Original Article

Pharmacists’ Warfarin Therapy Knowledge and Counseling Practices in the Eastern Province, Saudi Arabia: A Cross-sectional Study

Ahmed Adel Mohamed¹, Marwah E. Alnewais¹, Yasir A. Ibrahim¹, Mohammad F. Zaitoun²

¹Department of Pharmacy Practice, College of Clinical Pharmacy, King Faisal University, Al Hofuf, Kingdom of Saudi Arabia, ²Department of Pharmacy, Armed Forces Hospitals Southern Region, Khamis Mushayt, Kingdom of Saudi Arabia

Context: For several decades, warfarin has been considered the mainstay anticoagulant for patients who require long-term prevention or treatment of thromboembolic disorders in outpatient settings. Hospital and community pharmacists—with adequate knowledge level and counseling skills—can play a significant role in improving warfarin therapy. Aims: The aim of this study was to assess the hospital and community pharmacists’ warfarin therapy knowledge and counseling practices in the eastern province of Saudi Arabia. Materials and Methods: A cross-sectional study was conducted for 2 months. A self-administered questionnaire was designed focusing on warfarin mechanism of action, indications, safety profile, management of toxicity, monitoring, drug/food interactions, and patient education. The questionnaire was distributed among a random sample of hospital and community pharmacists in the Eastern Province of Saudi Arabia. Results: One hundred and fifty-three pharmacists participated in the study; ninety-seven of them were hospital-based (63.4%), whereas the remaining were community pharmacists. Participant’s mean years’ of experience was 5.67. In terms of the percentage of right answers, hospital pharmacists showed significantly better warfarin therapy knowledge than community pharmacists (P = 0.026). The percentages of right answers were 31.3% for drug/food interactions, 49.9% for safety profile/management of toxicity, 53.3% for patient education, and 58.2% for monitoring warfarin safety/efficacy. Neither the participants’ educational level nor their duration of experience had a significant correlation with the percentage of right answers (P = 0.22 and 0.61) Conclusion: Inadequate knowledge and inappropriate practices were encountered among study participants, especially community pharmacists. Therefore, specialized training of pharmacists about warfarin therapy management is essential to optimize therapeutic outcomes and prevent complications.

Keywords: Anticoagulants, counseling, drug interactions, knowledge, pharmacists, warfarin

INTRODUCTION

For several decades, warfarin has been considered as the mainstay of long-term anticoagulation in the ambulatory care setting.¹ It is regarded as one of the highest 15 prescribed medications in the United States, with more than 2 million patients receiving it.²,³

The Institute of Safe Medication Practices considers warfarin as a high-alert medication as it may be
associated with hemorrhagic as well as thromboembolic complications when not used appropriately or without proper medical supervision. A previous cohort study reported a hemorrhage rate of 4.6 per 100 person-year in patients receiving warfarin therapy.

Adjusting the international normalized ratio (INR) is considered a critical point to ensure the safe and effective use of warfarin; inappropriate dosing may put the patient at risk of bleeding or increase the risk of thromboembolism. The level of INR varies according to the patient’s disease state. The risk of bleeding-related hospitalization was increased significantly when its concomitantly used with other medications such as clopidogrel, amiodarone, aspirin, and some antibiotics. In addition to many medications, warfarin interacts with several nutrients and supplements. All of these challenges should be taken into account during the course of anticoagulation therapy. Considering its complexity and seriousness, healthcare providers from different disciplines should be actively involved in warfarin therapy management. Pharmacists’ participation in warfarin therapy management has been shown to improve patients’ quality of life and reduce the time needed for anticoagulation monitoring. Pharmacists’ role in preventing warfarin therapy complications is multifactorial; it includes patient education, provision of drug information as well as the screening and prevention of drug–drug or drug–nutrient interactions. The pharmacist could be a source of reliable information to the nurse and physician.

In previous studies and systematic reviews, many positive outcomes were associated with pharmacists’ involvement in warfarin patient care. Pharmacist-conducted patient counseling improved patient knowledge, increased patient satisfaction, improved the INR control and reduced the time to achieve the target level, markedly decreased bleeding and thromboembolic events, and reduced the rate of hospitalization and emergency department visits. In addition, actively involving the pharmacist in patient care has shown cost-effectiveness.

In Saudi Arabia, a previous study reported that more than 50% of treatment failures who did not meet the INR target were due to unstructured and nonsystematic approaches for delivering warfarin therapy. After initiation of the pharmacist-led anticoagulation clinic, the percentages of patients who met therapeutic INR targets were 59% with significant improvement in patient satisfaction score. Another study, conducted in the central province, showed an inadequate level of knowledge about warfarin–drug and herb interactions among healthcare providers from different disciplines. Considering the limited evidence available, this study aimed to assess the practicing hospital and community pharmacists’ knowledge about warfarin therapy and their competency to provide effective patient counseling sessions for patients receiving warfarin.

