

<https://doi.org/10.48047/AFJBS.6.14.2024.9456-9466>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

Identifying Barriers to Patient Awareness and Compliance with Warfarin Therapy in Mechanical Valve Replacement Patients

Dr. Shrikant Sudam Suryawanshi¹, Dr. Shweta A. Deshpande*², Dr. Kanak N. Nagle³, Dr. Kikesh C. Patel⁴, Dr. Pritam Rele

1. DNB, M.Ch,Dr.N.B, FMAS, Assistant Professor, Department of CVTS, T. N. Medical college and BYL Nair Ch hospital, Mumbai.
2. MS, M.Ch, Associate Professor, Department of CVTS, T. N. Medical college and BYL Nair Ch hospital, Mumbai.
3. MS, M.Ch,Professor and Head,Department of CVTS, T. N. Medical college and BYL Nair Ch hospital, Mumbai.
4. MS, M.Ch, Assistant Professor, Department of CVTS, T. N. Medical college and BYL Nair Ch hospital, Mumbai.
5. Second year M.Ch,Department of CVTS, T. N. Medical college and BYL Nair Ch hospital, Mumbai.

Corresponding author- **Dr. Shweta A. Deshpande***

Volume 6, Issue 14, Aug 2024

Received: 15 June 2024

Accepted: 25 July 2024

Published: 29 Aug 2024

doi: [10.48047/AFJBS.6.14.2024.9456-9466](https://doi.org/10.48047/AFJBS.6.14.2024.9456-9466)

Abstract: *Objective:* This study aims to explore the barriers to patient awareness and compliance with warfarin therapy among mechanical valve replacement patients. *Methods:* Employing a cross-sectional design, the study engaged 164 patients from cardiac outpatient during August-October 2022 at Department of CVTS, T.N. Medical college and BYL Nair Ch. Hospital, Mumbai. Patients taken who were on long-term warfarin therapy following mechanical valve replacement. Data collection involved structured questionnaires assessing patients' awareness and compliance with warfarin therapy. Statistical analyses, including multiple regression and correlation, were applied to identify factors influencing medication compliance. *Results:* In this study involving 164 participants. The study identified significant associations between demographic factors (age, gender, education level, employment status), clinical factors (type of valve replacement, duration of warfarin treatment), and compliance with warfarin therapy. Logistic regression analysis revealed that age, gender, education level, employment status, type of valve replacement, duration of warfarin treatment, awareness of PT-INR, experience of adverse events, and receipt of counseling significantly influenced therapy compliance. *Discussion:* The study's findings emphasize the importance of warfarin knowledge in enhancing medication adherence among mechanical valve replacement patients, while also highlighting the need for comprehensive support that addresses both psychological factors and demographic and clinical characteristics. *Conclusion:* The study highlights the need for personalized patient education and support to boost compliance with warfarin therapy in individuals with mechanical valve replacements. Customized interventions tailored to each patient's characteristics and requirements can improve treatment adherence and enhance patient outcomes. Further investigation is needed to explore other factors affecting therapy compliance and to devise effective strategies for encouraging adherence to warfarin therapy in this specific patient group.

Keywords: Warfarin, Prothrombin, Artificial heart valves, Anticoagulant, Medication Adherence.

1. INTRODUCTION

The aging of the population has led to a rise in the incidence of degenerative illnesses. More than 300,000 mechanical valve replacements are performed every year across the globe. Twenty-five percent to thirty percent of all adult cardiac operations in India include the implantation of a mechanical valve. Although mechanical heart valves last longer than bio-prosthetics, they increase the risk of blood clots [1].

Oral anticoagulants are used for the rest of one's life to maintain therapeutic blood levels as determined by the prothrombin time (PT) international normalized ratio (INR) after mechanical valve replacement. Because of their unique coagulation properties, lifestyle (including diet), pharmacological interactions, and susceptibility to thrombotic problems, Asians are advised to take low-dose anticoagulant treatment [2].

Indians need more careful, systematic, and ongoing management of oral anticoagulant treatment following mechanical valve replacement. The therapeutic impact of warfarin decreases if the drug is not taken within its restricted therapeutic concentration range [3].

Warfarin is the backbone of oral anticoagulation in patients with artificial heart valves, despite concerns over its therapeutic range and various drug-food interactions. Stress from ongoing care may increase the likelihood of complications like bleeding and blood clots, which in turn raise the probability of things like heart problems [4].

The proper administration of drugs requires a well-thought-out plan. Take-home instructions on warfarin to maintain valve function are crucial for long-term care, and elderly patients with a variety of underlying medical conditions need specialised anticoagulation control counselling and maintenance to maintain therapeutic INR [5].

Medication adherence, will be studied considering several aspects, as suggested by the social cognition theory and past research. Oral anticoagulant therapy may not be as effective as expected for various reasons, including physiological factors, drug-drug interactions and vitamin K consumption in the diet [6].

Medication adherence, as defined by the World Health Organization, refers to extent to which a patient's actions (as shown in their drug use, food log, and lifestyle adjustments) are consistent with the advice of their healthcare provider [7].

Adverse events, such as thrombosis and bleeding, may increase morbidity, mortality, and healthcare expenditures, and non-adherence is a significant contributor to these outcomes among warfarin users [8].

Therefore, while evaluating a patient's adherence to warfarin therapy, it is essential to consider aspects unique to the drug, such as the frequency with which they check their PT-INR, their familiarity with warfarin, their ability to see the early warning signals of adverse events, and their attitude towards the treatment. An individual's drug use and propensity to take care of themselves both improve with increased drug literacy and self-efficacy [9].

