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Knowledge about warfarin treatment in patients with atrial fibrillation or mechanical prosthetic valves

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The authors declare no conflict of interest.

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ABSTRACT

Objective. To determine the degree of knowledge about warfarin treatment in patients with atrial fibrillation or with mechanical prosthetic valves. **Materials and methods.** Descriptive, observational, cross-sectional study. The Oral anticoagulation Knowledge (OAK) test was applied to all adult patients with a diagnosis of atrial fibrillation or with mechanical prosthetic valves treated with warfarin, who attended the hematology consultation from May 17 to November 10, 2022, at the "Instituto Nacional Cardiovascular Carlos Alberto Peschiera Carrillo". **Results.** A total of 150 patients were included, 64% were male, with an average age of 60.3 ± 15 years, 45.3% had a diagnosis of atrial fibrillation and 54.7% had mechanical prosthetic valves. The mean OAK test score was 44.4% (8.4/19), only 6% (n=9) achieved a satisfactory score ≥75%, the percentage of correct answers according to dimensions was: 68 % in forms of use, 39.3% in interactions and complications and 41.1% in INR control. A 40.7% did not understand the meaning of the term INR and 81.3% did not know their optimal values. **Conclusions.** The patient's degree of knowledge about warfarin treatment was inadequate; both in its use, interactions and complications. Considering that it is a difficult drug to use, due to its narrow therapeutic window and its multiple interactions, inadequate knowledge of its use may contribute to inappropriate anticoagulation.

Keywords: Knowledge; Atrial Fibrillation; Cardiac Valve Prostheses; Warfarin; Anticoagulation (source: MeSH-NLM).

Introduction

In cardiology, one of the fundamental pillars for primary and secondary prevention of ischemic stroke is oral anticoagulant therapy, mainly used in patients with atrial fibrillation (AF) and in patients with mechanical heart valves [1,2]. AF affects millions of people worldwide, and increases the risk of cerebrovascular events, heart failure and even death. It is an important public health problem and, together with population aging, shows an upward trend in prevalence and hospitalizations [3,4]. On the other hand, one of the most common procedures in cardiovascular surgery is the valve prostheses implantation [5], so that every year about 280 000 valve replacements are performed worldwide between biological and mechanical prostheses [6]. The latter require permanent anticoagulation, which increases the risk of bleeding and thromboembolic complications [7].

According to cardioembolic and hemorrhagic risk stratification, a large number of patients with AF, and all those with mechanical heart valves, need to be anticoagulated with warfarin [8,9]. In Peru, warfarin is the most widely used drug for these purposes, and it is the only drug of its type included in the national essential drug formulary [10]. This drug is an antagonist of vitamin K and indirectly interrupts the anticoagulation cascade [11]; however, it is considered a complex drug to use, since patients may present variable responses and multiple interactions with drugs and food, which increases the risk of hemorrhagic complications. In addition, it has a narrow therapeutic window and it is necessary to control the prothrombin time through the International Normalized Ratio (INR) formula for its titration [12,13].

Thus, the anticoagulated patient or his primary caregiver, can play a crucial role in achieving optimal anticoagulation and preventing complications through proper knowledge of warfarin therapy, home care, nutrition, drug interactions, INR control therapeutic range, and the importance of educational interventions by the nursing staff [14,15].

Some studies highlights that patients´ knowledge about warfarin treatment are usually deficient, especially in those who did not receive previous educational interventions [16-19]. The percentage of correct answers in one of these studies was only 36%, with greater errors in questions related to knowledge about drug interactions (83%), interactions with herbs or vitamins (93%) and diet (77%) [16]. In another study, 94.1% also had inadequate knowledge about warfarin, 79.4% did not know the action of this drug, as well as interactions with food (76.4%), alcohol (44.1%) and nonsteroidal anti-inflammatory drugs (44.1%) [18].

Given this situation and the lack of local data, the objective of the present study is to determine the degree of knowledge about warfarin treatment in patients with atrial fibrillation or carriers of mechanical valve prosthesis in order to identify their educational, control, and follow-up needs.