**MATERIALS AND METHODS**

**Study design and setting**

A cross-sectional study was conducted from March to May 2014. Participants of the study were pharmacists working at tertiary hospitals and community pharmacies in the Eastern province of Saudi Arabia. The study protocol was approved by the research ethics committee of the deanship of scientific research, King Faisal University.

**Survey**

The data collection tool used in this study is a self-administered structured questionnaire. It was designed based on an extensive literature review focusing on the evidence-based patient education and counseling practices, drug–drug, and drug–nutrient interaction as well as the pharmacological and clinical information regarding warfarin therapy. The questionnaire was designed based on reliable resources including the medication guides of the American Heart Association, United States Food and Drug Administration, American College of Chest Physician, and United Kingdom National Health Services. Additional sources included Micromedex monograph and Lexicomp monograph.

The questionnaire was developed in the English language, which was used while interviewing the study participants. To test the survey validity and reliability, the initial draft of the questionnaire was distributed to several clinical pharmacists for their opinion and suggestions about the questionnaire elements, and some modifications were performed according to the recommendations. In addition, 20 participants’ responses were selected randomly, and the validity was assessed according to their responses using Cronbach α coefficient.

The questionnaire was composed of both closed and open-ended questions and divided into five main sections. The first section indicated the participant’s demographics. The second section investigated warfarin
basic information, including its pharmacological class, indications, monitoring parameters, and dosage adjustment. The third section examined the ability of the pharmacist to identify the most clinically significant interactions of warfarin with other medications and nutrients. The fourth section assessed the pharmacist’s practices in case of overwarfarinization. The last section investigated the pharmacist’s knowledge about various counseling aspects and their ability to educate patients on warfarin therapy.

**Data analysis**

The participants’ responses were analyzed with Statistical Package for the Social Sciences (SPSS) software program, version 20.0 (IBM Corp., Armonk, NY, USA). All the knowledge questions were marked according to the preassigned model of the right answers, and one point was given to each correct answer, then the total score was calculated for each participant. The quantitative data were presented with mean ± standard deviation (SD), whereas qualitative data were scored according to the number of correct answers, and presented as percentages of correct answers for each question category. The correlation of educational level with the overall scores of the right answers for each participant was performed using a nonparametric Spearman correlation test. Pearson correlation test was used between the percent of the right answers and the duration of the experience. The Student’s t test was used to investigate the significance of the difference between the means of the total scores of the hospital and community pharmacists. The Student’s t test was also used to find significant differences between the groups for each of the questionnaire elements. Results were considered to be statistically significant when the observed P value was ≤0.05.

### Results

**Demographics of participants**

One hundred fifty-three participants completed the questionnaire, of which 97 were hospital pharmacists and 56 were community pharmacists. The majority of participants (66.7%) possess a bachelor of pharmacy degree, and half of the participants dispense less than 50 prescriptions of warfarin per day. The mean duration of experience of the participants is (5.67 ± 5.6) years. Details about the pharmacist’s demographics are presented in Table 1. The reliability of the questionnaire was confirmed by the Cronbach α value of 0.79, which assume that the questions were reliable.[28,29]

**Participants’ knowledge and practices**

Concerning the overall knowledge and practice questions, the percentages of right answers for each question category are summarized in Table 2. The percentage of the right answers for hospital pharmacists was 44.5%, and for the community pharmacists was 38.4%, with a significant difference between the mean total scores of the two groups (P = 0.026). Hospital pharmacists scored significantly higher in all questionnaire elements except for warfarin use during pregnancy and lactation, target INR, appropriate instructions on missed doses, rare adverse effects, and lifestyle modifications.

Concerning warfarin adherence support tools, only 11.3% defined the tools they are using to improve patients’ adherence. The tools included warfarin patient educational booklet, counseling, and clinical pharmacy clinic appointments.

As shown in Table 3, pharmacists were unable to identify some of the most clinically significant drug and nutrient interactions, such as allopurinol, sucralfate, estrogen and progestin derivatives, and fenugreek, where only 30% or less of the participants could identify warfarin’s interaction with these products. In addition, it was noticed that participants have limited knowledge about herb/nutrient–warfarin drug interactions.

When asked about the drug information resources they use, quarter of the community pharmacists and 7.2% of the hospital pharmacists mentioned that they do not use any resource during their practice, and they depend only on their previous knowledge.

**Discussion**

Several studies have proven the critical role of pharmacists in warfarin therapy as they act as a source of evidence-based information for both patients and healthcare professionals on the safe and effective use of
Adequate control of the INR level for warfarin patients is crucial to keep the patients safe from having a failure of therapy. Low INR levels may indicate an increased chance of emboli formation, whereas an elevated level of INR may indicate an increased chance of hemorrhage. Warfarin-therapy competent pharmacists could play an essential role in improving patients’ INR control. The limited knowledge level of our study participants about the adjusted level of INR will inevitably affect their ability to perform their role positively.