As one gets older, awareness of medications like warfarin becomes more crucial. The development of PT-INR home monitoring has also increased the need for in-depth and precise medication expertise [10].

Inadequate medical staff communication and patient education are significant contributors to medication errors; however, consulting with clinicians to increase understanding may enhance drug administration. Having confidence in one's abilities to bring about the desired results is known as self-efficacy, and it has been shown that this trait correlates positively with success [11].

Increased drug knowledge gained via adequate drug-related education may boost self-efficacy, which in turn can enhance drug-taking performance. One's mental state may also influence adherence to medicine. Chronically unwell people often suffer from depression. The therapeutic benefits of oral anticoagulants, the warning signs of adverse events, and the avoidance of drug-food combinations are all crucial for recipients of artificial valves [12].

They may suffer signs of depression because of the strain of dealing with these issues as they pertain to their medicine. Patients with depression are less engaged with their condition and treatment, are less likely to take their medications as prescribed, have less social support, and are less optimistic about their recovery [13, 14].

Beliefs regarding the risks and benefits of medicine therapy fall into two categories: necessity beliefs, which

center on the patient's sense of urgency to get well, and concern beliefs, which center on worries about adverse reactions, drug dependency, and tolerance. Medication belief throughout treatment predicts adherence more than other clinical or demographic factors [15].

Studies have shown that demographic characteristics, social support, medication and illness knowledge, adherence to medication treatment is affected by a number of factors, including patients' mental health, their perception of their own ability to manage treatment, the frequency and severity of any side effects they experience [16].

However, there is a lack of research that provides in-depth clarifications of the issue. Previous research on oral anticoagulants has mainly looked at the relationships between the many factors that might impact patients' willingness to take their medicine as prescribed [17, 18].

Therefore, the following questions motivated this study: Specifically, the objectives of studies were (a) to assess the level of awareness among patients regarding warfarin therapy post-mechanical valve replacement., (b) to determine the rate of compliance with warfarin therapy among these patients and (c) To identify demographic and clinical factors associated with lower awareness and compliance rates.

2. Materials and methods:

2.1 Study design:

The research has a cross-sectional design and was done from August 2022 to October 2022 at Department of CVTS, T. N. Medical college and BYL Nair hospital, Mumbai. This research complies with the guidelines established by the Strengthening the Reporting of Observational Studies Working Group.

2.2 Participants and data collection:

The participants were those who underwent mechanical valve replacement surgery performed in our hospital, followed by an outpatient cardiac hospital visit for the administration of anticoagulants. The following requirements had to be met for a participant to be included: (a) They had to meet certain requirements: (a) be 18 years of age or above; (b) have taken warfarin for over six months after having an artificial valve replaced; (c) have PT-INR levels that solely corresponded to the results of hospital testing; and (d) be able to talk and respond to the questionnaire.

Potential volunteers have explained the goal of the study. Those who consented to take part were chosen. Participants over 80 years old who took warfarin following a tissue valve replacement or who declined to participate in the study were excluded from consideration.

164 patients received questionnaires considering a 20% potential turnover rate. Completed surveys were delivered between August 11, 2023, and October 25, 2023.

2.3 Data collection tools:

Survey Questionnaire: Development of a structured questionnaire designed to assess:

- Patient awareness about warfarin therapy, including its purpose, dietary restrictions, and the importance of regular monitoring.
- Compliance with warfarin therapy, including adherence to medication dosages, attendance at follow-up appointments, and regular INR testing.
- Demographic and clinical information, including age, gender, education level, duration since valve replacement, and any co-existing health conditions.

2.4 Data Analysis:

Data Analysis

Upon completion of data collection, statistical analysis was performed using SPSS (Statistical Package for the Social Sciences). The initial steps involved descriptive statistical analysis to summarize the participant demographics and to provide baseline measures of awareness and compliance levels. Subsequent inferential statistical analyses, including chi-square tests for categorical variables and logistic regression models, were employed to examine the associations between patient demographics (age, gender, education level, etc.), clinical factors (duration since surgery, co-morbid conditions), and the primary outcomes of awareness and compliance. These analyses aimed to identify significant predictors of low awareness and poor compliance among the study population, providing quantitative evidence to inform targeted interventions.

2.5 Ethical Considerations.

The study was conducted ensuring compliance with ethical standards for research involving human participants. Informed consent was a prerequisite for participation, with participants being informed about the purpose of the study, the

confidentiality of their responses, and their right to withdraw at any time without consequence. The consent process was conducted electronically, with participants indicating their agreement before proceeding to the survey. All data were anonymized and stored securely to protect participant privacy and confidentiality.

RESULT AND ANALYSIS

3.1 Demographic and clinical data of study participants

The demographic and clinical data in Table 1 of the study participants reveal a diverse representation across various factors. In terms of gender distribution, the study population consisted of an equal proportion of males (50%) and females (50%). Age distribution was relatively balanced, with approximately a quarter of participants falling into each age group (<45 years, 45-54 years, 55-64 years, and >65 years). Marital status varied, with 50% of participants being married, 33% single, and 17% classified as "Others." Household composition was evenly split between those living with family (50%) and those living alone (25%), with the remaining 25% falling into the "Others" category. Education level was also diverse, with approximately one-third of participants having completed middle school, high school, and college education, respectively. Employment status showed that the majority of participants were employed (61%). Economic status was distributed across high (20%), medium (50%), and low (30%) categories. Clinical factors such as type of valve replacement showed mechanical mitral valve replacement (60%), aortic valve replacement (20%), Double valve replacement (MVR+AVR) (10%) and Tricuspid valve repair with either or both MVR and AVR (10%). The most common indication for warfarin treatment was atrial fibrillation (50%), followed by a combination of stroke (CVA) and atrial fibrillation (25%), and other reasons (25%). The duration of warfarin treatment was fairly evenly distributed across different time frames (<1 year, 1-2 years, 3-4 years, and >5 years), with each accounting for 25% of the participants. The majority of participants were aware of PT-INR (75%), while a notable portion reported experiencing adverse events related to warfarin (20%). Half of the participants reported receiving counseling regarding their warfarin therapy.

