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Exploring The Effects Of Pharmacist-Led Intervention On Perceptions And Practices Of Pharmacological Thromboprophylaxis Prescribing In Patients With Renal Impairment

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Abstract

Background: *Chronic kidney disease (CKD) is linked to numerous consequences, with venous thromboembolism (VTE) being one of the most significant. The prevalence of venous thromboembolism (VTE) is elevated in cases of severe kidney disease; however, the association between less severe chronic kidney disease (CKD) and VTE risk remains ambiguous. Considering the rising global incidence of chronic kidney disease (CKD), it is essential to mitigate the related risk of devastating vascular consequences, such as stroke. Therapeutic alternatives for mitigating the risk of all stroke subtypes in individuals with chronic kidney disease are still constrained. The quantity of anticoagulants approved for the prevention and treatment of thromboembolic disorders has risen. Irrespective of the anticoagulants used, prior studies indicate that improper utilization in patients with renal impairment elevates the risk of bleeding.*

Objective: *improve the knowledge and practice of pharmacological thromboprophylaxis prescribing in patients with renal impairment.*

Methodology: *An interventional study was undertaken to improve the knowledge of nephrologist regarding anticoagulants use among patients with renal impairment at healthcare institutions in Najaf Province. The intervention includes lectures, brochures, roll-ups, and checklists regarding the recent recommendations of guideline for appropriate anticoagulant use in individuals with renal impairment. The study had two groups of physicians based on whether they received the intervention or not named intervention and control groups respectively. The knowledge of both groups was examined by questioner at three periods but only interventional group has received the intervention. The suitability of the intervention was evaluated at three intervals: baseline, four weeks post-intervention, and twelve weeks post-intervention, to assess the knowledge for utilizing the CHAD-VASC scoring system for stroke risk and the PADUA scoring system for VTE risk.*

Results: *the result revealed that baseline data highlighted a significant gap in the knowledge of nephrologists regarding anticoagulant use in patients with renal impairment. However, the knowledge of nephrologists significantly increased when compared to control group at three interval includes baseline, 4 weeks and 12 weeks post-intervention.*

Conclusions: *intervention can significantly increase the knowledge among participant nephrologists. With notable and long-lasting increases seen at 4 and 12 weeks, the educational intervention clearly raised participant's knowledge. These findings emphasize the need of organized education in improving such knowledge over time.*

Keywords: *Chronic kidney disease, CKD, stroke, VTE, pharmacological thromboprophylaxis.*

INTRODUCTION

The concept of chronic kidney disease (CKD) includes multiple indicators of renal impairment and is not confined to a diminished glomerular filtration rate (GFR) and an albumin-to-creatinine ratio (ACR) surpassing 30 mg/g (>3 mg/mmol); however, the classification system is based on the two parameters of GFR and albuminuria levels (1). Kidney damage typically denotes