Materials and Methods

Design and place of study

A descriptive, observational, cross-sectional study was carried out at the "Instituto Nacional Cardiovascular Carlos Alberto Peschiera Carrillo" in Lima, Peru.

Study population

Study participants were selected by convenience from patients attending the hematology consultation from May 17 to November 10, 2022, without applying any type of sampling. All patients attending during the study period were invited to participate. Patients over 18 years of age on warfarin treatment, with a medical diagnosis of atrial fibrillation or mechanical prosthetic valves, who had previously received at least one hematology consultation and who could read and write or their caregivers, were included. Patients who refused to take part in the study were excluded.

Variables and measurement

The information was collected through the application of a questionnaire (see supplementary material), which was made up of two parts:

First section: three questions on sociodemographic data (age, sex and educational level) and three questions on general information of their treatment were included: 1. Time on warfarin (open question); 2. Reason for receiving warfarin (multiple choice question with single answer); 3. Do you know your optimal INR values (mixed question); if the answer was yes, the values were asked to be indicated and evaluated according to their therapeutic range.

Second section: included the application of The *Oral anticoagulation Knowledge* (OAK) test [20], where three dimensions were evaluated: 1. Knowledge about warfarin use; 2. Interactions and complications, and 3. INR control. This test has been validated and adapted to several languages, including Spanish [20-23]. The internal consistency of the instrument was calculated using the Kuder-Richardson formula 20 = 0.76; reliability was evaluated according to Pearson's correlation coefficient = 0,81 [20]. The test consists of twenty closed and

polytomous questions with only one correct answer; however, for this study, one question related to the characteristics of the drug according to dosage was excluded because our institution has only one presentation. Likewise, the option "I do not know" was included, since there is a possibility that they do not know the information requested and guesswork is minimized. As used in previous studies, satisfactory knowledge was considered if a score ≥75% was achieved [23,24], with score ≥14/19, considering the 0 to 19 scoring scale (0 = incorrect answer, 1 = correct answer), and a score < 75% was considered inadequate knowledge.

Procedure

The information was collected in the outpatient hematology clinic. After a face-to-face interview, the questionnaires were self-administered for 25 minutes and, at the end, informative leaflets on the subject were handed out. All this process was carried out by the four researchers. Subsequently, the information was entered and corroborated by two of them.

Data analysis

The information was recorded in an Excel® database, grouped and coded according to the type of question; in addition, the statistical software IBM® SPSS Statistics version 26 was used. The results of the correct and incorrect answers were grouped according to the three dimensions previously mentioned. Absolute frequency distributions and percentages, measures of central tendency and dispersion were used according to the variables.

Ethical considerations

The study was approved by the ethics committee of the "Instituto Nacional Cardiovascular Carlos Alberto Peschiera Carrillo" of the Social Security of Peru, by certificate of approval 18/2021-CEI dated May 21, 2021. All patients and/or their caregivers signed an informed consent form. The confidentiality and anonymity of the data were maintained and the information was stored with codes.

Results

One hundred and fifty patients were included, most were male (64%) with a mean age of 60.3 ± 15 years. A 45.3% had a medical diagnosis of atrial fibrillation and 54.7% had mechanical prosthetic valves. Regarding the time they had been on warfarin treatment: 65% had less than 1 year, and of these 36% had 1 to 2 months.

A 70.7% of patients surveyed, knew the reason for receiving warfarin treatment (their answers were corroborated with medical records), but 81.3% were unaware of the optimal INR values **(Table 1).**

The percentages of patients who answered the OAK test correctly according to dimensions were: 68% in forms of use; 39.3% in interactions and complications and 41.2% in INR control. For the total population the average number of correct answers was 44.4% (8.4/19), only 6% (nine patients) achieved a satisfactory score ≥75% **(Figure 1).**

The results in the forms of use dimension, in the interactions and complications dimension and in the INR control dimension are detailed in **Figures 2, 3 and 4,** respectively.

