wjpmr, 2020,6(7), 177-183

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

OUTCOMES OF A PHARMACIST-LED ANTICOAGULATION EDUCATION PROGRAM AMONG PATIENTS ON LONG-TERM WARFARIN THERAPY IN A KENYAN REFERRAL HOSPITAL

Dr. Sakina I. Mamdani[a]*, David G. Nyamu[b] and Tom B. Menge[c]

[1]Assistant Chief Pharmacist, Karatina Sub County Hospital, P.O. Box 133-10101 Karatina.
[2]Senior Lecturer of Clinical Pharmacy, Department of Pharmaceutics and Pharmacy Practice, University of Nairobi, P.O. Box 19676-00202 Nairobi.
[3]Chief Pharmacist, Kenyatta National Hospital.

***Corresponding Author: Dr. Sakina I. Mamdani**

Assistant Chief Pharmacist, Karatina Sub County Hospital, P.O. Box 133-10101 Karatina.

Article Received on 13/05/2020 **Article Revised on 03/06/2020** **Article Accepted on 24/06/2020**

ABSTRACT

Background: Warfarin is widely used for long-term anticoagulation management in low resource health settings but it has a narrow therapeutic index. Patients' knowledge on warfarin use promotes optimal anticoagulation and adherence. **Objective**: To evaluate the effect of a designed warfarin based patient education program on oral anticoagulation knowledge, adherence and level of control among adult outpatients on warfarin therapy at Kenyatta National Hospital. **Methodology**: A pre-test/post-test single group quasi study. **Participants:** forty-five outpatients aged ≥ 18 years at anticoagulation clinics. **Main outcome measures**: Level of knowledge, adherence and anticoagulation control. **Methods:** Ethical approvals were sought from institutional review board (reference KNH/ERC/A/151) and study sites. Eligible participants were enrolled during clinic appointments**.** A predesigned data collection tool was used to collect information on sociodemographics, baseline oral anticoagulation knowledge, adherence and the most recent international normalized ratios, after which a designed warfarin based education program was provided to participants. Patients were given a warfarin education booklet for further reference.The effect of the designed education program on knowledge of anticoagulation, level of adherence and anticoagulation control was assessed thirty days post the intervention using the the same tools administered at baseline data. Data was analyzed using Statistical Package for Social Sciences version 21 software at 95% confidence level. **Results:** The mean participants' age was 42.9(±13.7) years and majority were females (86.7%). There was a significant improvement between the pre-test and post-test anticoagulation knowledge mean scores ($p<0.001$) as well as adherence ($p<0.001$). **Conclusion**: Pharmacist-led warfarin based education program improves patient knowledge and adherence in warfarin anticoagulation therapy. Future studies should correlate patients' knowledge with adverse drug reactions.

KEYWORDS: Knowledge, Adherence, Warfarin, Anticoagulation level, International normalized ratio.

INTRODCUTION

Warfarin has been used clinically for over seventy years and remains the oral anticoagulant of choice in low and medium income countries[1] probably because it is cheap and readily available.[2] However, the narrow therapeutic index, inter-patient variabilities[3] and tendency to interact with food and other drugs limits its use.[4] Furthermore, studies have indicated that it is one of the top three drugs that increase patient morbidity and mortality due to adverse effect such as hemorrhagic complications and thrombotic recurrence.[5,6] Subsequently, use of this drug requires frequent laboratory and clinical monitoring in order to attain optimal anticoagulation control.[3]

Studies have revealed that patient education increases adherence and decreases warfarin toxicity.[7,8,9] Researchers have suggested that the anticoagulation education program should embrace signs and symptoms of bleeding, impact of diet, drug-drug interactions, missed dose and target International Normalized Ratio (INR).[10] Furthermore, the education program has been shown to be important for a successful long-term warfarin therapy.[11] Although patient education is an important component of warfarin therapy, published reports on anticoagulation education vary greatly with strategy and content due to the time required in providing an effective patient education.[12]

Studies have found that there is a positive relationship between patients' knowledge and optimal

anticoagulation control.[13,14] Furthermore, one study found that patient knowledge level increased by 50% after an individualized education intervention in patients who had just started oral anticoagulants.[15] Another study found that one of the effective risk reduction strategies that helps in promoting patient safety and improving the quality of life for patients is provision of an education program on warfarin therapy.[13] Available studies, though, have been conducted among the patients in high income countries. The present study, therefore, sought to assess the effect of a designed pharmacist-led warfarin based education program on patients' knowledge, level of adherence and anticoagulation control in resource constrained settings, Kenyatta National Hospital (KNH).