pathological abnormalities in either the native or transplanted kidney, identified through imaging, biopsy, or inferred from clinical indicators such as elevated albuminuria, specifically an albumin-to-creatinine ratio (ACR) exceeding 30 mg/g (3.4 mg/mMol), or changes in urinary sediment. Decreased kidney function signifies a diminished glomerular filtration rate (GFR), commonly estimated (eGFR) based on serum creatinine levels (2). Given that all direct oral anticoagulants (DOACs) are partially excreted by the kidneys, the simultaneous presence of chronic kidney disease (CKD) and atrial fibrillation (AF) poses a distinct difficulty in clinical practice due to the compounded risk of thromboembolic and hemorrhagic events, particularly in patients with end-stage renal disease (ESRD). In patients with severe chronic kidney disease (eGFR of 15–29 mL/min/1.73 m^2), recent observational data indicate a positive effectiveness and safety profile for lower dosing regimens of rivaroxaban, apixaban, and Edoxaban in comparison to warfarin. Consequently, the 2020 AF ESC recommendations and the 2021 EHRA practical guide permit the cautious administration of Factor Xa inhibitors in patients with severe chronic kidney disease (CKD) (3). The clearance of drugs is contingent upon molecular size, plasma protein binding rates, and the physicochemical characteristics of the dialysis filter, resulting in both warfarin and DOACs being inadequately cleared during dialysis in patients receiving renal replacement therapy. Conversely, contradictory findings have been reported about the efficacy of anticoagulation in patients with end-stage renal disease (ESRD). A comprehensive meta-analysis involving 47,480 individuals indicated that warfarin did not diminish the occurrence of ischemic stroke in patients with end-stage renal disease, while it elevated the rates of hemorrhagic stroke (4). ESC guideline recommends to Identify low-risk patients CHA2DS2-VASc to evaluate use of anticoagulant in order to prevent the stroke in AF patients with CKD with score more than 2 indicates the starting of anticoagulants (5) . AF patients with CKD are likely to have an increased CHA2DS2-VASc risk factor for stroke and are at high risk even with a score of 0–1 and such scoring system is recommended to evaluate the indication of anticoagulants (1). Utilize risk assessment instruments such as Padua for evaluating VTE risk. High or moderate VTE risk Low VTE risk If a patient is classified as low risk for VTE according to your institution's Risk Assessment Model and is not expected to undergo significant immobility, then VTE prophylaxis (either pharmacological or mechanical) is unwarranted. Reassess the patient's VTE risk status as clinically appropriate (6). In the majority of the aforementioned research, clinical pharmacists collaborated within multidisciplinary care teams alongside nephrologists, nurses, and nutritionists. Clinical pharmacy services undoubtedly possess the capacity to make substantial contributions to multidisciplinary teams, delivering safe, effective, and cost-efficient care (7). The majority of the clinical trials analyzed were conducted in the United States indicating the increasing significance of clinical pharmacists within the US healthcare system. Conversely, only isolated research originated from Brazil, India, Iran, Iraq, or South Korea, where the number of pharmacists participating in interdisciplinary teams is restricted. In these sites, pharmaceutical services primarily encompass the dispensing of medications, patient education regarding their use, management of psychotropic substances, and regulation of medication storage conditions. The influence of clinical pharmacy services on the management of inpatients with chronic kidney disease (CKD) remains to be determined Consequently, the suggested pharmacist-led interventions in these trials may diverge from actual circumstances (8). Pharmacists' interventions encompassed the dissemination of information regarding the disease, guidance on appropriate diets, counseling to improve medication adherence, and follow-up via telephone. The findings of one previous research align with those of a non-randomized controlled multi-healthcare professional collaborative interventional study conducted in Korea, which demonstrated a significant improvement in CKD knowledge scores over time in the intervention group relative to the control group among patients with pre-dialysis CKD (9).

Inclusion criteria: Nephrologists work in nephrology ward in Al-Najaf educational hospital. All corresponding patients with atrial fibrillation (AF), hospitalized and surgical with CKD.

RESEARCH METHODOLOGY

Design: interventional Quasi-experimental study with control group. The study has been started at the beginning of Jan.2025 and ended at beginning of May.2025. Participants: physicians work in nephrology wards. Intervention: Educational lecture includes the recent recommendations of thromboprophylaxis prescribed in patients with CKD to prevent the stroke and venous thromboembolism (VTE) according to recent guideline (1). the intervention also contained brochures, rollups and buck lists in order to to increase the awareness among nephrologists. then questionnaire was repeated at two intervals 4 weeks and 12 weeks post-intervention.

ETHICAL CONSIDERATIONS

This study received ethical approval by two institutions. first approval by medical ethics committee from college of medicine, Kufa university in 17/10/2024 with reference #: MEC-79. While the second approval by Scientific Committee of Researches of Al-Najaf Health Directorate (in September 2024 – Reg No:4430). in addition to that Verbal agreements were also obtained from the participant physicians after outlining the purpose of the study.

STUDY POPULATION AND SAMPLING

The study was oriented to the physicians who were working in one of three health institutions, namely (Al-Hakeem General Hospital, Al-Sadder Medical City and Al-Najaf educational hospital). The three institutions contained 40 physicians working in the nephrology wards.
The size of sample was calculated by statistical expert through IBM SPSS Sample Power version 24 according to the following equation:

$$n = ((Z\alpha/2 + Z\beta)^2 \times (\sigma_1^2 + \sigma_2^2)) / (\mu_1 - \mu_2)^2$$

Where:

Z alpha/2 is the Z-value for the desired significance level (alpha)

Z_beta is the Z-value for the desired power (1 − beta)

$\sigma 1$ and $\sigma 2$ are the standard deviations of the two groups

$\mu 1$ and $\mu 2$ are the means of the two groups.

By using above equation and submitting the values of each term the number of physicians was 40 doctors. the physicians were divided into 20 intervention group and 20 control group (did not receive such intervention).