Another challenge of prescribing warfarin is its multiple drug and food interactions. It can be challenging for pharmacists to possess an acceptable level of knowledge about warfarin interactions that enables them to deal with different clinical scenarios and participate actively in patient care. Our results revealed a marked knowledge deficiency among the participant regarding common warfarin drug and food interaction, which can directly affect the quality of patient care they provide. Similar results were reported by Al-Arifi et al. in the central region of Saudi Arabia. Their study revealed an inadequate level of knowledge about warfarin drug and its interactions among all healthcare providers, including pharmacists. In the same context, Allah Ali and Abdallah highlighted the limited knowledge of community pharmacists of Khartoum state, Sudan, about warfarin food interactions.

The limitations of this study include the small sample size, inability to ascertain the exact time that each

Table 2: Participants’ knowledge and practices

| Question category | Percentage of right answers | $P$ Value |
|-------------------|-----------------------------|-----------|
| Overall percentage of right answers | 44.5 | 38.4 | 0.026 |
| Pharmacological class | 75.3 | 46.4 | 0.0003 |
| Indication | 55.7 | 42 | 0.0015 |
| Monitoring | 94.8 | 78.6 | 0.0019 |
| Use during pregnancy | 85.6 | 78.6 | 0.27 |
| Use during lactation | 39.2 | 48.2 | 0.2789 |
| Safety measures in using warfarin | | | |
| Target INR | 54.6 | 41.1 | 0.1073 |
| Effect on AF patients | 28.9 | 16.1 | 0.0759 |
| Dose adjustment strategy | 28.9 | 48.2 | 0.0161 |
| Drug and nutrient interactions | 32.6 | 30.7 | 0.0001 |
| Management of over-warfarinization | 47.9 | 38.4 | 0.0001 |
| Patient education and counseling | | | |
| Ideal time of warfarin administration during the day | 28.6 | 60.8 | 0.0001 |
| Instructions on missed doses | 32.1 | 44.3 | 0.1399 |
| The most common side effects | 64.9 | 44.9 | 0.0142 |
| Some rare adverse effects | 51.5 | 42.9 | 0.3033 |
| Eating green vegetables with Warfarin | 70.1 | 51 | 0.0131 |
| Lifestyle modifications | 63.9 | 58.9 | 0.5431 |

INR = international normalized ratio, AF = atrial fibrillation

Table 3: Warfarin–drug and nutrient interactions results as percent of right answers

| Question category | Hospital pharmacist | Community pharmacists | $P$ Value |
|-------------------|---------------------|-----------------------|-----------|
| Right answers (%) | Right answers (%)   |                       |           |
| Allopurinol       | 35.1                | 37.5                  | 0.627     |
| Naproxen          | 53.6                | 44.6                  | 0.435     |
| Carbamazepine     | 44.3                | 51.8                  | 0.59      |
| Antacids          | 33.0                | 42.9                  | 0.433     |
| Acetaminophen     | 38.1                | 26.8                  | 0.445     |
| Topical salicylate| 14.4                | 28.6                  | 0.451     |
| Omeprazole        | 29.9                | 33.9                  | 0.451     |
| Fluconazole       | 46.4                | 46.4                  | 0.968     |
| Sucralfate        | 16.5                | 26.8                  | 0.336     |
| Estrogen and progestin derivatives | 26.8 | 23.2 | 0.451 |
| Amoxicillin/clavulanic acid | 20.6 | 19.6 | 0.968 |
| Simvastatin       | 40.2                | 35.7                  | 0.451     |
| Azithromycin      | 50.5                | 37.5                  | 0.451     |
| Fenugreek         | 22.7                | 16.1                  | 0.451     |
| Green tea         | 34.0                | 14.3                  | 0.451     |
| Vitamin E         | 22.7                | 21.4                  | 0.451     |
| Ginseng           | 20.6                | 14.3                  | 0.451     |

Thus, pharmacists must have an adequate level of knowledge regarding the appropriate use of warfarin. Unfortunately, one of the significant findings in this study was the limited knowledge of both hospital pharmacists and community pharmacists. This, in turn, may be considered a main limiting step in reaching optimum treatment outcomes.
participant needs to fulfill the questionnaire, and whether they were able to answer the questionnaire based on their knowledge only or they relied on specific references. Despite these limitations, the study results provided insight into areas that need improvement of the hospital and community pharmacists’ warfarin therapy knowledge level. The significant findings of this study call for conducting a countrywide larger sample size study to confirm the generalizability of its results. In addition, this study results highlight the need for involving pharmacists, particularly the community pharmacists, in specialized quality improvement projects and educational activities about warfarin therapy management. Such involvement could enable their active participation in the multidisciplinary anticoagulation management team and improvement of anticoagulated patients’ clinical outcomes.

**CONCLUSION**

Inadequate knowledge and inappropriate practices were encountered among study participants, which may—in turn—lead to inadequate patient counseling and result in adverse clinical consequences. Therefore, specialized educational programs for pharmacists are essential to optimize therapeutic outcomes and prevent warfarin therapy complications.

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**Conflict of interest**

There are no conflicts of interest.

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