MATERIAL AND METHODS

Study design, site and area

This was a pre-post-test single group quasi experimental design carried out among outpatients' aged≥18 years who were undergoing long term anticoagulation therapy at the anticoagulation clinics of KNH, which is the largest teaching and referral hospital in East and Central Africa. The specialized anticoagulation clinics included the cardiac, hemato-oncology and cardiothoracic clinics which serve as the central points for all patients undergoing long-term anticoagulation in the hospital. The clinics also serve as referral centres for coagulation management of patients from peripheral facilities.

Study Population

Outpatients aged≥ 18 years , on oral anticoagulation therapy (OAT), who consented to participate in the study and whose next regular appointment did not exceed 4 weeks to allow time for assessing the intervention. Warfarin treatment naïve patients and those with cognitive impairment were excluded from the study owing to the challenges in assessing and leveling the knowledge among them.

3 Sample size and sampling procedure

The sample size was calculated using the formula for difference in mean scores in knowledge on pre-post education intervention.[16] Using this formula, the estimated sample size was forty-one participants based on a difference of seven in the mean scores between the pre-test and post-test as has been documented,[13] and a standard deviation of 16 from a study done at KNH.[17] Due to expected attrition of the participants during follow-up, the sample size was adjusted upwards by 10% to give a total of forty-five participants. Convenience sampling was used until the sample size was achieved. On clinic days, patient files were perused and screened. All eligible patients were taken through the consent explanation and asked to sign the consent form before being enrolled into the study.

Data Collection

Authority to conduct the study was granted by Kenyatta National Hospital/University of Nairobi-Ethics and Research Committee (KNH/UoN-ERC) vide reference KNH-ERC/A/151 and the Heads of Departments governing the anticoagulation clinics. Additionally, the study was registered by Department of Research and Programs at KNH under reference number KNH/AD-MED/428/VOL.1. Baseline data was collected by administration of a pre-designed structured questionnaire to the patients to obtain information about patients' level of knowledge and adherence to anticoagulation therapy. The patients' most recent INRs were also recorded for assessment of the level of anticoagulation control.

Knowledge on anticoagulation was determined by administering seventeen questions adapted from the Oral Anticoagulation Knowledge (OAK) test. This is a widely used and validated tool designed for testing the patients knowledge on warfarin.[18] Each question was rated one (1) if correct and zero (0) if incorrect. Therefore, the total highest score was seventeen (17) and lowest zero (0). Scores above 12 were considered satisfactory while those between 9 and 12 were considered fair and below 9 were considered below average.

Adherence of patients to warfarin was determined by the 8-point Morisky tool.[19] This is a validated tool that checks for adherence of medications. It contains eight yes/no questions that assess intentional and non-intentional non-adherence. A score of eight indicated high adherence, 6-8 indicated moderate adherence and less than 6 indicated low adherence.

An education program describing the indications, precautions, side-effects and monitoring of warfarin was then provided directly to individual patient. Participants were also given a warfarin education booklet for further reference. Evaluation of the knowledge, adherence and level of anticoagulation control was later conducted thirty days after providing the education intervention to establish the outcome of the program.

Data Entry and Statistical Analysis

The raw data was entered into Microsoft Access version 2010, cleaned and exported to IBM Statistical package for social sciences version 21.0 for analysis. Student t-test was used to compare the knowledge, adherence level and anticoagulation control pre and post education intervention at 95% confidence level. P-value of ≤ 0.05 was considered statistically significant.

RESULTS

Socio-demographic characteristics of study participants

Table 1: Social demographic characteristics of the study participants (N=45).