STUDY QUESTIONNAIRE

In order to evaluate the knowledge of participating physicians regarding pharmacological thromboprophylaxis in patients with CKD, a questionnaire was used. Because there were no previous similar studies, the questionnaire was made by the researcher after reading thoroughly about the subject. It contained 53 questions in four parts which are demographics, knowledge, practice and barriers, written in English language. The structure of questionnaire parts was checked and received the final approval according to expert's document from Kufa faculty of pharmacy at 2024.
Demographics include the characteristics of participant including; the ID of the participant, age, gender, the degree, the experience, estimated encounter cases per week as well as the previous medical educational events. knowledge part of the questionnaire contained four sections A, B, C and D include Questions related to Knowledge about pharmacological thromboprophylaxis in

renal impairment patients. Each question has five choices (strongly agree, agree, disagree, neutral, disagree and strongly disagree). Where section A consists of five Questions related to knowledge regarding risk assessment of stroke and venous thromboembolism (VTE) in renal impairment patients in addition to patients with dialysis. Section B consists of seven Questions related to knowledge about the indications of Thromboprophylaxis in patients with renal impairment to prevent stroke, VTE in addition to patients with dialysis. Section C consists of five Questions related to knowledge about contraindications of Thromboprophylaxis in patients with renal impairment to prevent stroke, VTE in addition to patients with dialysis. Section D consists of seven Knowledge related Thromboprophylaxis regimen in patients with renal impairment to prevent stroke, VTE in addition to patients with dialysis. The third part contains three sections A, B and C included Questions related to prescribing practice of pharmacological thromboprophylaxis (Thromboprophylaxis) in renal impairment patients. Each question has five choices (always, often, sometimes, rarely and never). Where section A consists of eight Questions related to prescribing of thromboprophylaxis agent in patients with renal impairment to prevent stroke, VTE in addition to patients with dialysis. Section B consists of seven Questions related to prescribing of Thromboprophylaxis dosing in patients with renal impairment to prevent stroke, VTE in addition to patients with dialysis. Section C consists of seven Questions related to prescribing of Thromboprophylaxis duration in patients with renal impairment to prevent stroke, VTE in addition to patients with dialysis. The last part of questionnaire was related to Barriers to prescribing seven barriers with one an open question to specify the barriers. Before being distributed, the questionnaire had been tested for validity by five academic experienced specialists, including a clinical pharmacy specialist, three pharmacology and therapeutics specialists, and a biostatistics specialist. The revised questionnaire was sent to 40 physicians to perform a pilot study, and the Cronbach alpha value was 0.9 which indicates a good internal constancy and readability.

STATISTICAL ANALYSIS

The data were analyzed utilizing Microsoft Excel 2019 and version 24 of the SPSS software package for social sciences. Frequencies, percentages, averages, and standard deviations were employed to represent categorical data. Friedman test, pairwise comparison, Pearson- Chi-square have done. Categorical data were expressed using frequencies, percentages, means, and standard deviations. The Friedman test was employed to compare knowledge across the three phases of the study: baseline, 4 weeks post-intervention, and 12 weeks post-intervention. Pairwise comparisons were conducted to evaluate each pair of phases individually. The association and changes in knowledge were assessed using the Chi-square test. To compare the mean scores before and after the intervention, the mean difference was calculated as the difference between the mean scores (mean score after intervention minus mean score before intervention). The percentage change was calculated by dividing the resultant value by the mean score prior to the intervention and multiplying by 100%. The effect size was derived from the z-value obtained from the Wilcoxon test comparing two means (Effect size (r) = $Z/\sqrt{N}$). Cohen (1988) categorized effect size values into three groups: approximately 0.2 indicates a small effect, around 0.5 signifies a medium effect, and 0.8 or higher represents a large effect (10)

RESULTS AND DISCUSSIONS

Table1: Baseline characteristics of the participant doctors in the preintervention phase (n=40).

Variables	Group		Total	P*
	Intervention (n=20) No. (%)	Control (n=20) No. (%)		
Age(years) Mean±SD	38.2±9.2	35.5±7.3		0.3

Gender	Female	8(40%)	8(40%)	16(40%)	1
	Male	12(60%)	12(60%)	24(60%)	
Degree	BSc	9(45%)	13(65%)	22(55%)	0.4
	High Dip	3(15%)	1(5%)	4(10%)	
	MSc	5(25%)	4(20%)	9(22.5%)	
	Board	0(0%)	1(5%)	1(2.5%)	
	PHD	3(15%)	1(5%)	4(10%)	
Experience (years)	1 to 5	9(45%)	6(30%)	15(37.5%)	0.03
	6 to 10	4(20%)	11(55%)	15(37.5%)	
	11 to 20	6(30%)	1(5%)	7(17.5%)	
	21 to 30	1(5%)	2(10%)	3(7.5%)	
Estimated Cases per week	less than 10	7(35%)	10(50%)	17(42.5%)	0.7
	11 to 20	10(50%)	7(35%)	17(42.5%)	
	21 to 50	3(15%)	3(15%)	6(15%)	

