



Unlocking Urban India's Awareness of Oral Anticoagulation: Implications for Healthcare Education

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ABSTRACT

Objectives: Treatment outcomes for patients with arrhythmias, deep vein thrombosis, prosthetic valves, blood thinning, and cardiac issues/chest pain problems can be affected by knowledge about oral anticoagulant therapy. The primary objective is to assess the knowledge of patients using oral anticoagulants for anticoagulation therapy, and the secondary aim is to identify factors influencing the level of anticoagulation knowledge.

Materials and Methods: This prospective cross-sectional study was conducted at selected community pharmacies. A 33-item, self-administered questionnaire was adopted to evaluate patient understanding of anticoagulant medication in the urban population. Scores were calculated for each part and the association between patients' knowledge. Binary logistic regression analysis was performed to assess variables associated with oral anticoagulation knowledge among participants.

Results: The mean percentage knowledge score of the study population (n=323) was 42.38±12.5. Age has been found to have a negative correlation with anticoagulant therapy knowledge ($p=0.01$). It was discovered that there were gaps in knowledge regarding critical areas of use and self-management, including the identification of bleeding as a serious side effect of medication, drug-drug interactions, and dose omission.

Conclusion: This research article highlights urban participants' knowledge gaps in oral anticoagulation. Targeted educational interventions by pharmacists are vital for improving patient safety and treatment outcomes. Advancing age was associated with knowledge. Further research could explore the long-term impacts of educational interventions in larger populations.

Keywords: Oral anticoagulant therapy, knowledge assessment, patient knowledge, patient education, pharmaceutical care

INTRODUCTION

Currently, the morbidity and mortality rates are high today. Anticoagulants have been extensively used for a decade for preventing and treating vascular and thromboembolic diseases despite their relatively high risk/safety profile.¹ Anticoagulants are narrow therapeutic range drugs leading to life-threatening complications like bleeding and re-thrombosis, which can occur when patients are over-anticoagulated or under-anticoagulated.² If not properly controlled, anticoagulants, which are referred to

as "high alert medications," may result in adverse drug events in the inpatient and outpatient healthcare context.³

The urban population, in particular, is more likely to be exposed to various risk factors associated with cardiovascular diseases, such as a sedentary lifestyle, unhealthy dietary habits, and increased stress levels.⁴ Consequently, anticoagulant medications are frequently prescribed to this population to manage and prevent complications. Several research findings indicate that patients who receive therapeutic education have

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a reduced likelihood of experiencing hemorrhagic accidents and/or thrombotic recurrences 3 months after discharge. Conversely, patients who do not receive therapeutic education are more susceptible to developing complications.³

According to previous reports, individuals frequently taking oral anticoagulants are unaware of the risks and consequences associated with their medication.⁵ The response of patients to treatment depends on their understanding of oral anticoagulant medication. Patients who are better informed about the benefits and risks of taking oral anticoagulants are more likely to take them consistently. Patients who do not adhere to dose and monitoring regimens not only reduce the likelihood of therapeutic benefits but also put themselves at a higher risk of experiencing adverse events. Up to 36,000 patients are seen in U.S. hospital emergency rooms annually for side effects from anticoagulant therapy.⁶

According to a recent national study, 93% of patients taking oral anticoagulants reported adverse events and other studies have shown that many of these occurrences are caused by avoidable patient mistakes. Some patient errors can likely be attributed to their insufficient understanding of anticoagulant therapy and its associated risks.⁷ One of the most important elements in improving treatment and lowering complications for patients receiving oral anticoagulant medication is currently thought to be patient education. Therefore, more efficient patient education regarding anticoagulant therapy is needed. The dissolution of a blood clot it takes about 3 months, so non-adherence to medication provokes the incidence of stroke.³ Patients taking anticoagulants will benefit from education and information services that lower treatment costs by limiting the risks of bleeding and thromboembolism.⁸

However, it is crucial to note that anticoagulant therapy can be complex and challenging to manage effectively. Patients should have a thorough understanding of the purpose, dosage, potential side effects, and interactions of these medications. Moreover, they must be aware of the importance of regular monitoring and follow-up appointments. Lack of knowledge or misconceptions about anticoagulants can lead to suboptimal outcomes, including increased risk of bleeding or thrombosis. Therefore, in this study, we primarily aimed to assess patient knowledge regarding oral anticoagulant treatment, identify knowledge gaps, and identify patients at risk.