Variable/Category	N	Percent (%)
Age in Years		
19-37	17	37.8
38-57	**22**	**48.9**
≥58	6	13.3
Gender		
Male	6	13.3
Female	39	**86.7**
Marital status		
Single	11	24.4
Married	**30**	**66.7**
Widowed	4	8.9
Education level		
Informal	4	8.9
Primary	9	20.0
Secondary	**27**	**60.0**
Tertiary	5	11.1
Occupation		
Unemployed	**17**	**37.8**
Casual jobs	10	22.2
Formal jobs	12	26.7
Retired	6	13.3
Duration since last anticoagulation clinic visit		
30 days	18	**40.0**
31-60 days	10	22.2
≥ 60 days	17	37.8

Patients had a mean age of 42.8 ±13.7 years (range 19-78 years) and almost half were aged between 38 and 57 years. Majority were females, 39 (86.7%) and married 30 (66.7%) with at least secondary level of education, 27 (60.0%). Almost two thirds of the participants had visited the clinic in the past two months prior to the study.

Knowledge on Warfarin Anticoagulation

A paired sample t-test was used to compare the mean level of knowledge scores of patients before and after the education intervention. There was a significant difference in the pre-test scores (Mean score=11.9 ±2.0) and post-test scores (Mean score=15.6±2.2) [$t_{(45)}$ = -8.615; 95% CI: -4.496- -2.792, p< 0.001].

Knowledge levels were compared pre and post the study and the findings are shown in Figure 1.

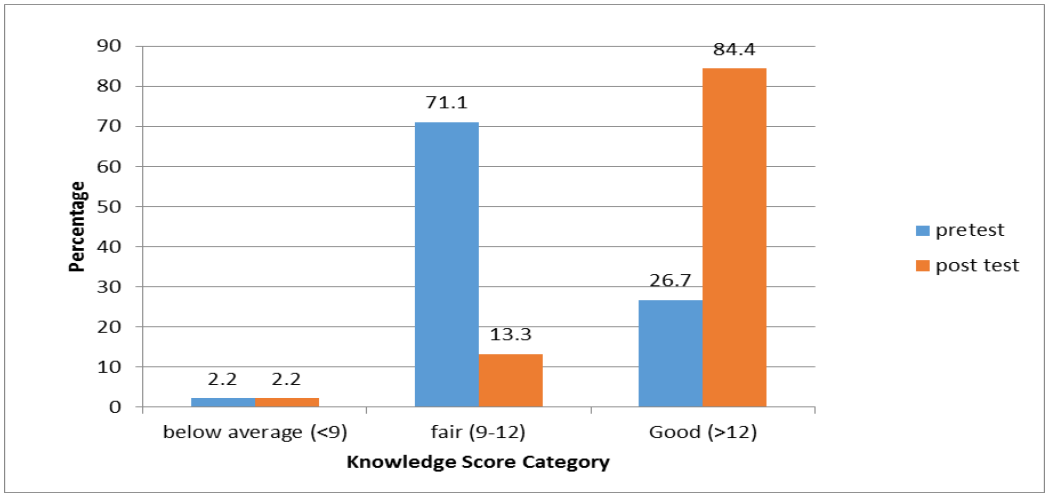

Figure 1: Comparison of knowledge scores pre and post education of warfarin anticoagulation.

Only 1 participant got below average scores on warfarin anticoagulation knowledge on both pre and post education intervention. Thirty-two (71.1%) and 6 (13.3%) had fair knowledge pre and post education, respectively, while 12 (26.7%) and 38 (84.4%) had good knowledge pre and post education, respectively (Figure 1).

Figure 2 gives a breakdown of how the participants averagely performed in each of the questions of the oral anticoagulation knowledge test before and after the intervention.

