Evaluation of patients' knowledge of warfarin at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

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ABSTRACT

Objective: The study was to assess the knowledge of warfarin in patients using the validated anticoagulation knowledge assessment questionnaire and to evaluate the predictors of the level of knowledge among outpatients receiving warfarin at the Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

Methods: It was a prospective cross-sectional study carried out from October 2019–January 2020. During the study period a total 401 of them were included in the study. Anticoagulation Knowledge Assessment questionnaire has 29 question items, a single patient should answer at least 21 of the question to be considered as knowledgeable about his/her medication. The data was exported into SPSS version 25 and a one way ANOVA and post hoc were conducted.

Results: The mean age of the study participants were 36 years old (SD $\pm$ 11.83), which was ranges from 18 to 82 and majority of the participants were females (69.6%). Almost in one-third of the participants (35.7%), the reasons for warfarin therapy were Chronic Rheumatic Valvular Heart Disease. The overall AKA mean $\pm$ SD score of the respondents was 7.4 ($\pm$2.6) that ranges from 2 to 22. From those only (4.2%) of the study participants had succeeds the passing score. Educational level and the duration of warfarin therapy were independent predictors towards patient's warfarin knowledge.

Conclusion: The overall patient's knowledge about warfarin treatment was poor when it was compared to most other studies. The longer duration of warfarin therapy and advanced educational level showed favored relationship towards better warfarin knowledge of the study participants.

1. Introduction

Given the recent launch of many direct-acting oral anticoagulants, warfarin, a vitamin K antagonist, is likely to remain the dominant medication for the prevention and treatment of thromboembolic, cardiac and hypercoagulable disorders in low-and middle-income countries in the years to come [1,2]. Warfarin has a narrow therapeutic index and possibly sever adverse effects, repeated laboratory testing is essential to maintain the International Normalized Ratio (INR) within the therapeutic range [2–4].

Warfarin, a coumarin derivative, prevents clotting by reducing the hepatic development of bioactive vitamin K-dependent clotting factors (activated factors II, VII, IX and X) [5,6]. Research indicates, however, that anticoagulant and antithrombotic effects can be completely separated and that the reduction of prothrombin and likely factor X is more essential than the reduction of antithrombotic factors VII and IX [7]. This has an unpredictable pharmacokinetics and dynamics and requires personalized dosing to achieve effective anticoagulation [8].

In most cases, the therapeutic INR range is 2.0–3.0. Exceptional cases can be when warfarin is being used for prevention following a myocardial infarction or in individuals with severe-risk mechanical prosthetic heart valves, in whose circumstance the range is 2.5–3.5 [2,5]. Follow up is necessary to prevent both low-intensity anticoagulation thromboembolic events and higher-intensity haemorrhagic events [9,10]. The rise in INR across the therapeutic range bestows a predisposition to bleeding, which would be a frequent cause of hospitalization(4).

In addition, a list of prescription medications has been considered as

Abbreviations

AKA	Anticoagulation Knowledge Assessment
INR	International Normalized Ratio
TASH	Tikur Anbessa Specialized Hospital

a highly interactive medication with food and other medicines [1,11]. In reality, it is understood that long-term consistency is difficult to achieve due to unpredictable changes in patients' INR values, which can be related to a wide variety of factors including dietary adjustment, poor medication compliance, alcohol intake, seasonal variability, and medication interactions [9].

The effectiveness of warfarin can be greatly determined by numerous factors, including concomitant drug treatment for patients, modifications in diet or alcohol consumption, and medical problem. Thus it is crucial for patients to be well advised and fully recognize the risks of anticoagulant therapy [5–7,10]. Health care providers should also understand that many patients with warfarin will have major gaps in their warfarin-related information. In fact, patients may have unhealthy attitudes that could still be present after initial warfarin education and regular supervision by an anticoagulation clinic.

It is important to assess the level of awareness of warfarin therapy amongst these users as well as provide appropriate education and advice to patients. The aim of the study was to assess the knowledge of warfarin in patients using the validated Anticoagulation Knowledge Assessment (AKA) questionnaire and to evaluate the predictors of the level of knowledge among outpatients receiving warfarin at the Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia.

2. Methods

2.1. Study setting

The study was done at TASH, one of the tertiary hospitals in Addis Ababa, Ethiopia. The hospital is affiliated with Addis Ababa University, it delivers the service divided as inpatient, outpatient and emergency departments [12]. In the Hospital there are 465 physicians, 76 pharmacists and 992 nurses are dedicated in providing health care service (College of health sciences, human resource management 2018). Around 600 beds are available in the hospital and more than half million patients served annually [13]. Mainly the cardiac and hematology clinics are the one most patients received a warfarin prescription in the hospital.