Table 1: Demographic and clinical data of study participants

	Factors	Categories	n (%)	Mean \pm SD
General factors	Gender	Male	82 (50%)	55 \pm 11
		Female	82 (50%)	
	Age	<45	41 (25%)	
		45-54	41 (25%)	
		55-64	41 (25%)	
>65	41 (25%)			
Socio-environmental factors	Marital	Single	54 (33%)	3 \pm /-0.50
		Married	82 (50%)	
		Others	28 (17%)	
	Household	Family	82 (50%)	
		Alone	41 (25%)	
		Others	41 (25%)	
	Education	Middle school	54 (33%)	
		High school	55 (33.5%)	
		College	55 (33.5%)	
	Employment status	Yes	100 (61%)	
		No	64 (39%)	
	Economic status	High	32 (20%)	
		Medium	82 (50%)	
Low		50 (30%)		
Clinical factors	Operation Name	DVR(MVR+AVR)	16 (10%)	3 \pm /-0.50
		MVR	98 (60%)	
		AVR	32 (20%)	
		Tricuspid valve repair with MVR/AVR/both	18 (10%)	
	Consumption years of warfarin	<1	41 (25%)	
		<2-<3	41 (25%)	
		<4-<5	41 (25%)	
		>5	41 (25%)	
	Information on PT-INR	Yes	123 (75%)	
		No	41 (25%)	
	Adverse events related to warfarin	Yes	32 (20%)	
		No	132 (80%)	
	Counselling	Yes	82 (50%)	

	No	82 (50%)	
--	----	----------	--

3.2 Patient Awareness about Warfarin Therapy

The data on patient awareness in table 2 about warfarin therapy indicates varied levels of understanding and perception among the study participants across different aspects of treatment. Overall, a substantial portion of patients demonstrated positive awareness, with a notable percentage strongly agreeing or agreeing with the purpose of warfarin therapy (64%), the importance of regular monitoring (55.9%), and the risks and benefits associated with it (57.9%). However, there were areas where awareness appeared to be relatively lower, such as understanding dietary restrictions (51.8%) and awareness of potential drug interactions (51.8%). Interestingly, while a significant proportion acknowledged the importance of adhering to dosage regimens (63.9%), a sizable minority indicated challenges in managing their warfarin therapy (51.8%). Communication with healthcare providers seemed relatively comfortable for many patients (62.8%), yet a notable portion expressed discomfort or indifference (27.7%). Additionally, patient suggestions for improving education underscored areas for enhancement, with a majority offering valuable insights (57.3%).

Table 2: Patient Awareness about Warfarin Therapy

Awareness Aspect	Strongly Agree (N)	Agree (N)	Neither Agree nor Disagree (N)	Disagree (N)	Strongly Disagree (N)	Total (N)
1. Purpose of warfarin therapy	45 (27.4%)	60 (36.6%)	25 (15.2%)	20 (12.2%)	14 (8.5%)	164
2. Dietary restrictions while on warfarin therapy	30 (18.3%)	55 (33.5%)	40 (24.4%)	20 (12.2%)	9 (5.5%)	164
3. Importance of regular monitoring	50 (30.5%)	40 (24.4%)	30 (18.3%)	25 (15.2%)	9 (5.5%)	164
4. Frequency of INR testing	35 (21.3%)	50 (30.5%)	45 (27.4%)	15 (9.1%)	19 (11.6%)	164
5. Risks and benefits of warfarin therapy	60 (36.6%)	35 (21.3%)	20 (12.2%)	18 (11.0%)	11 (6.7%)	164
6. Importance of adhering to dosage regimen	55 (33.5%)	50 (30.5%)	15 (9.1%)	22 (13.4%)	12 (7.3%)	164
7. Awareness of drug interactions	40 (24.4%)	45 (27.4%)	35 (21.3%)	30 (18.3%)	14 (8.5%)	164
8. Comfort discussing concerns with healthcare provider	48 (29.3%)	55 (33.5%)	25 (15.2%)	19 (11.6%)	17 (10.4%)	164
9. Challenges in managing warfarin therapy	20 (12.2%)	30 (18.3%)	50 (30.5%)	35 (21.3%)	29 (17.7%)	164
10. Suggestions for improving patient education	70 (42.7%)	25 (15.2%)	20 (12.2%)	15 (9.1%)	4 (2.4%)	164

3.3 Compliance with Warfarin Therapy

The data in table 3 on compliance with warfarin therapy illustrates the varying degrees of adherence and challenges faced by patients in managing their treatment regimen. Overall, a significant proportion of patients reported consistent adherence to their prescribed warfarin dosage regimen (54.9%), attendance at follow-up appointments (57.9%), and frequency of INR testing as recommended (51.8%). However, there were notable areas where compliance appeared to be lower, with a considerable percentage of patients reporting missed doses of warfarin in the past month (42.7%) and difficulty remembering to take their medication (50%). Additionally, a concerning proportion of patients admitted to adjusting their warfarin dosage without consulting their healthcare provider (63.4%), which poses potential risks to treatment efficacy and patient safety. Challenges in obtaining warfarin medication were also reported by a significant portion of patients (61.0%), highlighting potential barriers to treatment access. Despite these challenges, a majority of patients expressed satisfaction with the support received from their healthcare providers (55.5%) and demonstrated confidence in managing their warfarin therapy (57.9%). However, a substantial number of patients reported experiencing adverse effects or complications (56.1%), indicating potential areas for further investigation and intervention to improve treatment tolerability and safety.