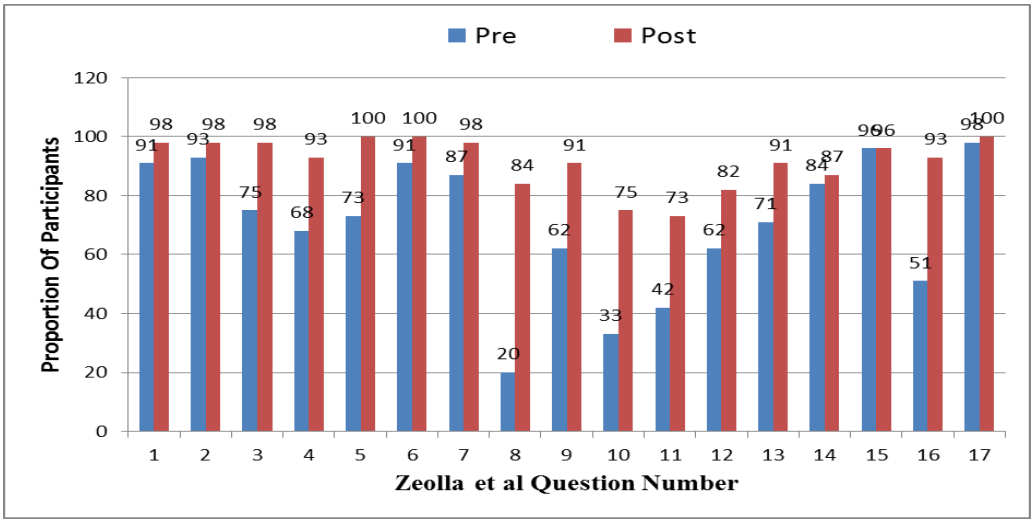

Figure 2: Comparison of responses in the assessment of knowledge pre ad post warfarin based education program.

The best answered questions on pre-warfarin education was items on indications of warfarin (question 1), purpose of INR test (question 2), effect of alcohol consumption on warfarin (question 6), what to do when warfarin dose is missed (question 15) and foods high in vitamin K (question 17). Poor knowledge was noted in questions related to use of pain killers and interacting medication (questions 8 and 11), question pertaining to dietary habits (question 10) and symptoms that required seeking medical attention (question 16) (Figure 2).

The best answered questions during the post warfarin education (100% scores) were questions on ideal INR range (question 5), effect of alcohol intake on warfarin (question 6) and foods rich in vitamin K (question 17). The rest of the questions were scored correctly by more than 70% of the participants after the education intervention. The question that had the least score (73%) was based on interacting medication (question 11) (Figure 2).

Adherence to warfarin therapy

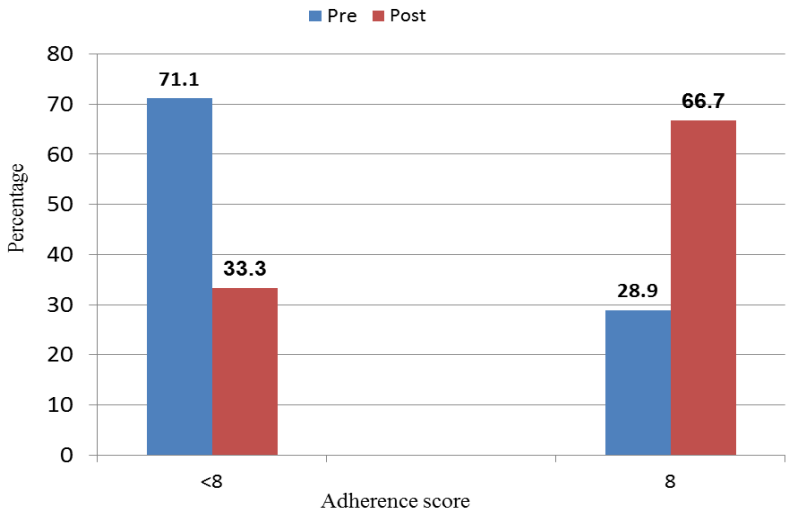

Figure 3: Adherence score at pre and post education intervention on warfarin anticoagulation.

Before the education intervention, majority of patients (71.1%) were not adherent to warfarin therapy (score of < 8). On conducting the education, only 33.3% of patients were non-adherent. Adherence level more than doubled (Score >8) on education intervention (Mean adherence scores; pre=6.3±1.6, post=7.4±1.0, $t_{(45)} = -3.811$, 95% CI: -1.665- -0.513, p <0.001) (Figure 3).

