceived quality of life and response to the educational intervention .

Tool II: Kidney Disease Quality of Life Scale (KDQOL-36):-

Adapted form. The second tool was an adapted version of the Kidney Disease Quality of Life Scale (KDQOL-36), which was used to assess quality of life among patients with renal failure. This tool measured quality of life in multiple dimensions relevant to living with kidney disease and its complications. According to the uploaded study, the adapted tool covered six major aspects: physical activities, psychological coping/difficulties/effects, social life, sexual activities, nutritional habits, and compliance with treatment and dealing with disease complications . The physical domain assessed the patient's ability to perform daily activities, tolerate movement, maintain energy, and manage physical symptoms such as fatigue, pain, or limitations in activity. The psychological domain explored emotional status, stress, anxiety, coping ability, and the patient's mental response to the burden of chronic illness. The social domain evaluated the patient's social interaction, support systems, family relationships, communication, and participation in social life. The sexual domain assessed family and sexual relationships, intimacy, satisfaction, and communication about sexual health concerns. The dietary domain investigated eating habits, meal planning, nutritional practices, and dietary restrictions related to kidney disease. Finally, the treatment adherence and disease-management domain evaluated compliance with medications, attendance at follow-up appointments, health-related lifestyle habits, and the patient's ability to deal with disease complications. These domains provided a comprehensive picture of the patient's overall quality of life and made the tool suitable for evaluating the impact of the educational program.

Validity:-

The tool validity was done by 5 of Faculty staff nursing experts in the field. The validity of the data collection tools was established through content validation. The tools were reviewed by a panel of five experts from the Medical-Surgical Nursing Department, Faculty of Nursing, Capital University. The experts evaluated the tools in terms of clarity, relevance, comprehensiveness, understanding, and applicability. Based on their comments and recommendations, the necessary modifications were made to improve the final form of the tools before they were used in the study.

Reliability:-

The reliability of the tools was assessed using Cronbach's alpha coefficient to determine internal consistency. This step was performed to ensure that the items within the tool measured the same construct consistently and that the instrument produced dependable results when applied to the study participants.

A pilot study:-

The pilot study was done on 10% of the sample to examine the clarity of questions and the time needed to complete the study tools. Based on the results, a modification was made (paraphrasing of some questions was done according to the pilot study, which also served to estimate the time needed for each subject to fill out the study tools for data gathering purposes)..

Ethical Consideration:-

An official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee, Faculty of Nursing, Capital University and from the IRB research center in King Saud Medical City. Participation in the study was voluntary, and subjects were given complete information about the study, which included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, and confidentiality of the information so that it is not accessed by any other party without the permission of the participants. Ethics, values, culture and beliefs were respected.

Field Work:-

After receiving the required approvals, fieldwork was initiated in the previously mentioned setting. Data collection began in early May 2025 and continued until approximately the end of October 2025. The researcher attended the study setting five days per week over a period of six months. At the first contact, the researcher introduced herself to each participant, explained the purpose of the study, and established a trusting relationship to gain cooperation. After obtaining verbal agreement, the link to the consent form and study tools was sent to the participants through WhatsApp so that they could sign the consent and complete the questionnaire. A total of 130 participants were initially recruited at baseline. During the follow-up period, 119 participants completed the study. The same participants were reassessed using the same data collection tool to evaluate changes in their quality of life after exposure to the program.Following completion of the pre-assessment, access to the educational application was provided through a QR code and the following link: https://kidney-disease-78c9b.web.app, enabling continuous access throughout the intervention period.The teaching methods included one-to-one explanation and a self-learning module. Educational content was delivered using a QR code prepared by the researcher or by sending the link, which contained pictures and materials related to the study topics and patient concerns. The researcher explained each category of the educational program to the patients to ensure understanding and appropriate engagement with the content. After six months, the same participants were reassessed using the same tool that had been used before the intervention in order to evaluate changes in their quality of life after exposure to the program.