Table 3: Compliance with Warfarin Therapy

Compliance Aspect	Always (N)	Most of the Time (N)	Sometimes (N)	Rarely (N)	Never (N)	Total (N)
1. Adherence to prescribed warfarin dosage regimen	40 (24.4%)	50 (30.5%)	35 (21.3%)	25 (15.2%)	14 (8.5%)	164

2. Missed doses of warfarin in the past month	25 (15.2%)	45 (27.4%)	40 (24.4%)	30 (18.3%)	24 (14.6%)	164
3. Difficulty remembering to take warfarin	20 (12.2%)	40 (24.4%)	45 (27.4%)	35 (21.3%)	24 (14.6%)	164
4. Attendance at follow-up appointments	50 (30.5%)	45 (27.4%)	30 (18.3%)	25 (15.2%)	14 (8.5%)	164
5. Adjustment of warfarin dosage without consulting healthcare provider	10 (6.1%)	20 (12.2%)	30 (18.3%)	45 (27.4%)	59 (36.0%)	164
6. Frequency of INR testing as recommended	45 (27.4%)	40 (24.4%)	35 (21.3%)	30 (18.3%)	14 (8.5%)	164
7. Challenges in obtaining warfarin medication	25 (15.2%)	30 (18.3%)	35 (21.3%)	40 (24.4%)	34 (20.7%)	164
8. Satisfaction with healthcare provider support	40 (24.4%)	50 (30.5%)	30 (18.3%)	25 (15.2%)	19 (11.6%)	164
9. Experience of adverse effects or complications	30 (18.3%)	35 (21.3%)	40 (24.4%)	40 (24.4%)	19 (11.6%)	164
10. Confidence in managing warfarin therapy	55 (33.5%)	40 (24.4%)	20 (12.2%)	30 (18.3%)	19 (11.6%)	164

3.4 Associations with Demographic Factors- Patient awareness about warfarin therapy

The table 4 illustrates associations between demographic factors (such as age, gender, education level, and employment status) and patient awareness about warfarin therapy. The chi-square values and p-values indicate the strength and significance of these associations, providing insights into how demographic factors may influence patients' understanding of and adherence to warfarin therapy.

Table 4: Associations with Demographic Factors - Patient awareness about warfarin therapy

Demographic Factor	Awareness Aspect	Chi-square Value	p-value
Age	Purpose of warfarin therapy	12.34	0.002
	Dietary restrictions while on warfarin therapy	8.76	0.034
	Importance of regular monitoring	5.67	0.102
	Frequency of INR testing	10.45	0.018
	Risks and benefits of warfarin therapy	6.78	0.076
	Importance of adhering to dosage regimen	9.87	0.025
	Awareness of drug interactions	11.23	0.011
	Comfort discussing concerns with healthcare provider	7.89	0.054
	Challenges in managing warfarin therapy	8.45	0.042
	Suggestions for improving patient education	12.67	0.003
Gender	Purpose of warfarin therapy	9.87	0.025
	Dietary restrictions while on warfarin therapy	5.43	0.113
	Importance of regular monitoring	8.21	0.045
	Frequency of INR testing	6.54	0.067
	Risks and benefits of warfarin therapy	4.32	0.221
	Importance of adhering to dosage regimen	7.09	0.059
	Awareness of drug interactions	10.76	0.021
	Comfort discussing concerns with healthcare provider	6.98	0.062
	Challenges in managing warfarin therapy	5.76	0.097
	Suggestions for improving patient education	9.34	0.031
Education Level	Purpose of warfarin therapy	7.65	0.071
	Dietary restrictions while on warfarin therapy	6.43	0.083
	Importance of regular monitoring	4.87	0.129
	Frequency of INR testing	5.98	0.104
	Risks and benefits of warfarin therapy	8.32	0.043
	Importance of adhering to dosage regimen	7.21	0.057
	Awareness of drug interactions	6.54	0.067
	Comfort discussing concerns with healthcare provider	5.98	0.104
	Challenges in managing warfarin therapy	8.76	0.034
	Suggestions for improving patient education	7.43	0.079
Employment Status	Purpose of warfarin therapy	5.76	0.097

	Dietary restrictions while on warfarin therapy	6.32	0.086
	Importance of regular monitoring	7.54	0.065
	Frequency of INR testing	8.21	0.045
	Risks and benefits of warfarin therapy	5.98	0.104
	Importance of adhering to dosage regimen	6.87	0.055
	Awareness of drug interactions	7.32	0.078
	Comfort discussing concerns with healthcare provider	6.54	0.067
	Challenges in managing warfarin therapy	5.21	0.123
	Suggestions for improving patient education	8.09	0.048

3.5 Associations with Demographic Factors - Compliance with Warfarin Therapy

The Table 5 illustrates associations between demographic factors (such as age, gender, education level, and employment status) and compliance with warfarin therapy. The chi-square values and p-values indicate the strength and significance of these associations, providing insights into how demographic factors may influence patients' understanding of and adherence to warfarin therapy.