Level of warfarin anticoagulation control

Table 2: Comparison of INR levels during pre and post test.

INR level	Pre-intervention n	%	Post intervention n	%
Therapeutic range (2-3)	15	33.3	**23**	**51.1**
Out of range (<2 or >3)	30	**66.7**	22	**48.9**

Only 15 (33.3%) participants had therapeutic INR range before the intervention. This number increased to 23 (51.1%) participants after the intervention (Table 3).However, comparison of the mean level of INR among the participants pre and post education program, revealed no significant difference (Mean INR pre=2.38±1.01; Mean INR Post= 2.39±1.02), p>0.05).

DISCUSSION

This study has characterized the level of knowledge, adherence and anticoagulation control among 45 patients who underwent a pharmacist-led warfarin anticoagulation education in a tertiary teaching and referral hospital in Kenya. Patients were mainly in the middle level ages and were married, which is comparable with related studies.[13,20]

Research has shown that patient level of knowledge on anticoagulation is directly proportional to level of anticoagulation control.[21] Furthermore, providing patient education has been shown to improve anticoagulation.[22] For instance, available local studies showed that only 10.1% of patients had adequate knowledge,[17] which contrasts our study at 26.7% before education intervention. This deviation could be attributed to the differences in pass marks assigned for study participants. For instance, whilst Kizito *et al* pass mark was set at 75%, a lower cut-off of 70% was used to define adequate knowledge in the present study. Other related studies have used different cut-off pass mark, including Egypt at 60%.[13] and Illinois, 78%. [23] Our findings, however, are close to the study done in Egypt whereby 23.9% of patients had satisfactory knowledge scores before education intervention.[13] Education intervention, however, improved knowledge with more than 90% of participants surpassing the set score mark, which tallies with 84.4% in related studies.[24]

During the pre-test, most participants exhibited good knowledge in the use of warfarin, role of INR test and effects of alcohol consumption on anticoagulation but there was lack of knowledge about dietary measures to be observed and interacting medication. This finding mirrors other similar studies which showed that most patients did not have enough knowledge on interacting medication and diet.[25,26] During posttest, all the poorly performed pretest questions had significant improvement suggesting that these aspects of warfarin knowledge require education intervention in order to improve anticoagulation. The improvement in knowledge scores after intervention may be attributed to the handbook that was provided for the patients and counseling by the pharmacist which have been supported by related studies.[15,27]

There was a significant improvement is knowledge scores after education intervention which corroborates a similar study that was carried out in Cairo, Egypt, that showed a significant increase in the patient mean scores.[13] A prospective randomized controlled study carried out in India, with 40 participants in the control group and 40 in the intervention group found out that there was a significant increase in the patients' knowledge scores from 5.6±3.2 to 13.8±0.94 ($P \leq 0.001$) after counseling by a clinical pharmacist.[28] Additionally, another study, carried out in Sudan, found a sixty five percentage improvement in the knowledge scores after a clinical pharmacist education intervention.[27]

In the present study, there was poor adherence (33.3 %) to warfarin therapy before education intervention as has been supported locally among patients undergoing long term anticoagulation[17] but this improved to 66.7% after the intervention. This is comparable with another study that indicated that 69.8% of patients were adherent after the intervention.[27]

Although there was no significant difference in the mean INR levels at pre and post education program (p>0.05), the proportion of patients with therapeutic INRs were higher after the intervention. These finding are similar to a study that was done in Saudi Arabia whereby no relationship was found between patients knowledge of warfarin and anticoagulation control.[29] Related study found that patient education was effective in INR control during the start of the therapy but not on long term therapy.[30] Similarly, a study done in Egypt found that the higher INRs associated with bleeding greatly reduced after an education intervention.[13] In contrast, there was no significant relationship between knowledge and INR control in other studies.[23] These conflicting variations could be due to the different study populations and frequency of INR measurements among the study participants.