Discussion

According to the results obtained, knowledge about warfarin treatment in patients with atrial fibrillation or carriers of

Table 1. Sociodemographic characteristics and treatment-related information

Variable		Value
Sex n (%)	Woman	54 (36.0)
	Man	96 (64.0)
Age (%)	<35 years	11 (7.3)
	35 years - 49 years	24 (16.0)
	50 years - 59 years	33 (22.0)
	60 years - 74 years	56 (37.3)
	>74 years	26 (17.3)
Educational level	No formal schooling	2 (1.3)
	Primary	22 (14.7)
	Secondary	48 (32.0)
	Higher	78 (52.0)
Knows the reason for receiving warfarin	Do not know	44 (29.3)
	Know	106 (70.7)
Know your optimal INR* value	Do not know	122 (81.3)
	Know	28 (18.7)
Diagnosis based on clinical history	Atrial fibrillation	68 (45.3)
	Mechanical valve prosthesis	82 (54.7)
Time on warfarin treatment	≤2 months	54 (36)
	3 - 6 months	28 (18.7)
	7 months - 1 year	16 (10.7)
	>1 year - 3 years	11 (7.3)
	>3 years	41 (27.3)

*International Normalized Ratio

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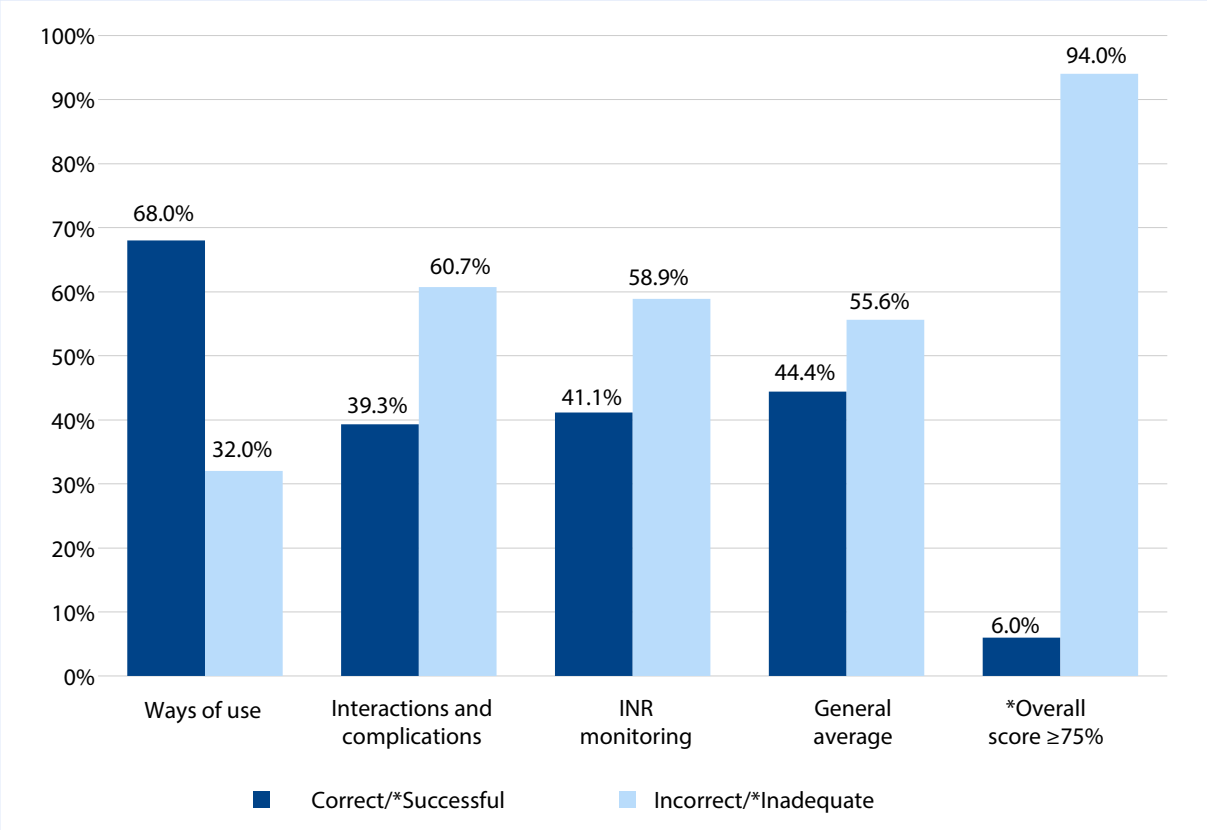