MATERIALS AND METHODS

A prospective cross-sectional study was conducted at selected community pharmacies in Nilgiris, India, between July 2022 and May 2023. In this setting, patients who had medications from various prescribers, many of whom had different clinical problems. Patients who are not willing to participate in the study are excluded.

Sample size estimation

The sample size for the present study was calculated with the help of Cochran's formula, $n = Z^2 pq/d^2$, where n is the sample size, Z is 1.96, p is the estimated average patient knowledge

of anticoagulation at 70%, q is 1- p , and there is a 5% margin of error. Therefore, the estimated sample size for this study is approximately 323.

Study instrument

The present study utilized the Oral Anticoagulation Understanding Tool (AKT), a 33-item, self-administered questionnaire for evaluating one's understanding of anticoagulation, by the community pharmacies as the study instrument. The data collection form was derived from a prior study with acceptable validity and reliability.¹⁰ The data collection tool included three major sections:

Section A: Assessment of socio-demographic characteristics: This consists of six questions covering age, sex, level of education, occupation, monthly income, and duration of oral anticoagulant use, which are used to evaluate patients' socio-demographic characteristics.

Section B: Assessment of oral anticoagulation knowledge. This section consists of 20 questions that analyze patients' knowledge about oral anticoagulants.

Assessment of oral anticoagulation knowledge

A study information sheet and a brief explanation of the study's objective were given to each participant. The ethics committee approved the waiver of written informed consent and questionnaire. The responses received from the participants were scored and assessed for their knowledge. Except for questions 18 and 19 in section 2, each response received one point for being correct and zero for being incorrect. For questions 18 and 19, each of the three correct answers to these questions was awarded one point. A cut-off value of more than 50% was considered an adequate knowledge score.

Statistical analysis

Data analysis was performed using SPSS software version 22.0. The participant baseline characteristics were reported using percentages and medians. Using the Shapiro-Wilk test, the normality of continuous variables. Using a linear regression sub-analysis, we assessed whether there was a relationship between mean AKT and age. All analyses were deemed significant at p values of 0.05.

Ethical considerations

This study was approved by the Institutional Review Board of JSS College of Pharmacy (approval number: JSSCP/IRB/10/2022-2023, dated: 11.02.2023).

RESULTS

A total of 323 respondents were included in the analysis. The study revealed that men are at risk of taking oral anticoagulant drugs compared to women. Maximum of the participants had no formal education (43.1%). The median age of the participants was 59 years. The minimum age of patients was 30 years, and the maximum age was 89 years. Most of the participants were older patients (86%). Of them, 39.4% used oral anticoagulants for less than 3 months. Table 1 presents the demographic characteristics of the study participants and the distribution