Statistical design:-

The collected data was organized, tabulated and statistically analyzed using the Statistical Package for Social Science (SPSS) version 25 for Windows, running on an IBM-compatible computer. Descriptive statistics were applied (e.g. frequency, percentages, mean and standard deviation). Qualitative variables were compared using qui square test (x2) as the test of significance, and the Wilcoxon signed rank test (t) was used to compare the means of quantitative variables. The Spearman correlation test (r) was used to test the correlation between the studied variables. Reliability of the study tools was assessed using Cronbach's Alpha. A significant level value was considered when $p < 0.05$, and a highly significant level value was considered when $p < 0.01$. No statistical significance difference was considered when $p > 0.05$.Normality of continuous variables was assessed before inferential analysis. Since the quality-of-life scores represented paired observations and were not normally distributed, the Wilcoxon signed-rank test was used to compare pre- and post-intervention scores. Descriptive statistics were expressed as frequencies, percentages, means, and standard deviations. Spearman's rank correlation coefficient was used to examine correlations. Reporting the effect size ($r = Z/\sqrt{N}$) together with p-values is recommended to demonstrate the magnitude of the intervention effect

Results:-

Table (1) shows that 28.6% of the studied sample were in the 40–49 years group, while 12.6% of them were in both the 20–29 years and ≥60 years groups (each). Regarding gender, males (52.1%) represented a slightly higher percentage than females (47.9%). Concerning marital status, married participants (57.1%) constituted the highest proportion, whereas divorced participants (8.4%) represented the lowest. In relation to education level, secondary/diploma (25.2%) was the most common category, while master’s degree or above (3.4%) was the least common. As for employment status, employed participants (48.7%) accounted for the highest percentage, whereas students (3.4%) showed the lowest. With respect to monthly income, the category less than 5,000 SAR (32.8%) was the most frequent, while both 15,000–20,000 SAR and more than 20,000 SAR (9.2% each) were the least frequent. Regarding living arrangement, the majority of participants lived with family (80.7%), whereas living in a care facility (4.2%) was the least reported. In terms of residence area, urban residents (52.9%) represented the highest percentage, while rural residents (16.8%) represented the lowest. For smoking status, never smokers (53.8%) constituted the highest proportion, whereas current smokers (20.2%) showed the lowest. Finally, the findings revealed that participants with health insurance (60.5%) were more common than those without insurance.

Table (2) shows that the highest proportion of comorbidities was hypertension (37.0%), while the lowest was cardiovascular diseases (16.0%). Regarding medication adherence, always was the most frequently reported response (47.9%), whereas never showed the lowest percentage (5.0%). For physical activity level, light activity had the highest percentage (41.2%), while high activity was the least reported (4.2%). Concerning dietary restrictions, the most common pattern was following a low-sodium diet (36.1%), whereas other dietary restrictions represented the lowest percentage (5.9%). As for hospital admissions during the past year, 1–2 times was the most common category (46.2%), while ≥5 times was the least common (10.1%). Finally, for family history of kidney disease, no family history represented the highest percentage (72.3%), whereas yes accounted for the lower percentage (27.7%).

Table (3) reveals that the comparison between baseline and 6-month follow-up demonstrated significant improvement across all quality-of-life domains. Before the intervention, the total quality of life score was 2.60 ± 0.38, and at post six months, indicating a highly significant improvement. Regarding the single domains, we detected the greatest improvement in lifestyle habits, followed by physical health and psychological domains, which also showed significant progress. There were also significant improvements in the social and dietary domains.