Total participants 40 doctors from the four health institutions who received the questionnaire agreed to complete it. The majority of participants were female, comprising 60% (n=24), with 55% (n=22) holding a bachelor's degree in medicine. The average age was 36.8 years. The average years of experience at the hospital was 8.75 years. the total estimated cases per week were 42.5% (n=17), with a mean of 15.1 cases per week. Additional information regarding both groups (interventional and control) is presented in Table 1. It can be noted that female nephrologists participated in study higher than male 60% versus 40 % respectively as in other research (11). It has been found that the mean ages of participates doctors in intervention group is somewhat higher than those in control group 38.2±9.2 versus 35.5±7.3 (P 0.3) (12) .

Physician's knowledge at baseline, 4 weeks and 12 weeks after intervention:
This study shows that the knowledge of both interventional group and control groups is the same which classify into moderate 55% and good 45%. P value equal to 0.99 which refers to no significant difference at base line period (before intervention) as illustrated in figure 1 (13) **.**

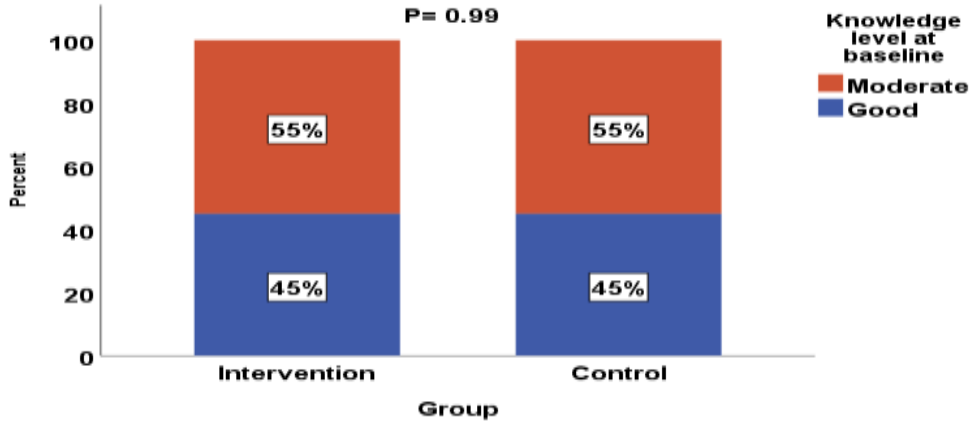

Figure 1: the levels of knowledge by percent (%) for control and intervention doctors' pre-intervention (baseline)**.**

However, four weeks after intervention it is clear that the knowledge inclined significantly among those patients with intervention group. While those in control group also increased but not dramatically (95% vs 30% respectively which indicated that the intervention was effective and interventional physicians received sufficient information. Other studies showed similar results (14) **.**

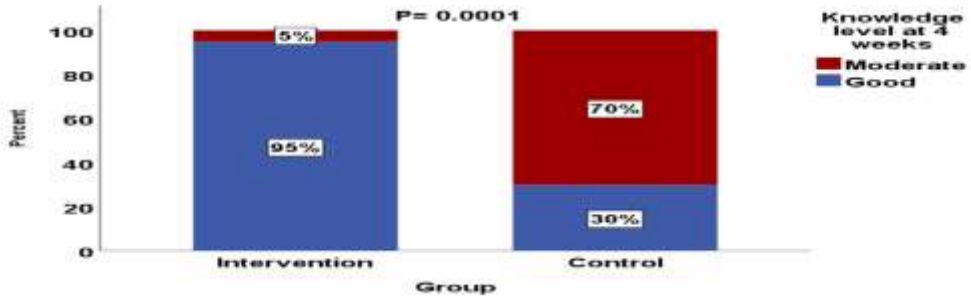

Figure 2: the levels of knowledge by percent (%) for control and intervention doctors 4 weeks post-intervention.

as showed in figure 2 which classify the knowledge into moderate and good. The knowledge among intervention group has increased from 45% to 95 % which indicates that time interval (4 weeks post-intervention) played an important role to positively affect such knowledge (15) .