Figure 1. Percentage of patients who answered the OAK test questions correctly and incorrectly according to dimensions, overall average, and percentage of patients with overall score ≥75%.

**International Normalized Ratio

mechanical prosthetic valves is inadequate, since the mean OAK test score was 8.4/19, equivalent to 44.4% correct answers. A striking finding is that only 6% (n=9) achieved a satisfactory score ≥75%. These results are lower compared to other investigations that used the same test; in China the average score was 10.2/19 (54.1%), only 13.8% (n=24) achieved a satisfactory overall score [23], in another study conducted in Canada the average score was 12/20 (60.0%), 64.0% (n=144) failed the test [24].

In our study, 54.6% were older adults (≥ 60 years), with a mean age of 60.3 years; in other similar studies that evaluated a population older than 18 years, the mean age was 69.72 and 71 years [21,25]. According to the "World Population Prospects 2019" report, it is predicted that between 2019 and 2050, the proportion of people ≥ 65 years and cardiovascular diseases will double [26]; therefore, care strategies should be implemented according to their needs for this population group. In relation to the educational level, 52% had higher education, this percentage was higher than other research conducted in Brazil and Canada, whose results were 13% and 28.9% respectively [22,24]; in addition, the percentage of patients with no education was 1.2%, a lower result compared to other research [21,25].

An additional cause for concern is that 29.3% did not specify the reason for receiving warfarin (AF or mechanical heart valves). Despite the fact that most patients carried a card detailing this information, 81.3% were unaware of the optimal INR values according to their disease. In this sense, education on INR is part of comprehensive patient care and should be intensive, cost-effective and generate clinical benefits [27].

The majority of participants (54.7%) were on warfarin therapy for 1 to 6 months; all had at least one prior hematology consultation, and continued with this care only until optimal INR values were achieved; during this time they did not receive other interventions aimed at improving their understanding of their therapy; however, many studies recommend the participation of these patients in educational programs and regular counseling as a crucial part of effective and safe anticoagulation [13,25,28].