The main limitations of our study were that elderly patients, though few, might have had difficulty in comprehending the education intervention. Secondly, how often the prescribers adjusted warfarin doses were not measured and this could have impacted on the INR levels and anticoagulation control.

CONCLUSION

There is significant improvement in patients' level of warfarin anticoagulation knowledge, adherence and level of anticoagulation after the education intervention. This suggests that provision of a designed, well organized warfarin education program can improve long-term anticoagulation. Future studies should be aimed at improving knowledge on interacting medications and diet.

ACKNOWLEDGEMENTS

The author acknowledges the anticoagulation clinics at KNH for permission to use them as study sites.

REFERENCES

1. Ageno W, Gallus AS, Wittkowsky A, Crowther M, Hylek EM, Palareti G. Oral Anticoagulant Therapy. *Chest*. 2012; 141(2): e44S-e88S. doi:10.1378/chest.11-2292.
2. Jasmine Chiat Ling Ong, Seng Han Lim, Chai Ling Ong, et al. Complications and Costs Associated with Initiation of Anti-coagulation Therapy Using Warfarin - An Observation Study. *J Pharm Pharmacol*. 2015; 3(1): 262-267. doi:10.17265/2328-2150/2015.06.002.
3. Quintero-Gonzalez JA. [Fifty years of clinical use of warfarin]. *Invest Clin*. 2010; 51(2): 269-287.
4. Snaith A, Pugh L, Simpson CR, McLay JS. The potential for interaction between warfarin and coprescribed medication: A retrospective study in primary care. *Am J Cardiovasc Drugs*. 2008; 8(3): 207-212. doi:10.2165/00129784-200808030-00007.
5. Diane K. Wysowski, Parivash Nourjah LS. Bleeding Complications With Warfarin Use. *J Intern Med*. 2007; 167(13): 1414-1419. doi:10.1001/archinte.167.13.1414.
6. Nyamu D, Guantai AN, Osanjo GO, Mwatha E, Gitonga I, Kanyiri ML. Predictors of Adequate Ambulatory Anticoagulation among Adult Patients in a Tertiary Teaching and Referral Hospital in Kenya. *African J Pharmacol Ther*. 2017; 6(1): 20-26.
7. Baughman C, Spurling L, Mangoni AA. Provision of warfarin education to hospital inpatients. *Br J Clin Pharmacol*, 2008; 66(3): 416-417. doi:10.1111/j.1365-2125.2008.03242.x.
8. Kagansky N, Knobler H, Rimon E, Ozer Z, Levy S. Safety of anticoagulation therapy in well-informed older patients. *Arch Intern Med*. 2004; 164(18): 2044-2050. doi:10.1001/archinte.164.18.2044.
9. Tang EOYL, Lai CSM, Lee KKC, Wong RSM, Cheng G, Chan TYK. Relationship between patients' warfarin knowledge and anticoagulation control. *Ann Pharmacother*. 2003; 37(1): 34-39.
10. Tideman PA, Tirimacco R, St. John A, Roberts GW. How to manage warfarin therapy. *Aust Prescr*. 2015; 38(2): 44-48.
11. Barber RL. Patient education and Coumadin (warfarin) therapy : Readmission rates pre / post Coumadin team initiation. Published online 2013.
12. Wofford JL, Wells MD, Singh S. Best strategies for patient education about anticoagulation with warfarin: a systematic review. *BMC Health Serv Res*. 2008; 8: 40. doi:10.1186/1472-6963-8-40.
13. El-naby AGA, Hashem HY, Ismail GM. Evaluation of a Designed Warfarin Educational Program on Patients ' Knowledge and Incidence of Side Effects Department of Community Health Nursing, *Glob J Pharmacol*. 2014; 8(4): 592-600. doi:10.5829/idosi.gjp.2014.8.4.8525.
14. Hu A, Chow C-M, Dao D, Errett L, Keith M. Factors influencing patient knowledge of warfarin therapy after mechanical heart valve replacement. The Journal of cardiovascular nursing.
15. Consuelo Izazola-Conde, Abraham Majluf-Cruz, Isabel Reyes-Lagunes JJM, Molina-Guarneros y J. [Face-to-face education to optimize knowledge in patients initiating oral anticoagulant treatment (OAT)]. *Gac Med Mex*. 2016; 152(3): 364-370.
16. Charan J, Biswas T. How to calculate sample size for different study desgins in medical research. *Indian J Psychol Med*. 2013; 35(2): 121.
17. Mariita K, Maina C, Nyamu D, Menge T, Karimi P. Patient factors impacting on oral anticoagulation therapy among adult outpatients in a Kenyan referral hospital. *African J Pharmacol Ther*. 2016; 5(3): 193-200.
18. Zeolla MM, Brodeur MR, Dominelli A, Haines ST, Allie ND. Development and validation of an instrument to determine patient knowledge: The oral anticoagulation knowledge test. *Ann Pharmacother*. 2006; 40(4): 633-638. doi:10.1345/aph.1G562.
19. Morisky DE, Ang A, Krousel-wood M, Ward HJ. Predictive Validity of a Medication Adherence Measure in an Outpatient Setting. *J Clin Hypertens*. 2008; 10(5): 348-354.
20. Matalqah L, Raaideh M, Suleiman S, Hassali M, Kader M. Relationship between patients' warfarin knowledge and anticogulation control: results of a validated tool in Malaysian. *J Pharm Biomed Sci*, 2013; 30(30): 967-974.
21. Alphonsa A, Sharma KK, Sharma G, Bhatia R. Knowledge regarding oral anticoagulation therapy among patients with stroke and those at high risk of thromboembolic events. *J Stroke Cerebrovasc Dis*. 2015; 24(3): 668-672. doi:10.1016/j.jstrokecerebrovasdis.2014.11.007.
22. Davis NJ, Billett HH, Cohen HW, Arnsten JH. Impact of adherence, knowledge, and quality of life on anticoagulation control. *Ann Pharmacother*, 2005; 39(4): 632-636. doi:10.1345/aph.1E464.
23. Deck ED. The Effect of an Educational Intervention