Table 1. Demographic characteristics of the study participants

| Demographic characteristics | n (%) | Knowledge of anticoagulants (SD) | p value |
|---|-------------|----------------------------------|---------|
| Age | | | |
| 65 years | 237 (73.37) | 82 (\pm 12.5) | 0.01 |
| 65 years and older | 86 (26.62) | 36 (\pm 8.7) | |
| Sex | | | |
| Female | 132 (40.86) | 45 (\pm 10.2) | 0.77 |
| Male | 191 (59.13) | 73 (\pm 11.8) | |
| Highest level of education | | | |
| No formal education | 152 (43.1) | 65 (\pm 9.5) | 0.78 |
| High school or equivalent | 137 (38.8) | 50 (\pm 11.2) | |
| Technical and vocational skills | 5 (1.4) | 2 (\pm 1.5) | |
| College | 0 | 0 | |
| Bachelor's degree | 29 (8.2) | 13 (\pm 2.8) | |
| Occupation | | | |
| Full-time work | 116 (32.9) | 42 (\pm 9.9) | 0.75 |
| Home maker | 121 (34.3) | 43 (\pm 10.5) | |
| Part-time work | 0 | 0 | |
| Unemployed/Retired | 86 (24.4) | 33 (\pm 8.0) | |
| Annual income range INR (USD) | | | |
| Rs.0-50,000 (0-600\$) | 156 (44.2) | 50 (\pm 9.0) | 0.91 |
| Rs.51,000-1,00,000 (612-1200\$) | 5 (1.4) | 1 (\pm 0.5) | |
| Rs.5,00,000 and later (6000\$ and above) | 11 (3.1) | 4 (\pm 1.1) | |
| I prefer not to say this | 96 (27.2) | 35 (\pm 8.2) | |
| Duration of treatment with oral anticoagulants | | | |
| <3 months | 139 (39.4) | 52 (\pm 10.7) | 0.73 |
| 1-2 years | 68 (19.3) | 22 (\pm 6.8) | |
| 3-12 months | 104 (29.5) | 39 (\pm 9.1) | |
| >2 years | 12 (3.4) | 4 (\pm 1.5) | |
| Not taking anticoagulant medication | 0 | 0 | |

SD: Standard deviation, INR: International normalised ratio

of knowledge about anticoagulant use among different demographic groups.

The results revealed statistically significant associations between age and knowledge. Other factors like sex, education, occupation, income range, and duration of anticoagulant therapy did not significant association with knowledge scores. Figure 1 presents the results of the multivariate logistic regression. Figure 2 shows a pictorial representation of the knowledge assessment among the elderly and other patient groups. The relationship between the oral anticoagulation knowledge score and the age of respondents (circles) is presented. The straight line is the oral anticoagulation knowledge score.

Responses regarding the use of oral anticoagulants are detailed in Table 2. The results showed that rivaroxaban (48.6%) was the most commonly used anticoagulant, followed by dabigatran (30.3%) and apixaban (21.1%). Regarding the reasons for prescribing anticoagulant medicine, most participants reported taking it for arrhythmias (39.9%), followed by cardiac issues/chest pain (20.1%). Major of respondents were unsure about how the medicine worked in their bodies, and few correctly identified that it prevents blood from clotting (23.3%). Major (42.4%) of respondents were uncertain about the duration needed to take the medicine. Most participants recognized the importance of taking the medicine as prescribed to avoid bleeding

Anti-coagulant (1-2 years vs. not on any medication)
 Anti-coagulant (<3 months vs. 1-2 years)
 Anti-coagulant (<3 months vs. not on any medication)
 Education (highschool vs. no education)
 Education (bachelor's vs. no education)
 Education (high school vs. technical)
 Income (no income vs. >1L)
 Income (no income vs. >5L)
 Income (prefer not to say vs. > 5L)
 Occupation (housewife vs. fulltime)
 Occupation (unemployed vs. fulltime)
 Gender (male vs. female)
 Diagnosis (arrhythmia vs. others)
 Drug (rivarobaxan vs. others)
 Education (educated vs. uneducated)
 Age (<65 vs. >65)

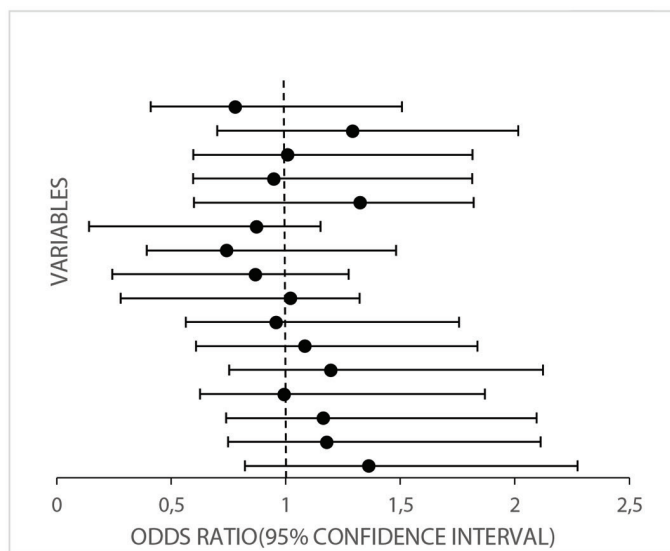


Figure 1. Results of multivariate logistic regression analysis for factors associated with adequate anticoagulant knowledge