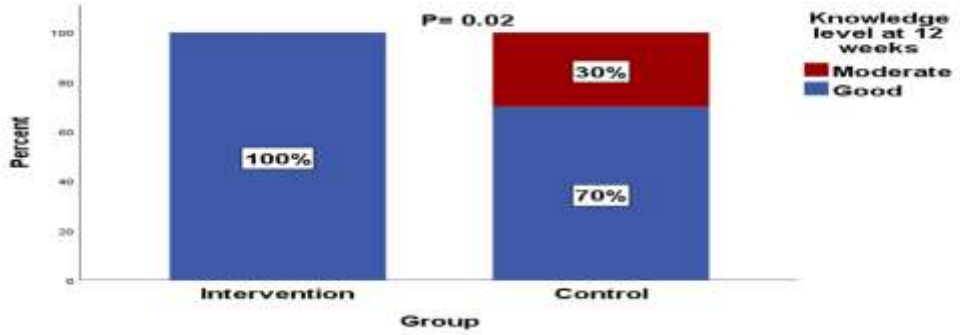

Figure 3: the levels of knowledge by percent (%) for control and intervention doctors 12 weeks post-intervention.

There is a significant disparity between the two groups regarding knowledge retention and enhancement. In the intervention group, all participants attained a "Good" level of knowledge, but in the control group, only 70% achieved this level, with the remaining 30% classified as possessing "Moderate" knowledge. The difference is statistically significant, with a p-value of 0.02, suggesting that the probability of this variation arising by chance is merely 2%. The findings indicate that the educational intervention significantly enhanced participants' understanding of thromboprophylaxis in patients with renal impairment over time. These findings align with existing literature highlighting the importance of continuous professional education in enhancing clinical practice (16) .

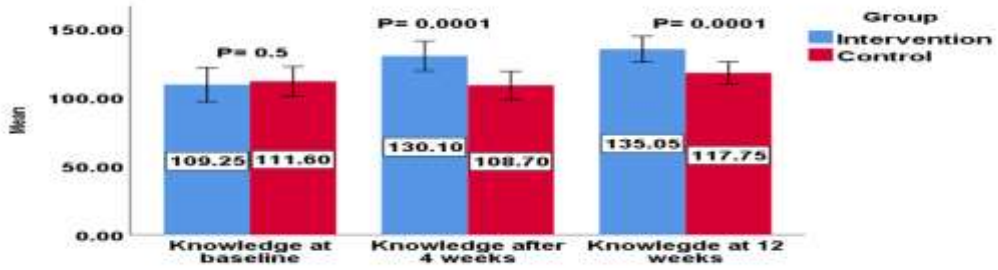

Figure 4: comparison of the mean overall knowledge score between control and intervention group at baseline, after 4 weeks and at 12 weeks.

It is revealed that the knowledge of interventional group and control group have nearly equal knowledge at baseline 109 and 111 out of 161 respectively with p value =0.5. However, after 4 weeks knowledge of intervention group has been increased significantly compared to control one 130 and 108 respectively with P value=0.0001. Highest knowledge is appeared at 12 weeks post-intervention in interventional group 135 but the knowledge of control physician slightly inclined to 117 with p value=0.0001. Other study emphasize similar results (16) .

Many studies collectively demonstrate the beneficial effects of diverse educational interventions on enhancing physicians' knowledge and compliance with thromboprophylaxis guidelines. The implementation of such programs can result in improved patient outcomes and enhanced clinical practices (17) .

Table 2: Summary statistics for the overall knowledge before and after intervention for the intervention group (n=20).

Overall knowledge assessment	Mean±SD	Mean±SD	Mean difference ±SD	Percentage change	Effect size *	P value Wilcoxon signed-rank test
Before and 4 weeks After intervention	109.3±12.4	130.1± 10.9	-20.9±10.4	19.1%	0.9	0.0001
Before and After 12 Weeks	109.3±12.4	135.1± 9.3	-25.8±12.6	23.6%	0.9	0.0001
4 weeks and after 12 weeks	130.1± 10.9	135.1± 9.3	-4.95±6.5	3.8%	0.7	0.002

The total knowledge scores of intervention group members show a notable increase in Table 2 at both post-intervention times. Reflecting a mean rise of 20.9 ± 10.4 points, the mean knowledge score rose from 109.3 ± 12.4 to 130.1 ± 10.9 before and four weeks after the intervention. This translates into a 19.1% knowledge increase. The p-value (< 0.0001) shows that this variation is extremely statistically significant; the effect size (r = 0.9) implies a great practical influence. Interpretation: Within a four-week period, the intervention—probably an instructional or training session—was successful in raising knowledge. The mean knowledge score rose even further to 135.1 ± 9.3, producing a mean difference of 25.8 ± 12.6 from baseline. Before and 12 Weeks After the Intervention. From the pre-intervention score, this shows a 23.6% increase. The effect size stays huge (r = 0.9), and the p-value (< 0.0001) validates great statistical significance. Interpretation: Although the intervention had short-term success, the knowledge gains persisted

and even improved after 12 weeks, suggesting strong retention and maybe continuous learning or reinforcing effects.(9)