on Oral Anticoagulation Therapy Knowledge in Primary Care. Published online, 2015: 44-47. doi:DOI 10.1001/archinte.147.1.44.
24. Nasser S, Mullan J, Bajorek B. Challenges of Older Patients' Knowledge About Warfarin Therapy. *J Prim Care Community Health*. 2011; 3(1): 65-74. http://uow.summon.serialssolutions.com.
25. Yahaya, Hassali, Awaisu, Shafie. Factors Associated with Warfarin Therapy Knowledge. *J Clin Diagnostic Res*., 2009; (3): 1663-1670.
26. Khudair IF, Hanssens YI. Evaluation of patients' knowledge on warfarin in outpatient anticoagulation clinics in a teaching hospital in Qatar. *Saudi Med J*., 2010; 31(6): 672-677.
27. Mayet AY. Association between Oral Anticoagulation Knowledge, Anticoagulation Control, and Demographic Characteristics of Patients Attending an Anticoagulation Clinic in Saudi Arabia : A Cross-Sectional Prospective Evaluation. *Trop J Pharm Res*. 2015; 14(July): 1285-1291. doi:10.4314/tjpr.v14i7.23.
28. Lakshmi R, James E, Kirthivasan R. Study on Impact of Clinical Pharmacist's Interventions in the Optimal Use of Oral Anticoagulants in Stroke Patients. *Indian J Pharm Sci*. 2013; 75(1): 53-59. doi:10.4103/0250-474X.113550.
29. Shehata RS, Elassal AA, Gabal AA. Compliant to Warfarin Therapy after Mechanical Heart Valve Replacement. *Open J Thorac Surg*. 2014; 4(4): 39-43. doi:10.4236/ojts.2014.42009.
30. Clarkesmith DE, Pattison HM, Lane D a. Educational and behavioural interventions for anticoagulant therapy in patients with atrial fibrillation. *Cochrane Database Syst Rev*. 2013; 6(6): Cd008600. doi:10.1002/14651858.CD008600.pub2.