Table (1): Demographic Characteristics of Participants (N = 119)

Variable	Category	n (%)
Age (years)	20–29	15 (12.6%)
	30–39	28 (23.5%)
	40–49	34 (28.6%)
	50–59	27 (22.7%)
	≥60	15 (12.6%)
Gender	Male	62 (52.1%)
	Female	57 (47.9%)

Variable	**Category**	**n (%)**
Marital Status	Single	26 (21.8%)
	Married	68 (57.1%)
	Widowed	15 (12.6%)
	Divorced	10 (8.4%)
Education Level	Illiterate	14 (11.8%)
	Primary	22 (18.5%)
	Intermediate	26 (21.8%)
	Secondary/Diploma	30 (25.2%)
	Bachelor’s	23 (19.3%)
	Master’s or above	4 (3.4%)
Employment Status	Employed	58 (48.7%)
	Unemployed	35 (29.4%)
	Retired	22 (18.5%)
	Student	4 (3.4%)
Monthly Income (SAR)	<5,000	39 (32.8%)
	5,000–10,000	34 (28.6%)
	10,000–15,000	24 (20.2%)
	15,000–20,000	11 (9.2%)
	>20,000	11 (9.2%)
Living Arrangement	Lives alone	18 (15.1%)
	Lives with family	96 (80.7%)
	Care facility	5 (4.2%)
Residence Area	Urban	63 (52.9%)
	Suburban	36 (30.3%)
	Rural	20 (16.8%)

Variable	**Category**	**n (%)**
Smoking Status	Never smoker	64 (53.8%)
	Former smoker	31 (26.1%)
	Current smoker	24 (20.2%)
Health Insurance	Yes	72 (60.5%)
	No	47 (39.5%)

Table 2. Medical History Characteristics (Single-choice) (N = 119)

Variable	**Category**	**n (%)**
11. Comorbidity	Diabetes mellitus	32 (26.9%)
	Hypertension	44 (37.0%)
	Cardiovascular diseases	19 (16.0%)
	Other	24 (20.2%)
12. Medication adherence	Always	57 (47.9%)
	Often	39 (32.8%)
	Rarely	17 (14.3%)
	Never	6 (5.0%)
13. Physical activity level	None	41 (34.5%)
	Light (walking/simple activities)	49 (41.2%)
	Moderate (exercise/active sports)	24 (20.2%)
	High (manual work/intense workouts)	5 (4.2%)
14. Dietary restrictions	None	19 (16.0%)
	Low-sodium diet	43 (36.1%)
	Low-potassium diet	28 (23.5%)
	Low-phosphorus diet	22 (18.5%)
	Other	7 (5.9%)
15. Hospital admissions (past year)	None	27 (22.7%)
	1–2 times	55 (46.2%)
	3–4 times	25 (21.0%)
	≥5 times	12 (10.1%)
16. Family history of kidney disease	Yes	33 (27.7%)
	No	86 (72.3%)

Table 3. Comparison of Quality of Life Domains among Kidney Failure Patients Before and After 6 Months

Domain	**Before 6 months Mean ± SD**	**After 6 months Mean ± SD**	**Mean Difference**	**P value**
Physical Health Domain	2.61 ± 0.42	3.34 ± 0.46	+0.73	**<0.001****
Psychological Domain	2.58 ± 0.45	3.29 ± 0.48	+0.71	**<0.001****
Social Domain	2.66 ± 0.44	3.31 ± 0.47	+0.65	**<0.001****
Family & Sexual Domain	2.49 ± 0.51	3.02 ± 0.52	+0.53	**<0.001****
Dietary Domain	2.55 ± 0.46	3.18 ± 0.49	+0.63	**<0.001****
Lifestyle Habits Domain	2.72 ± 0.40	3.51 ± 0.45	+0.79	**<0.001****
Overall Quality of Life Score	2.60 ± 0.38	3.33 ± 0.41	+0.73	**<0.001****

. P= p-value. (**) Highly statistically significant at p <0.01.

Discussion:-

Different scales and instruments can measure health-related quality of life in patients with kidney failure, as this chronic disease impacts not only physical but also psychosocial aspects (Raoofi et al., 2023; Kefale et al., 2019). Kidney failure is usually treated through a long-term process such as hemodialysis, peritoneal dialysis, or kidney transplantation, all of which put a significant burden on the daily lives of patients (Dąbrowska-Bender et al., 2018; Supriyadi et al., 2019).