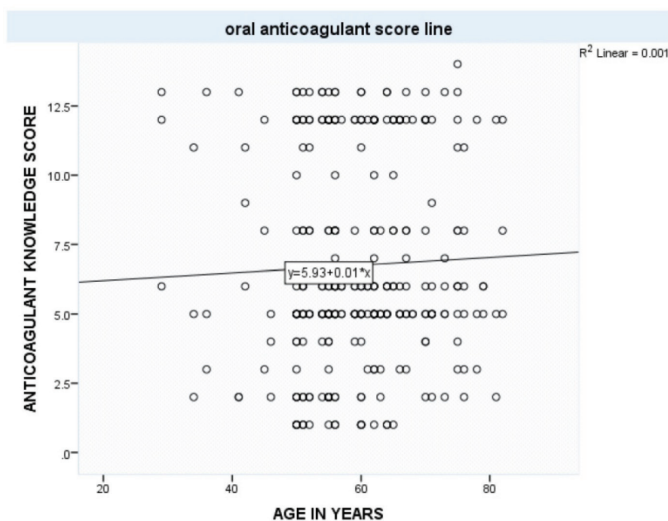


Figure 2. Linear regression plot of oral anticoagulation knowledge and age of the participants

complications (58.5%). Most respondents the significance of taking the medicine at the same time each day (97.2%). The data showed that a large number of respondents did not believe that skipping one dose could worsen their condition (98.5%). The importance of continuing the medication even after feeling better was also addressed, in which a maximum of participants were okay with stopping the medication (94.7%) once they felt better.

When asked about taking more of the medicine than prescribed, respondents were not sure (75.8%) that doing so would have any benefit. Concerning safety and side effects, a vast majority knew that excessive alcohol consumption could increase the risk of side effects (89.7%). Many were uncertain about other safety aspects, such as taking additional doses or taking anti-

inflammatory medicines (59.9%) with the anticoagulant. The study explored the respondents' understanding of the most important side effects and the signs to watch out for while taking the medication. Half of the participants identified bleeding (59.4%) as the most important side effect and correctly identified bleeding gums, prolonged nose bleeds, and nose bleeds (59.4%) as signs to watch out for.

DISCUSSION

The findings of this study highlight the need for targeted educational interventions to improve anticoagulant knowledge among urban populations. It is essential to address the identified knowledge gaps to ensure safe and effective anticoagulant therapy. Surveys in several nations, including England,¹¹ Australia,¹² Hungary,¹³ Poland,¹⁴ and Saudi Arabia,¹⁰ showed that patients taking oral anticoagulants had adequate knowledge (>50%), while surveys in others, including London,¹⁵ Brazil,¹⁶ New York City,¹⁷ Iran,¹⁸ Saudi Arabia,¹⁹ Pakistan,²⁰ Libya,²¹ Nepal,²² and European nations,²³⁻²⁸ like Switzerland, Germany, France, Denmark, Sweden, Spain, Norway, and Italy, showed that they had inadequate knowledge.

Healthcare providers should play a crucial role in educating patients about their medications and monitoring requirements. Additionally, community-based awareness campaigns and educational materials can enhance the public understanding of anticoagulant therapy.