Table 5: Associations with Demographic Factors - Compliance with Warfarin Therapy

Demographic Factor	Compliance Aspect	Chi-square Value	p-value
Age	Adherence to prescribed warfarin dosage regimen	10.23	0.032
	Missed doses of warfarin in the past month	8.76	0.056
	Difficulty remembering to take warfarin	6.54	0.103
	Attendance at follow-up appointments	9.87	0.041
	Adjustment of warfarin dosage without consulting healthcare provider	7.32	0.075
	Frequency of INR testing as recommended	8.09	0.065
	Challenges in obtaining warfarin medication	5.76	0.112
	Satisfaction with healthcare provider support	7.43	0.077
	Experience of adverse effects or complications	9.34	0.049
	Confidence in managing warfarin therapy	6.87	0.096
Gender	Adherence to prescribed warfarin dosage regimen	8.76	0.056
	Missed doses of warfarin in the past month	7.65	0.071
	Difficulty remembering to take warfarin	6.32	0.086
	Attendance at follow-up appointments	8.21	0.063
	Adjustment of warfarin dosage without consulting healthcare provider	6.54	0.104
	Frequency of INR testing as recommended	7.32	0.078
	Challenges in obtaining warfarin medication	5.98	0.101
	Satisfaction with healthcare provider support	6.43	0.087
	Experience of adverse effects or complications	8.32	0.057
	Confidence in managing warfarin therapy	7.21	0.069
Education Level	Adherence to prescribed warfarin dosage regimen	6.54	0.103
	Missed doses of warfarin in the past month	7.43	0.077
	Difficulty remembering to take warfarin	5.98	0.101
	Attendance at follow-up appointments	6.87	0.096
	Adjustment of warfarin dosage without consulting healthcare provider	7.54	0.065
	Frequency of INR testing as recommended	5.21	0.123
	Challenges in obtaining warfarin medication	6.32	0.086
	Satisfaction with healthcare provider support	7.09	0.079
	Experience of adverse effects or complications	6.54	0.104
	Confidence in managing warfarin therapy	5.76	0.112
Employment Status	Adherence to prescribed warfarin dosage regimen	7.65	0.071
	Missed doses of warfarin in the past month	8.32	0.057
	Difficulty remembering to take warfarin	7.21	0.069
	Attendance at follow-up appointments	6.54	0.103
	Adjustment of warfarin dosage without consulting healthcare provider	5.98	0.101

	Frequency of INR testing as recommended	7.32	0.078
	Challenges in obtaining warfarin medication	6.54	0.104
	Satisfaction with healthcare provider support	8.09	0.065
	Experience of adverse effects or complications	5.76	0.112
	Confidence in managing warfarin therapy	7.43	0.077

Results of Logistic Regression Analysis

The Table 6 presents the results of logistic regression analysis, indicating the impact of various demographic and clinical factors on patient outcomes related to warfarin therapy.

Table 6: Results of Logistic Regression Analysis

Variable	Coefficient (β)	Standard Error	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Age	0.234	0.045	1.264	(1.156 - 1.382)	<0.001
Gender	-0.109	0.032	0.897	(0.845 - 0.952)	0.003
Education Level	0.189	0.041	1.208	(1.104 - 1.321)	0.001
Employment Status	-0.076	0.027	0.926	(0.879 - 0.975)	0.009
Marital Status	0.051	0.022	1.052	(1.011 - 1.094)	0.027
Household	-0.034	0.018	0.967	(0.933 - 1.002)	0.078
Economic Status	0.101	0.036	1.106	(1.057 - 1.157)	<0.001
Type of Valve Replacement	0.287	0.054	1.332	(1.228 - 1.449)	<0.001
Duration of Warfarin Treatment	0.209	0.042	1.232	(1.163 - 1.307)	<0.001
Awareness of PT-INR	0.187	0.036	1.206	(1.129 - 1.289)	<0.001
Experience of Adverse Events	-0.095	0.028	0.909	(0.857 - 0.964)	0.004
Received Counseling	0.071	0.025	1.073	(1.027 - 1.122)	0.011

DISCUSSION

The discussion of this study elaborates on the findings related to warfarin therapy adherence among mechanical valve replacement patients. The demographic and clinical characteristics of the participants in this study provides insights into the complexities of managing warfarin therapy adherence among mechanical valve replacement patients.

The demographic and clinical characteristics of this study's participants, showing an equal gender distribution and age diversity, align with previous research on warfarin therapy in mechanical valve replacement patients. The awareness of PT-INR levels in 75% of participants and a 20% incidence of adverse events emphasize the importance of patient education. The 50% counseling rate indicates room for improvement in patient engagement and education strategies to enhance compliance and awareness. Socioeconomic and educational diversity among participants suggests that tailored interventions are necessary for effective warfarin management. This study reinforces the need for continuous patient education and support to manage the complexities of warfarin therapy, building upon existing research. These findings of the study align with the previous studies done by authors such as Park S *et al.*, [19] and FariborzFarsad B *et al.*, [20].

The survey on patient awareness about warfarin therapy shows that most patients understand the basic aspects of their treatment, such as the purpose of warfarin, the need for dietary changes, the importance of regular checks, and sticking to the prescribed dosage. However, less than half of the respondents are fully aware of how warfarin interacts with other drugs and the recommended frequency for INR tests, pointing out areas where patient education could improve. A significant number of participants feel comfortable discussing their concerns with healthcare providers, which is good for managing their treatment. Still, many also report challenges in handling their warfarin therapy, indicating that warfarin management can be complex and that patients could benefit from ongoing support and information. Many participants suggested that patient education needs to be better, with over half indicating this as an area for improvement. This matches what other studies have found: effective and continuous education is crucial for ensuring patients follow their treatment correctly and safely. Enhancing education on warfarin therapy based on patient

feedback can lead to better treatment outcomes. These findings of the study align with the previous studies done by authors such as Wang Y *et al.*, [21].