Many patients have fatigue, pain, sleep problems, dietary restrictions, dependence on medical care, and limited ability to work, as well as psychological issues like anxiety and depression (Francis et al., 2019; Ganu et al., 2018). Additionally, the disease can adversely impact family roles, social ties, and financial security. As a result, evaluating quality of life in kidney failure patients is necessary to understand the full impact of the disease better, recognize patients' unmet needs, and enhance overall quality of care across its medical, psychological, and social aspects (Naderifar et al., 2018).

Regarding Demographic Characteristics of Participants:-

The participants' sample characteristics showed a diverse distribution across categories. In terms of age, most participants were middle-aged. Regarding gender, males are slightly outnumbered by females. Over half of the participants were married. Regarding educational level, most participants had secondary or diploma education (35%). Regarding employment status, almost half of the participants were employed. A majority of them had low monthly income, and the second most frequent group was people with moderate income. Most participants were residing with family. By place of residence, over half the responders were from urban areas. In terms of smoking status, more than half had never smoked. Lastly, over half of the participants were insured, and a sizeable proportion were uninsured.

Regarding Medical History Characteristics:-

According to our study on kidney failure patients, hypertension was the most frequent comorbidity observed in this population group. In contrast, cardiovascular diseases represented the least proportion, and others reported other co-morbid conditions. This is in accordance with the work of Paramitha et al. (2021), who declared that diabetes was one of the main comorbidities in patients with chronic kidney disease, which supports the notion that metabolic and cardiovascular complications often overlap with renal diseases.

Regarding Total Quality of Life Domains among Kidney Failure Patients Before and After 6 Months:-
All domains of quality of life improved at 6 months, as per our comparative results. The most significant improvement occurred in lifestyle habits, followed by physical health and overall quality of life, with clear positive changes in psychological, social, and dietary domains. The family and sexual domains improved as well, but they were the least improved among the domains . These findings suggest that the patients studied experienced widespread improvement in their quality of life following follow-up, with the most pronounced improvements seen in daily self-management and lifestyle-related behaviours. The results for Brown et al. (2021), who recognised functioning and patient-reported status as key drivers of quality of life, and with So et al. (2023), who stressed symptom reduction and self-care improvement .

Legrand et al. (2020), who identified physical and mental health as the central domains of perceived well-being in CKD and kidney failure. However, our results are somewhat contrary to those of Chuasuwan et al. (2020), which suggest that differences in quality of life are highly dependent on treatment modality. In contrast, we found a generalized improvement across all domains. Additional defendants are also named in the complaint, partially against Paramitha et al. (2021),where some domains remained quite low. Still, our results showed a more pronounced upward trajectory post-follow-up.

Conclusion:-

In light of the results of the current Study and answers to the research hypotheses, it could be concluded that there were patients in the early stages of illness with renal insufficiency who showed significant physical, psychological, social, family, dietary, and daily lifestyle dimensions of quality of life. These dimensions improved significantly over time, especially in the lifestyle-related behaviours of physical functioning and total well-being. Despite this welcoming trend, family and sexual recommendations were still relatively poorer, indicating that kidney failure continues to involve some sensitive and personal settings of daily life, even though the general quality of life becomes much better.

Recommendations:-

In light of the current study findings, the following recommendations were suggested :-

1. Work on integrated patient education programs to improve medication adherence, dietary management, and self-care behaviours
2. Psychological evaluation and counselling are regularly provided to alleviate anxiety, emotional exhaustion, and depression.
3. Increase social and family support -- including regular counselling sessions between the patient, families, and caregivers that contribute to the care plan.
4. More personalized lifestyle interventions that include physical activity, sleep, and stress management.
5. The population group should be more carefully characterized in terms of family and sexuality health needs; these can then be addressed through private counseling and relevant supportive services.

Study Limitations:-

This study has several limitations. It was conducted at a single medical center using purposive sampling, which may limit generalizability and introduce selection bias. The quasi-experimental design without a control group limits causal inference. Quality-of-life outcomes were self-reported and may be affected by reporting bias. Furthermore, the six-month follow-up period may not fully evaluate the long-term sustainability of the intervention.

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