This study evaluated patients' awareness of anticoagulation in relation to deep vein thrombosis, coronary artery disease, atrial fibrillation, and blood thinning. The majority of the participants had inadequate knowledge of anticoagulation. Overall, there were gaps in our understanding of essential areas such as self-management, including missing doses, drug-drug interactions (DDIs), as well as recognizing bleeding as a significant adverse drug effect. These findings are in line with earlier reports on a variety of demographics in which low oral anticoagulant

Table 2. Assessment of respondents' knowledge about oral anticoagulants (n=323)

| Anticoagulant medication knowledge assessment | Response n (%) |
|---|----------------|
| Anticoagulant | |
| Rivaroxaban | 157 (48.6) |
| Apixaban | 68 (21.1) |
| Dabigatran | 98 (30.3) |
| The reason for the prescription | |
| Arrhythmias | 129 (39.9) |
| Deep vein thrombosis | 60 (18.6) |
| Prosthetic valve | 3 (0.9) |
| Blood thinning | 6 (1.9) |
| Cardiac issue/chest pain | 65 (20.1) |
| Others | 60 (18.6) |
| How does the medication work in the body? | |
| Lower BP | 3 (0.9) |
| Prevents blood clotting | 75 (23.2) |
| Lowers heart rate | 20 (6.2) |
| Don't know | 225 (69.7) |
| Frequency of medication | |
| Once | 151 (46.7) |
| Twice | 172 (53.3) |
| Duration of treatment | |
| 3 months | 124 (38.4) |
| 6 months | 33 (10.2) |
| 1 year | 2 (0.6) |
| Lifelong | 27 (8.4) |
| Don't know | 137 (42.4) |
| The importance of following physician's instructions | |
| Too much of this can cause bleeding. | 189 (58.5) |
| Don't know | 134 (41.5) |
| Importance of taking medication at the same time daily? | |
| Yes | 314 (97.2) |
| No | 6 (1.9) |
| Not sure | 3 (0.9) |
| Is it acceptable to double the dose if a dose is missed? | |
| Yes | 0 (0) |
| No | 318 (98.5) |
| Not sure | 5 (1.5) |
| Does skipping one dose of the medication worsen the patient's condition? | |
| Yes | 3 (0.9) |
| No | 319 (98.5) |
| Not sure | 1 (0.3) |

Table 2. Continued

| Anticoagulant medication knowledge assessment | Response n (%) |
|--|----------------|
| Can we stop taking the medication once the feeling improves? | |
| Yes | 306 (94.7) |
| No | 11 (3.4) |
| Not sure | 6 (1.9) |
| Can you take anti-inflammatory medicines like ibuprofen in combination with anticoagulant medication? | |
| Yes | 192 (59.9) |
| No | 3 (0.9) |
| Not sure | 126 (39.6) |
| Can vitamin supplements and herbal medicines with anticoagulant medication be administered without physician's opinion? | |
| Yes | 195 (60.4) |
| No | 2 (0.6) |
| Not sure | 126 (39.0) |
| Benefits of taking more medication than prescribed? | |
| Yes | 0 (0) |
| No | 78 (24.2) |
| Not sure | 245 (75.8) |
| Does alcohol consumption affect the side effects of the medication? | |
| Yes | 290 (89.7) |
| No | 0 (0) |
| Not sure | 33 (10.3) |
| Will you inform health professionals before any surgery? | |
| Yes | 195 (60.4) |
| No | 0 (0) |
| Not sure | 128 (39.6) |
| Will you inform all health care practitioners about your medications? | |
| Yes | 192 (59.4) |
| No | 0 (0) |
| Not sure | 131 (40.6) |
| The most important side effect | |
| Bleeding | 192 (59.4) |
| Others | 3 (0.9) |
| Don't know | 128 (40.6) |
| Three signs of side effects that should be monitored | |
| Don't know | 131 (40.6) |
| Bleeding gums, prolonged nose bleeding | 192 (59.4) |
| Three ways to reduce the risk of side effects | |
| Don't know | 291 (90.1) |
| INR monitoring regularly, proper dosing | 32 (9.9) |
| Steps to take if accidentally taking too much | |
| Consult the doctor | 192 (60.1) |
| Be alert for signs of side effects | 129 (39.9) |

BP: Blood pressure, INR: International normalised ratio

awareness has been documented on a regular basis. This study considered clinically relevant DDIs. This includes interactions that could significantly affect patient outcomes during anticoagulation therapy.