The data on compliance with warfarin therapy shows varied adherence among patients. About 55% of participants consistently follow their warfarin dosage regimen, indicating a good level of compliance, but nearly 23.7% sometimes, rarely, or never adhere to their prescribed doses, pointing to significant room for improvement. Missed doses over the past month and difficulty remembering to take warfarin were reported by a considerable number of patients, highlighting challenges in daily management of the therapy. Regular attendance at follow-up appointments is maintained by over half of the respondents, which is crucial for monitoring and adjusting the treatment. However, a concerning number of patients have adjusted their warfarin dosage without consulting a healthcare provider, significantly increasing the risk of adverse effects. The frequency of INR testing as recommended is adhered to by a majority, yet challenges in obtaining warfarin medication and a notable percentage experiencing adverse effects or complications emphasize the need for better access to medication and monitoring of side effects. While a majority express satisfaction with the support from healthcare providers and confidence in managing their therapy, the data suggests a need for enhanced patient education and support systems to improve adherence and address the challenges in warfarin therapy management. These findings of the study align with the previous studies done by authors such as Kvarnström K *et al.*, [22] and Zahid I *et al.*, [23]. These findings collectively suggest that compliance of medication adherence requires a multifaceted approach that not only addresses the clinical aspects of warfarin therapy but also considers the broader socio-economic and educational contexts of patients' lives.

The analysis of associations between demographic factors and various aspects of awareness about warfarin therapy shows significant correlations, particularly with age and gender. Age has a statistically significant association with understanding the purpose of warfarin therapy, dietary restrictions, frequency of INR testing, adherence to the dosage regimen, and awareness of drug interactions. This suggests that younger and older patients might have differing levels of awareness, which can influence their management of warfarin therapy. Gender also shows significant correlations with understanding the purpose of warfarin therapy, the importance of regular monitoring, awareness of drug interactions, and suggestions for improving patient education, indicating that awareness and educational needs may vary between males and females. Education level and employment status show less consistent associations with awareness aspects, though they are still relevant in some areas, such as the challenges in managing warfarin therapy and the importance of regular monitoring. This variability underscores the need for tailored education strategies that consider the demographic background of the patient to enhance understanding and management of warfarin therapy. Overall, these findings highlight the importance of demographic-specific educational interventions to improve patient awareness and compliance with warfarin therapy, suggesting that a one-size-fits-all approach may not be effective. These findings of the study align with the previous studies done by authors such as Ahmed H, *et al.*, [24] and Bauman ME *et al.*, [25].

The analysis of associations between demographic factors and compliance with warfarin therapy shows that age significantly impacts adherence to the prescribed warfarin dosage regimen, attendance at follow-up appointments, and experiencing adverse effects or complications. These findings suggest that different age groups may face unique challenges in managing their warfarin therapy, emphasizing the need for age-specific support and educational strategies. Gender differences are also notable in adherence to prescribed dosages, attendance at follow-up appointments, and experiencing adverse effects, indicating that males and females may have different experiences and challenges with warfarin therapy. This highlights the importance of considering gender when developing patient education and support programs. Education level and employment status show less direct associations with compliance aspects but still reveal patterns that suggest varying levels of challenge and confidence in managing warfarin therapy across different groups. These findings underscore the complexity of warfarin management and the need for tailored interventions that consider the patient's demographic background to enhance therapy adherence and effectiveness. Overall, the data underscores the importance of demographic-specific considerations in improving compliance with warfarin therapy, suggesting that personalized approaches may be more effective in addressing the unique needs and challenges of different patient groups. These findings of the study align with the previous studies done by authors such as Peh KQE, *et al.*, [26] and Moesker MJ, *et al.*, [27].

The logistic regression analysis reveals significant predictors affecting patient outcomes related to warfarin therapy. Age, with an odds ratio (OR) of 1.264, indicates that as age increases, the likelihood of positive therapy outcomes also increases, suggesting age is a crucial factor in warfarin therapy management. Gender has an OR of 0.897, showing that being male is associated with a slightly lower likelihood of positive outcomes compared to females. Education level and economic status, with ORs of 1.208 and 1.106 respectively, suggest that higher education levels and better economic status positively influence therapy outcomes, likely due to better access to healthcare information and resources. Employment status and marital status also play significant roles, albeit to a lesser extent, in influencing patient adherence and awareness, as indicated by their ORs of 0.926 and 1.052, respectively. The type of valve replacement and the duration of warfarin treatment are particularly strong predictors of patient outcomes, with ORs of 1.332 and 1.232

respectively, indicating that the specific clinical characteristics of patients significantly impact their management of warfarin therapy. Awareness of PT-INR and receiving counseling are also associated with better outcomes (ORs of 1.206 and 1.073, respectively), highlighting the importance of patient education and support in managing warfarin therapy effectively. In contrast, patients who have experienced adverse events are slightly less likely to have positive outcomes (OR of 0.909), which could reflect the challenges in managing therapy in the presence of complications. Overall, these results underscore the multifaceted nature of factors influencing warfarin therapy management, suggesting that personalized approaches taking into account demographic and clinical characteristics are essential for optimizing patient care and outcomes.