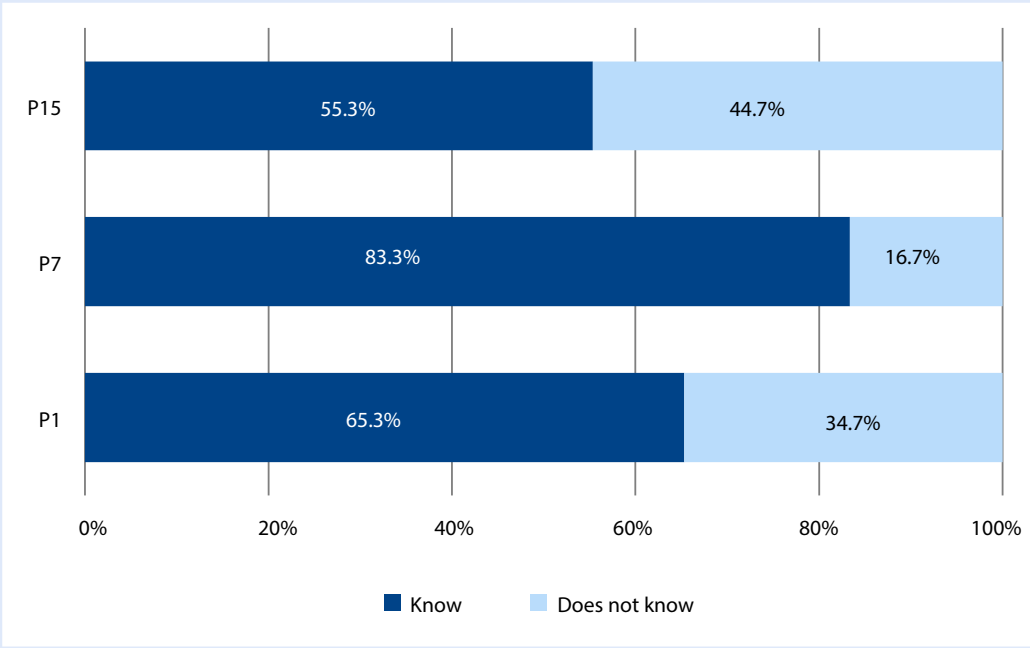

Figure 2. Percentage of patients who answered correctly and incorrectly to the OAK test questions according to the dimension "Forms of use". Q1: What can happen if you miss a dose of warfarin? Q7: What is warfarin used for? Q15: If you miss a dose, what is the best alternative?

On average, 68% of the participants were aware of the forms to use warfarin (what can happen if you miss a dose and the usefulness of warfarin); however, only 55% correctly answered the question related to the best alternative to have if you miss a dose. In this sense, Gilberto et al. mentioned that more than 80% of patients tend to forget a dose of their treatment, so health personnel should establish strategies to prevent and improve this situation [29]; likewise, this forgetfulness should be reported to physicians at the next medical consultation [30].

On the other hand, on average, 74.0% of the patients did not recognize the interactions between warfarin with food, drugs (aspirin or nonsteroidal anti-inflammatory drugs), alcohol, and over-the-counter products (herbal and dietary supplements). In addition, most of the participants (84.7%) were unaware of the care that they should take with their diet. Similar research also highlights the high number of patients (>50%) who are not aware of these interactions and precautions that should be considered when being treated with warfarin and the need for ongoing education, otherwise they may alter the stability of anticoagulant control. Similarly, warfarin is considered a difficult drug to manage due to multiple interactions, high variability of response, and having a narrow therapeutic window; consequently, patients have difficulty achieving ideal anticoagulation [12,15].

Another noteworthy aspect is that a low proportion of participants (15.3%) responded that they should be constant and follow a diet that includes all types of food. The available evidence does not support restricting vitamin K intake when receiving warfarin treatment, but rather recommends maintaining a stable and unrestricted intake of vitamin K-rich foods, thus avoiding large variations in their consumption and response to anticoagulant treatment [31,32].

Regarding knowledge of the INR, 62% were unaware of the risks of presenting values outside the established range, in addition 40.7% did not understand the meaning of the term INR, despite the fact that knowledge about the INR is of utmost importance for better management of anticoagulation and prevention of complications (hemorrhagic and thromboembolic) [33]. Several studies highlight the importance of educating the patient receiving warfarin treatment, given the lack of knowledge of the INR and its implications [19,34].

Finally, it is worth mentioning that the frequency of INR test monitoring, once the target range has been reached and is stable, will be based on the recommendations of the treating physician, which are usually every 4 to 6 weeks, or at extended intervals, depending on each patient's individual assessment [35,36].