Comparison of 12 Weeks and 4 Weeks Following Intervention . With a mean difference of 4.95 ± 6.5, the knowledge score rose somewhat from 130.1 to 135.1. With a modest effect size (r = 0.7), the percentage change is 3.8%; nonetheless, it is statistically significant (p = 0.002). Although at a slower rate, this points to a continuous positive trend, suggesting that the first improvement was the most significant and followed by little incremental changes. Suggesting that awareness of physicians increases after long period interval (18) .

*Effect size measured by (r) non parametric test Wilcoxon signed-rank test.

Cohen (1988) categorized effect size values into three groups: approximately 0.2 indicates a small effect, around 0.5 signifies a medium effect, and 0.8 or higher represents a large effect.

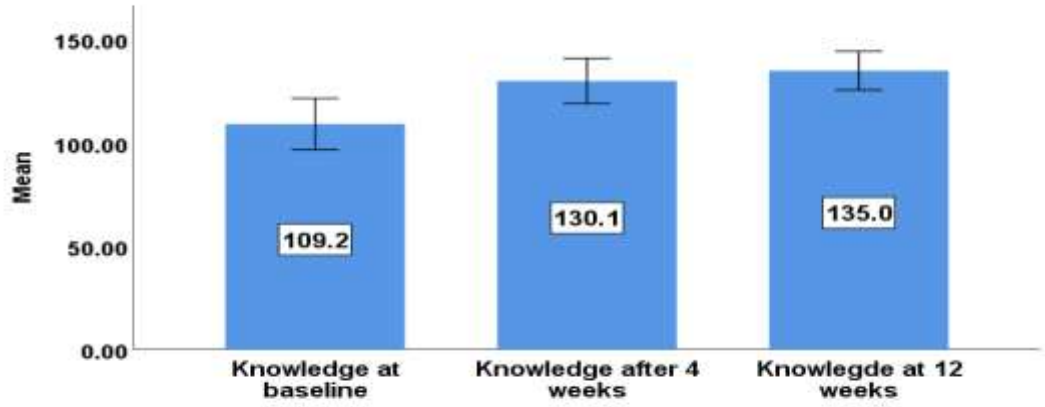

Figure 5 overall knowledge of interventional group at 3 periods (baseline, 4 weeks and 12 weeks. The mean knowledge score of the intervention group demonstrated a statistically significant improvement across the three assessed time points. The initial mean score was 109.2, indicating the participants' knowledge before any intervention. Post-educational program, the mean score rose significantly to 130.1 at the 4-week mark, reflecting a 19.1% enhancement and demonstrating the intervention's immediate efficacy. The change was statistically significant ($p < 0.0001$) and demonstrated a large effect size (r = 0.9), underscoring the substantial impact of the educational content. At 12 weeks, the knowledge score increased to 135.0, indicating a 23.6% improvement from baseline and a 3.8% rise relative to the 4-week assessment. The sustained improvement indicates that the acquired knowledge was retained over time and likely reinforced through practice or continuous exposure. These results are consistent with prior studies. The knowledge score was determined as the baseline reference point 1.00. Four weeks later, there was a notable rise in the score—2.15, more than a two-fold improvement over the starting level. At twelve weeks, this upward trend persisted and reached 2.85, implying a constant and improved knowledge retention across time. The numerical numbers show the corresponding increase in knowledge scores over baseline. With clear incremental increases in doctors' knowledge noted both at the short-term (4 weeks) and longer-term (12 weeks), this pattern supports the efficacy of the intervention (16).