2.2. Study design and period

It was a prospective cross-sectional study carried out from October 2019–January 2020. Information regarding the indications of warfarin, duration of therapy and current INR values were collected from medical records and the demographic characteristics and the question regarding patient's warfarin knowledge were collected by interviewing the patients. After completion of the data collection procedure, to specific knowledge gaps on individual patients education and counseling was given by the principal investigator and trained data collectors to the patients about their warfarin treatment.

2.3. Source and study population

All the patients who visited a cardiac and hematology clinics at TASH was taken as source population and those patients who meet the eligibility criteria was considered as study population.

2.4. Inclusion and exclusion criteria

Patients who had an appointment while the study period, those who has a willingness to participate in the study and patients with a recent INR result (past three months) in their medical records were included. Patients with age less than 18 years old and patients who were on warfarin for less than six months were excluded from the study.

2.5. Sampling and sample size determination

During the study period a total of 447 patients and medical records were approached, form those 401 of them fulfill the eligibility criteria were included in the study.

2.6. Data collection instruments

In the current study a validated AKA questioner was implemented to collect the data [14]. An effort has been made to validate the contents of the AKA questioner regarding its readability and reliability by experts in the area. The data abstraction format has contained twenty nine multiple choice questions regarding different aspects of warfarin therapy. In this questioner the patient's anticoagulation knowledge was assessed in ten major concerning areas. These areas were including the medication administration, interaction, physical activity, diet, pregnancy, procedure and basic laboratory monitoring.

The patients were categorized into three groups based on their scores points from AKA questioner. The first group composed of patients who had a score of less ten, group two assigned for respondents whose score was between eleven and twenty and the third group is the one who achieved the passing score of twenty one and above. Each correctly answered question was given a score of one point, whereas incorrectly answered questions were scored as zero. From all 29 question items, a single patient should answer at least 21 (72.4%) of the question to be considered as knowledgeable about his/her medication. Originally the questioner was presented in English, it was translated to local language Amharic and interviewed.

2.7. Data collectors recruitment and training

Five postgraduate pharmacy practice students were participate in the data collection process. Earlier to actual data collocation, a one day training was given about the AKA instrument and basic ethical principles by the principal investigator.

2.8. Data quality assurance and analysis

A pretest was conducted on 20 participants and slight adjacent was made in the instrument accordingly. The findings of the pretest were omitted from the final results. All over the data collection procedure a close supervision was made by the investigator. The data was checked for its completeness and consistency on regular base.

2.9. Data analysis and interpretation

The data was exported into SPSS version 25, after confirming its completeness. The descriptive statics has made to summarize the data by using mean $\pm$ SD, percentage and ranges. A one way ANOVA and post hoc analysis was demonstrated to check whether there is a significant association present between the socio-demographic characteristics and the overall mean score of warfarin knowledge of patients, a P-value < 0.05 was considered as statically significant association with warfarin knowledge score.

2.10. Ethical clearance

The study was approved by the ethical review board of Addis Ababa

Table 1
Socio-demographic and baseline clinical characteristics of study participants attending in cardiac and hematology clinics, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019 (n = 401).

Variables	Number (%)
Age	
18–35	62 (15.5%)
36–59	320 (79.8%)
>60	19 (4.7%)
Gender	
Male	122 (30.4%)
Female	279 (69.6%)
Marital status	
Single	117 (29.2%)
Married	250 (62.3%)
Widowed/divorce	34 (8.5%)
Educational level	
Unable to read and write	39 (9.7%)
Completed primary school	137 (34.2%)
Completed secondary school	102 (25.4%)
Diploma	69 (17.2%)
Degree	38 (9.5%)
Masters and above	16 (4.0%)
Occupation	
Unemployed	174 (43.4%)
Labor	81 (20.0%)
Governmental employer	47 (11.7%)
Private employer	99 (24.7%)
Duration of warfarin	
3 months–1 year	65 (16.2%)
1 year–2 years	110 (27.4%)
>2years	226 (56.4%)

University, school of pharmacy *(approval number: ERB/SOP/48/07/2019)*. A written permission was taken from both hematology and cardiac clinics. In addition to this an effort had been made by data collectors about explaining the aim of the study to the participants and an ethical consent was sought from each of the study participants before data collection.