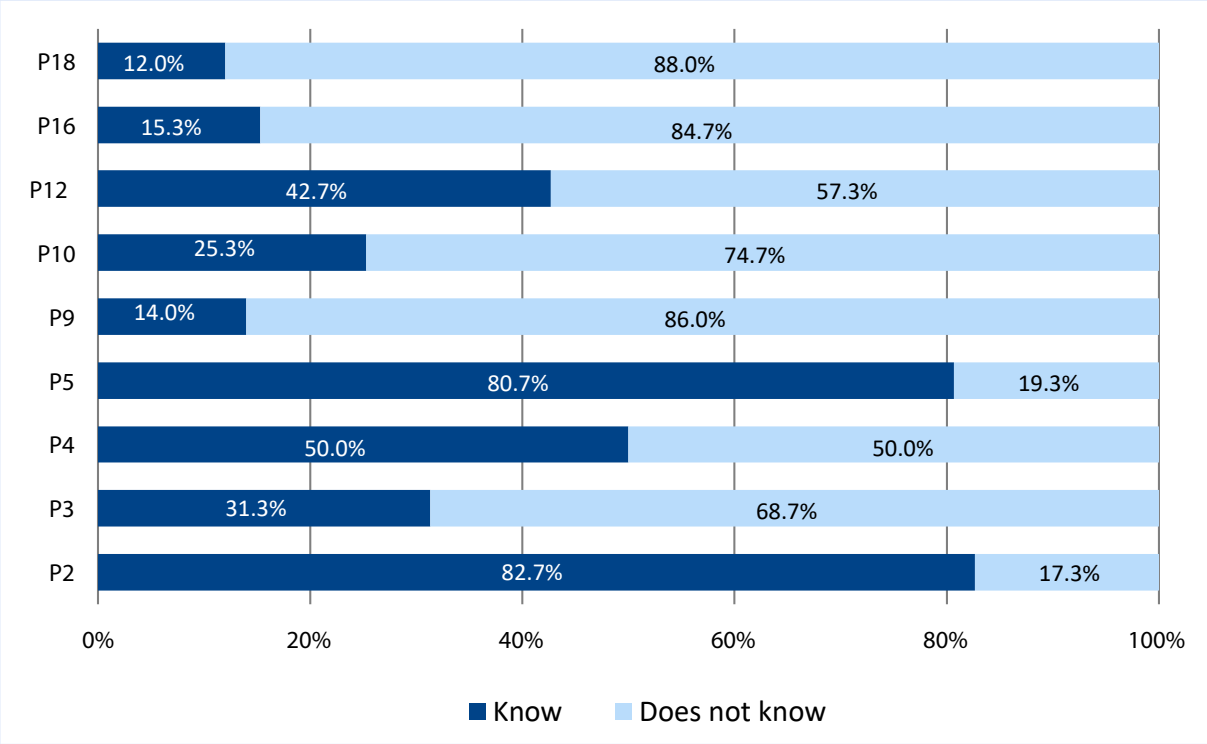

Figure 3. Percentage of patients who answered correctly and incorrectly to the OAK test questions according to the dimension "Complications and interactions". Q2: Whom do you contact if you have questions about adverse events related to warfarin use? Q3: Occasionally eating a lot of green leafy vegetables, what can it cause if you are taking warfarin? Q4: ¿Which of the following vitamins interact with warfarin? Q5: Who do you contact to find out if it is safe to take a medication that interacts with warfarin? Q9: What can it cause if you take aspirin or nonsteroidal anti-inflammatory drugs such as ibuprofen or metamizole while taking warfarin? Q10: When should a person on warfarin seek immediate health care? Q12: Is it recommended to drink alcohol while taking warfarin? Q16: In relation to diet, what care should people taking warfarin take? Q18: Which of the following over-the-counter products are most likely to interact with warfarin?

Regarding the implications of the study, the findings show the need for education of patients under treatment with warfarin, mainly because of the repercussions it may have on good anticoagulation [18,24,25]; thus, several studies have highlighted the importance of the existence of continuing education programs to contribute to the effectiveness of the drug [17,19,23]. In this sense, nursing personnel in various institutions have played a fundamental role in the achievement of these objectives, since they have been responsible for the follow-up, implementation of strategies and educational programs [14,21,34]. Therefore, it is suggested to carry out educational interventions with the participation of nurses and other members of the health care team, for monitoring, follow-up, improvement of adherence and knowledge about adverse events, food and drug interactions.

It should be noted that this study has limitations in the scope of its findings, since it only included patients attended at a single Peruvian institute specializing in cardiology and does not represent our national reality. Furthermore, it does not allow us to establish causality or generalize its results due to the type of design and selection of participants. Another important limitation was the use of a modification of the OAK test that was not validated in the Peruvian context. Finally, there may be politeness bias and comprehension problems by the participants.