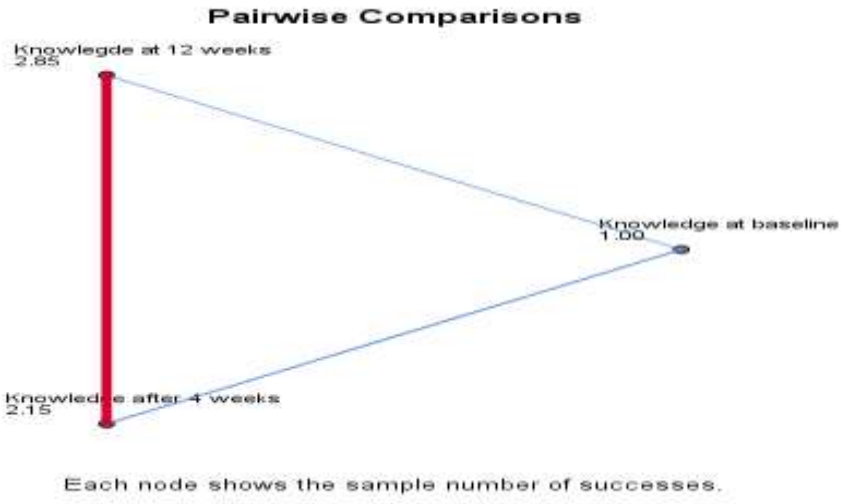

Figure 6: the trend of physicians' knowledge in the intervention group across three time points: baseline, four weeks, and twelve weeks post-intervention. The diagram demonstrates a progressive improvement in knowledge following the educational intervention.

*Freidman test -nonparametric test where data may not normally distribute each node shows the mean knowledge score (average) at 3 different intervals.

The pairwise comparison diagram in Figure above clearly illustrates the evolution of knowledge scores among participants in the intervention group at baseline, 4 weeks, and 12 weeks post-intervention. A notable enhancement is evident from baseline (score = 1.00) to 4 weeks (score = 2.15), signifying a substantial advancement in knowledge following the educational intervention. This significant increase demonstrates the prompt efficacy of the intervention in improving participant comprehension other studies also found similar investigations(19) . Sharp increase shows how quickly the intervention improves participant knowledge. With a score of 2.85, the comparison of baseline and 12 weeks shows an even more significant rise, implying not only retention but also ongoing knowledge reinforcement over time. Though less noticeable, the increase between 4 and 12 weeks—from 2.15 to 2.85—represents a significant gain in line with periods of information accumulation seen in educational environments. These results fit research by(14) .

Table 3 Summary statistics for the overall knowledge before and after intervention for the control (n=20).

Overall knowledge assessment	**Mean±SD**	**Mean±SD**	Mean difference ±SD	Percentage change	Effect size *	P value Wilcoxon signed-rank test
Before and 4 weeks After intervention	111.6±10.7	108.7±10.3	2.9±5.2	2.6 %	0.5	0.04
Before and After 12 Weeks	111.6±10.7	117.8±8.01	-6.2±5.9	5.5 %	0.8	0.0001

4 weeks and after 12 weeks	108.7± 10.3	117.8± 8.01	-9.1±6.8	8.4 %	0.8	0.0001

The control group (n = 20), which did not undergo the educational intervention, exhibited only minor variations in knowledge scores across the three assessment periods. Between baseline and 4 weeks, a modest and statistically significant enhancement in mean knowledge scores was observed (from 111.6 ± 0.7 to 108.7 ± 10.3), resulting in a mean difference of 2.9 ± 5.2 points and a small effect size (r = 0.5, p = 0.04).it can be seen that Participants in the control group with insufficient health education exhibited poorer performance on the CKD Knowledge assessment (20) . From baseline to 12 weeks, the score rose to 117.8 ± 8.01, indicating a mean difference of 6.2 ± 5.9, which corresponds to a 5.5% increase and a moderate effect size (r = 0.8, p = 0.0001). Between 4 and 12 weeks, a decline in the mean score was noted (−9.1 ± 6.8), suggesting variability in knowledge retention or the impact of external factors. The observed fluctuations indicate that, in the absence of structured intervention, knowledge levels may exhibit minimal improvement and potential regression over time, highlighting the essential importance of educational strategies in maintaining knowledge, particularly in clinical settings (9).