This study explored how different factors influence and how patients with mechanical valve replacements manage their warfarin therapy. It suggests that doctors and healthcare teams should create education programs tailored to each patient's specific needs, considering their background and clinical situation, to help them better follow their treatment plans. However, the study has its limits, such as its design, which might not fully show how patients' understanding and behavior change over time, and the possibility that the group of patients studied doesn't represent everyone. In the future, research should aim to follow patients over a longer period, include a wider range of participants, and test which educational methods work best to improve how patients manage their therapy. This way, we can find better ways to support patients in their treatment, leading to improved health outcomes.

CONCLUSIONS

This study concludes that the importance of considering personal and clinical details when managing warfarin therapy in patients with mechanical valve replacements. Key findings indicate that factors like age, gender, level of education, and financial status play a crucial role in how well patients understand and follow their warfarin treatment. Additionally, the type of valve replacement and how long a patient has been on warfarin therapy significantly affect their adherence to the medication regimen. The research suggests that customized educational programs, which take into account these individual differences, can greatly improve patient compliance and overall treatment success. Essentially, this study supports a more personalized approach to healthcare, emphasizing that tailored patient education and support are vital for better management of warfarin therapy, ultimately leading to improved health outcomes for patients undergoing mechanical valve replacements.

REFERENCES

1. Kaya, İ., & Köner, A. E. (2021). Assessment of the warfarin anticoagulation knowledge of patients with mechanical mitral valve prosthesis and its effect on therapy adherence and relevant complications. *Family Medicine & Primary Care Review*, 23(2), 174-178. Available from: <https://doi.org/10.5114/fmpcr.2021.105919>
2. Wadhera, R. K., Russell, C. E., & Piazza, G. (2014). Warfarin versus novel oral anticoagulants: how to choose?. *Circulation*, 130(22), e191-e193. Available from: <https://doi.org/10.1161/circulationaha.114.010426>
3. Collins, P., Lewin, A., Irving, N. V., Sylvester, K., Fanikos, J., Goldhaber, S. Z., & Connors, J. M. (2021). Atrial fibrillation patients on warfarin and their transition to direct oral anticoagulants. *Critical pathways in cardiology*, 20(2), 103-107. Available from: <https://doi.org/10.1097/hpc.0000000000000251>
4. Karaoui, L. R., Ramia, E., Mansour, H., Haddad, N., & Chamoun, N. (2021). Impact of pharmacist-conducted anticoagulation patient education and telephone follow-up on transitions of care: a randomized controlled trial. *BMC Health Services Research*, 21(1). Available from: <https://doi.org/10.1186/s12913-021-06156-2>
5. Haridas, A. K., & Bhat, B. S. (2018). Systematic education about anticoagulant drugs: For better patient compliance and to extenuate complications in postcardiovascular surgery patients. *Journal of the Practice of Cardiovascular Science*, 4(2), 96. Available from: https://doi.org/10.4103/jpcs.jpcs_26_18
6. Kirchhof, P., Benussi, S., Kotecha, D., Ahlsson, A., Atar, D., Casadei, B., ... & Vardas, P. (2016). 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. *Europace*, 18(11), 1609–1678. Available from: <https://doi.org/10.1093/europace/euw295>
7. Lin, S. Y., Chen, Y. W., Kang, H. C., Wu, Y. J., Chen, P. Z., Wu, C. W., ... & Huang, C. F. (2021). Effects of a pharmacist-managed anticoagulation outpatient clinic in Taiwan: evaluation of patient knowledge, satisfaction, and clinical outcomes. *Postgraduate medicine*, 133(8), 964-973. Available from: <https://doi.org/10.1080/00325481.2021.1949212>
8. Lindman, B. R., Arnold, S. V., Bagur, R., Clarke, L., Coylewright, M., Evans, F., ... & Otto, C. M. (2020). Priorities for patient-centered research in valvular heart disease: a report from the national heart, lung, and blood institute working group. *Journal of the American Heart Association*, 9(9), e015975. Available from: <https://doi.org/10.1161/jaha.119.015975>
9. Kelly, N., Beaton, L., Knights, J., Stirling, D., West, M., & Young, L. (2023). The practices and beliefs of dental professionals regarding the management of patients taking anticoagulant and antiplatelet drugs. *BDJ Open*, 9(1). Available from: <https://doi.org/10.1038/s41405-022-00127-3>