In conclusion, patients' knowledge about warfarin treatment was inadequate, both in its forms of use, interactions and complications, as well as in INR control, which could contribute to failure to achieve stable anticoagulation. It is necessary for patients to understand their treatment and the imminent signs of complications, which could end in fatal damage, considering that this drug is complex to use due to its narrow therapeutic window and multiple interactions.

Author contributions

LVO conceived the research topic, and the elaboration of

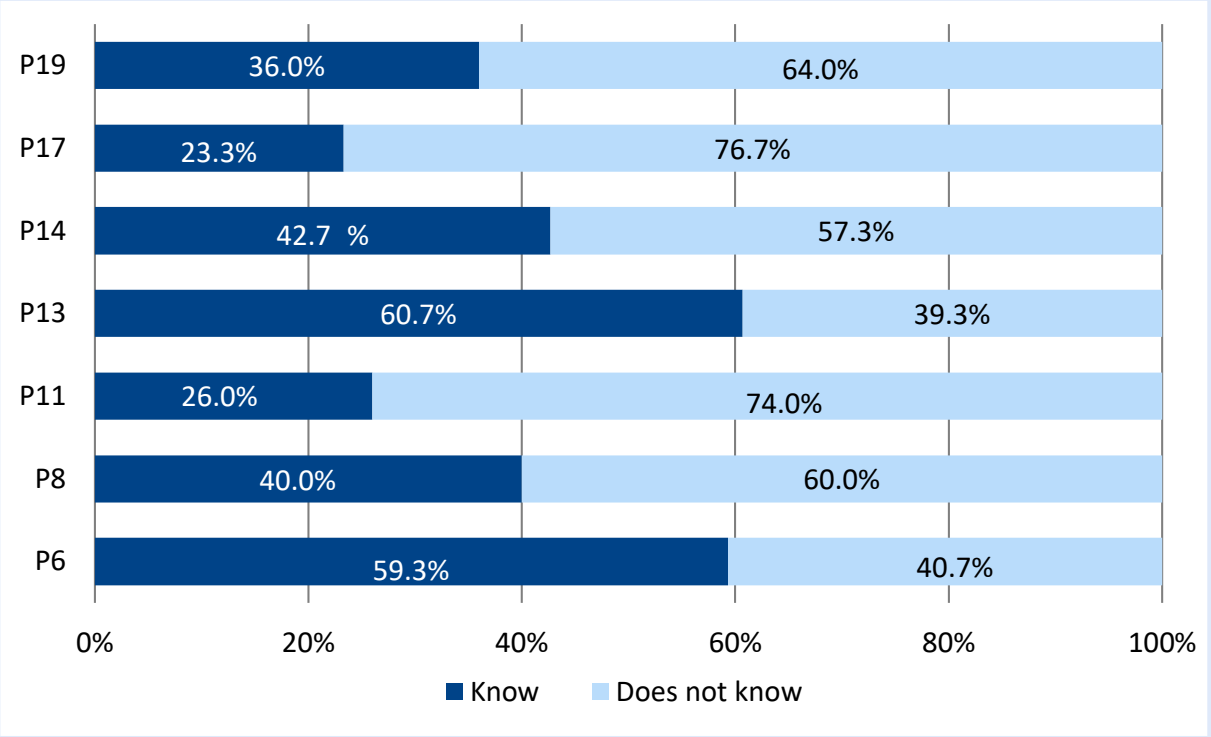

Figure 4. Percentage of patients who answered correctly and incorrectly to the OAK test questions according to the dimension "INR control". Q6: ¿What is INR testing? Q8: ¿What can happen if a patient has an INR below his or her established range? Q11: ¿What can skipping a dose of warfarin do? Q13: Once the warfarin dose has stabilized, approximately how often should you check your INR? Q14: For a patient on warfarin, when is it important to monitor for signs of bleeding? Q17: What should you do each time your INR is determined? Q19: What can happen if a patient has an INR above their established range?

the protocol. All authors participated in the collection and interpretation of data, drafting of the manuscript, approved the final version, and are responsible for the contents.

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