Our research showed that adults aged 65 years and older had much less knowledge about oral anticoagulants than those younger than 65. The understanding of anticoagulants was identically predicted by age. Several reports have found that aging is inversely connected with knowledge of oral anticoagulants, which have examined the impact of age on oral anticoagulant knowledge in a variety of populations. A known factor in determining drug-related knowledge is the quantity and quality of interactions between patients and medical professionals. An increase in the frequency of patient-healthcare professional interactions will persistently increase patient knowledge. Therefore, it is a great opportunity for healthcare professionals to interact with patients and prevent various side effects and hazards caused by inadequate knowledge regarding anticoagulant use.

Participants cannot effectively participate in shared decision-making or self-management of their condition unless they are informed about anticoagulation. To identify and address awareness gaps, it is imperative that knowledge assessments be incorporated into counseling programs and given to patients at the beginning of their oral anticoagulant therapy and on an ongoing basis thereafter. It is necessary to implement a comparable follow-up session for direct oral anticoagulant users in the absence of routine coagulation monitoring to assess their understanding of oral anticoagulants and other patient-related outcomes.

Anticoagulants are high-risk medications widely used to prevent and treat thrombotic events, resulting in the need for adequate patient education to minimize harm. However, patients should be closely and consistently monitored due to the narrow therapeutic index and potentially fatal side effects. According to previous studies, there is a higher risk of bleeding when the international normalised ratio (INR) is higher than the therapeutic range and a higher risk of thromboembolism when it is lower than 2. Education regarding the management of patients taking oral anticoagulants was identified as a critical component of the Joint Commission International, National Patient Safety Goal guideline for 2014.⁷

Although prior studies have indicated a potential positive relationship between patients' anticoagulant knowledge and achieving INR values within the therapeutic range, the study by Baysal and Midilli⁷ did not find a significant correlation between knowledge levels and INR outcomes. An effective education program is therefore required to raise and maintain patients' awareness of anticoagulants. Patients taking anticoagulants will benefit from education and information services that lower treatment costs by lowering the risks of bleeding and thrombosis. Non-adherence to medication can increase the risk of stroke.

Furthermore, the findings of this study have implications for healthcare policies and guidelines. The results can inform the

development of educational programs tailored to the specific needs of urban populations. By improving anticoagulant knowledge, healthcare providers can empower patients to actively participate in their treatment plans, resulting in better clinical outcomes.

Study limitations

It is important to acknowledge this study's constraints. The research focused on a specific urban population, and the findings may not be generalizable to rural or other demographic groups. However, patients' knowledge may be poorer if other centers were included. The sample size was limited, which may have affected the representativeness of the results. Consequently, it makes sense to conduct a nationwide survey involving a large sample of patients who are on oral anticoagulants. Moreover, the study relied on self-reported knowledge, which may be subject to recall or social desirability bias. The study did not take into consideration whether the patients were cognitively impaired, psychosocial, or psychotic.

CONCLUSION

In conclusion, this study presents a comprehensive assessment of anticoagulant knowledge among the urban population. The findings indicate both strengths and weaknesses in the level of knowledge, emphasizing the importance of targeted educational interventions to address the identified gaps. Significant knowledge gaps were discovered in this study among urban individuals using oral anticoagulants. Understanding oral anticoagulation was negatively correlated with advancing age. By improving anticoagulant knowledge, healthcare providers can enhance patient safety, adherence, and overall treatment outcomes. This evidence regarding oral anticoagulant medication may increase awareness of patient-related factors that may impact therapeutic outcomes. Future research could focus on evaluating the long-term impact of educational interventions and expanding the study to include a broader population for more robust conclusions.

Ethics

Ethics Committee Approval: This study was approved by the Institutional Review Board of JSS College of Pharmacy (approval number: JSSCP/IRB/10/2022-2023, dated: 11.02.2023).

Informed Consent: Not required.

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Footnotes

Authorship Contributions

Concept: B.V., P.S., Design: B.V., P.S., Data Collection or Processing: S.K., V.H.N., Analysis or Interpretation: S.K., V.H.N., B.V., Literature Search: S.K., V.H.N., B.V., P.S., Writing: S.K., V.H.N., B.V., P.S.

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