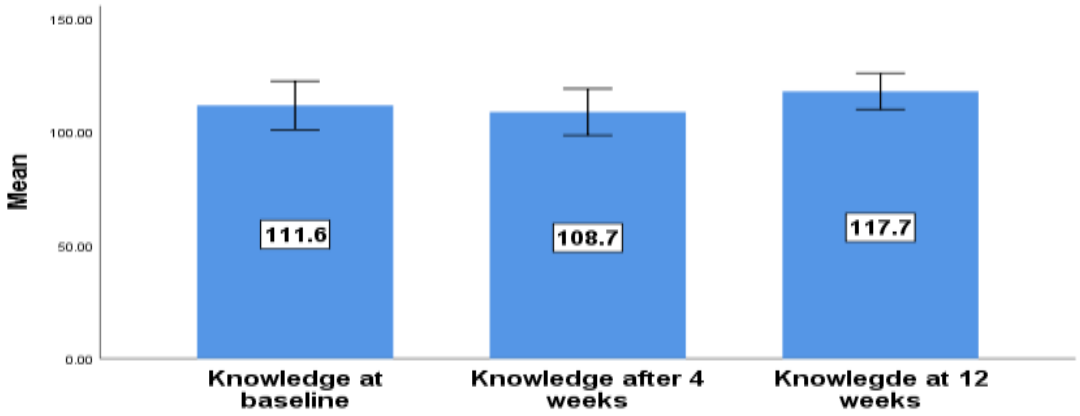

Figure 7: Overall knowledge of control group at 3 periods (baseline, 4 weeks and 12 weeks)

The knowledge score was determined as the baseline reference point 1.78. Four weeks later, there was a small decline in the score—1.45. At twelve weeks the score has increase somewhat to 2.78, indicating a fluctuation in improvement with small enhancement at 12 weeks period (12). post-intervention; The diagram demonstrates no significant improvement in knowledge at 3 periods. These oscillations imply that, in the absence of an educational intervention, knowledge does not show any constant or continuous improvement. While the modest increase at 12 weeks could be ascribed to incidental exposure or variability in response, the early drop may represent knowledge loss over time. These results, unlike those of the intervention group, show the limited natural development of knowledge devoid of organised educational guidance (21) .

*Freidman test -nonparametric test where data may not normally distributed each node shows the mean knowledge score (average) at 3 different intervals.

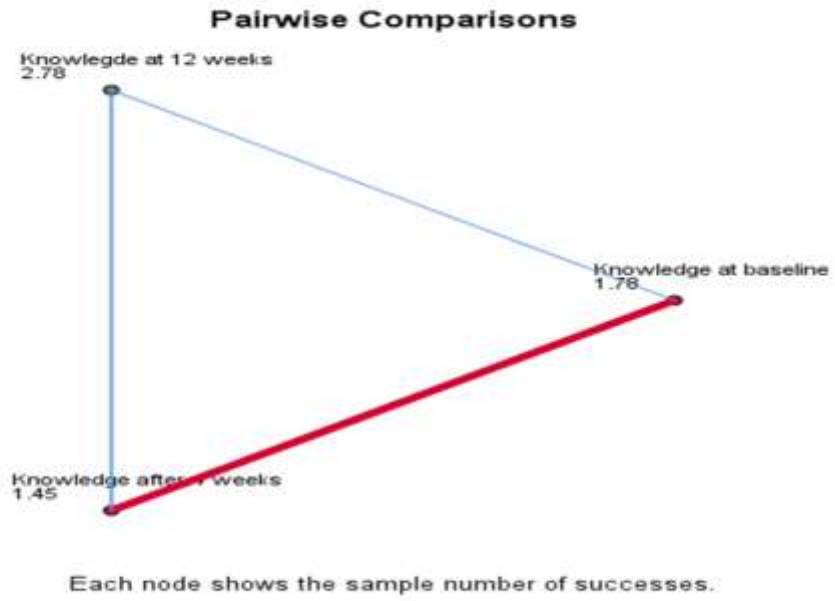

Figure 8: the trend of physicians' knowledge in the control group across three time points: baseline, four weeks, and twelve weeks post-intervention. The diagram demonstrates no improvement in knowledge following the three periods.

The pairwise comparison diagram in Figure depicts the trajectory of knowledge scores within the control group at three time points: baseline, 4 weeks, and 12 weeks. The initial score was 1.78, which decreased to 1.45 at 4 weeks, and subsequently increased to 2.78 at 12 weeks. The initial decline may indicate a natural decay of knowledge due to lack of reinforcement, whereas the subsequent increase at 12 weeks implies a potential external influence or incidental learning, rather than a structured intervention effect. Without a clear rising trend, the variations highlight the fact that focused instructional practices are necessary for major and continuous knowledge improvement(22).

This trend corresponds with results showing that, apart from actively participated structured interventions, control groups in CKD educational studies usually show no significant knowledge increases.it has been showed that the level of knowledge among physician was good in interventional phase. This finding agrees with a similar study (23).

CONCLUSION:

This study found that a systematic educational intervention markedly improved healthcare personnel' understanding of the proper application of thromboprophylaxis in patients with chronic renal disease. Knowledge enhancements were statistically significant and maintained over 12 weeks following the intervention, underscoring the efficacy of focused teaching tactics. The control group demonstrated little alterations. These findings underscore the essential need of ongoing professional education in enhancing clinical decision-making and patient safety among high-risk populations.

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