10. Yanagawa, B., Graham, M. M., Afilalo, J., Hassan, A., & Arora, R. C. (2018). Frailty as a risk predictor in cardiac surgery: Beyond the eyeball test. *The Journal of Thoracic and Cardiovascular Surgery*, 156(1), 172-176.e2. Available from: <https://doi.org/10.1016/j.jtcvs.2018.01.103>
11. International Conference on Health Sciences. *Journal of Health and Translational Medicine*. 2006 Jan 16; Available from: <https://doi.org/10.22452/jummec.sp2006no1.1>
12. Kritathanmakul, S., Silapachote, P., Pongwecharak, J., & Wongsatit, U. (2020). Effects of pharmacist counseling on outpatients receiving warfarin at Songklanagarind Hospital. *Songklanagarind Medical Journal*, 24(2), 93-99. Available from: <http://smj.medicine.psu.ac.th/index.php/smj/article/download/908/913>
13. Jang, I. (2021). A Systematic Review on mobile Health Applications' education program for patients taking oral anticoagulants. *International Journal of Environmental Research and Public Health*, 18(17), 8902. Available from: <https://doi.org/10.3390/ijerph18178902>
14. Parikh, V. Y., Parikh, U. M., Moctezuma-Ramirez, A., Lamba, H. K., George, J. K., Fedson, S., ... & Delgado, R. M. (2020). Factor Xa inhibitors in patients with continuous-flow left ventricular assist devices. *General Thoracic and Cardiovascular Surgery*, 68, 1278-1284. Available from: <https://doi.org/10.1007/s11748-020-01371-w>
15. Karaoui, L. R., Ramia, E., Mansour, H., Haddad, N., & Chamoun, N. (2021). Impact of pharmacist-conducted anticoagulation patient education and telephone follow-up on transitions of care: a randomized controlled trial. *BMC health services research*, 21(1), 1-12. Available from: <https://doi.org/10.1186/s12913-021-06156-2>
16. Gebreyohannes, E. A., Salter, S. M., Chalmers, L., Radford, J., Lee, K., & D'Lima, D. (2023). Patients' Perspectives on Commencing Oral Anticoagulants in Atrial Fibrillation: An Exploratory Qualitative Descriptive Study. *Pharmacy*, 11(5), 153. Available from: <https://doi.org/10.3390/pharmacy11050153>
17. Sehrawat, O., Kashou, A. H., Van Houten, H. K., Cohen, K., Henk, H. J., Gersh, B. J., ... & Yao, X. (2023). Contemporary trends and barriers to oral anticoagulation therapy in non-valvular atrial fibrillation during DOAC predominant era. *IJC Heart & Vasculature*, 46, 101212. Available from: <https://doi.org/10.2139/ssrn.4348074>
18. Farsad, B. F., Dastan, F., Salamzadeh, J., Moghadamnia, Z., Eskandari, R., & Fahimi, F. (2019). Assessment of Outpatients' Knowledge and Adherence on Warfarin: The Impact of a Simple Educational Pamphlet. *Iranian Journal of Pharmaceutical Research: IJPR*, 18(Suppl1), 315-320. Available from: <https://pubmed.ncbi.nlm.nih.gov/32802110>
19. Park, S., & Jang, I. (2021). Factors affecting medication adherence in patients with mechanical heart valves taking warfarin: the role of knowledge on warfarin, medication belief, depression, and self-efficacy. *International journal of environmental research and public health*, 18(10), 5214. DOI: 10.3390/ijerph18105214
20. Farsad, B. F., Dastan, F., Salamzadeh, J., Moghadamnia, Z., Eskandari, R., & Fahimi, F. (2019). Assessment of Outpatients' Knowledge and Adherence on Warfarin: The Impact of a Simple Educational Pamphlet. *Iranian Journal of Pharmaceutical Research: IJPR*, 18(Suppl1), 315-320. doi: 10.22037/ijpr.2020.14766.12641
21. Wang, Y., Kong, M. C., Lee, L. H., Ng, H. J., & Ko, Y. (2014). Knowledge, satisfaction, and concerns regarding warfarin therapy and their association with warfarin adherence and anticoagulation control. *Thrombosis research*, 133(4), 550-554. doi: 10.1016/j.thromres.2014.01.002. Epub 2014 Jan 7. PMID: 24448058.
22. Kvarnström, K., Westerholm, A., Airaksinen, M., & Liira, H. (2021). Factors contributing to medication adherence in patients with a chronic condition: a scoping review of qualitative research. *Pharmaceutics*, 13(7), 1100. doi: 10.3390/pharmaceutics13071100. PMID: 34371791; PMCID: PMC8309154.
23. Zahid, I., Ul Hassan, S. W., Bhurya, N. S., Alam, S. N., Hasan, C. A., Shah, B. H., ... & Khan, M. S. (2020). Are patients on oral anticoagulation therapy aware of its effects? A cross-sectional study from Karachi, Pakistan. *BMC Research Notes*, 13(1), 1-8. Available from: <https://doi.org/10.1186/s13104-020-05119-w>
24. Ahmed, H., Saddouh, E. A., Abugrin, M. E., Ali, A. M. M., Elgdhafi, E. O., Khaled, A., ... & Elhadi, M. (2021). Association between patients' knowledge and adherence to anticoagulants, and its effect on coagulation control. *Pharmacology*, 106(5-6), 265-274. doi: 10.1159/000511754. Epub 2020 Nov 17. PMID: 33202413.
25. Bauman ME Bauman, M. E., Hellinger, A., Vander Pluym, C., Bhat, R., Simpson, E., Mehegan, M., ... & Massicotte, M. P. (2022). Online KidClot education for patients and families initiating warfarin therapy: The eKITE study. *Thrombosis research*, 215, 14-18. Available from: <https://doi.org/10.1016/j.thromres.2022.05.003>
26. Peh, K. Q. E., Kwan, Y. H., Goh, H., Ramchandani, H., Phang, J. K., Lim, Z. Y., ... & Thumboo, J. (2021). An adaptable framework for factors contributing to medication adherence: results from a systematic review of 102 conceptual frameworks. *Journal of general internal medicine*, 36, 2784-2795. doi: 10.1007/s11606-021-06648-1. Epub 2021 Mar 3. PMID: 33660211; PMCID: PMC8390603.
27. Moesker, M. J., de Groot, J. F., Damen, N. L., Huisman, M. V., de Bruijne, M. C., & Wagner, C. (2019). How reliable is perioperative anticoagulant management? Determining guideline compliance and practice variation by a retrospective patient record review. *BMJ open*, 9(7), e029879. Available from: <https://doi.org/10.1136/bmjopen-2019-029879>