3. Results

3.1. Socio-demographic and baseline clinical characteristics

The mean age of the study participants were 36 years old (SD ± 11.83), which was ranges from 18 to 82. From four hundred one study participants, majority of them were females 279 (69.6%). Around one-fourth of the respondents were single 102 (25.4%). Almost ten percent of the study were unable to read or write and a significantly huge number of participants were unemployed at a time of data collection 174 (43.4%). More than half of the study participants had taken warfarin for more than two years 226 (56.4%) (Table 1).

3.2. Indications for warfarin therapy

Almost in one-third of the study participants 143 (35.7%), the reason for warfarin therapy were Chronic Rheumatic Valvular Heart Disease (CRVHD). Atrial Fibrillation (AF) and heart valve replacement also significantly encountered for the indication of warfarin 106 (26.4%) and 64 (16.0%) respectively (Fig. 1).

3.3. Warfarin knowledge of study participants

The overall AKA mean ± SD score of the respondents was 7.4 (±2.6) that ranges from 2 to 22. From those only seventeen (4.2%) of the study participants had succeeds the passing score. Majority of the patients correctly answered less than ten questions 233 (58.1%). More than one-third of the study participants were identified 11–20 of the AKA questions151 (37.7%). In the current study there was no single patient answered all twenty nine questions. The two most correctly answered questions by the study participants were (the best time of day for me to take my warfarin?) and (while in your pharmacy, you notice multivitamins are on sale. After some thought, you decide that you may need a multivitamin?) 381 (95.0%) and 365 (91.0%) respectively. On the other hand, the question about the duration of warfarin (Once your warfarin is stopped, how long does it take to get the medication to get out of your
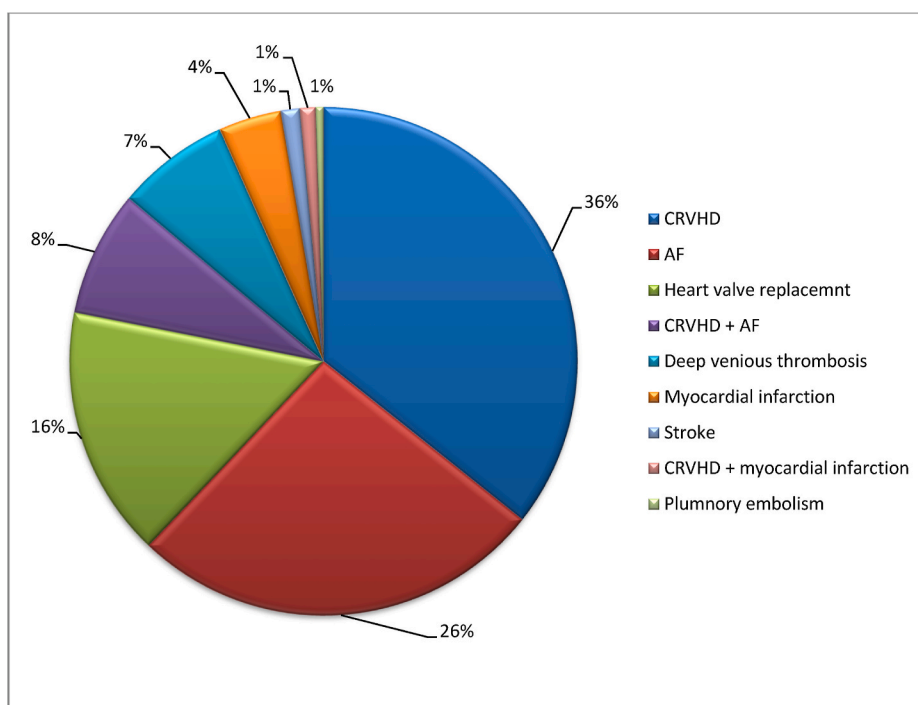

Fig. 1. Indications for warfarin therapy among study participants attending in cardiac and hematology clinics, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019 (n = 401).

Table 2

Warfarin knowledge of study participants attending in cardiac and hematology clinics, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019 (n = 401).

Variables	Correctly answered (%)
Which one of these medications is recommended if you are taking Coumadin (warfarin) and want relief from a headache? A. Advil (NSAID) B. Motrin C. Aspirin D. [a]*Tylenol (Acetaminophen)*	13 (3.2%)
Which of the following food items would interfere with your Coumadin (warfarin) medication? A. Bacon B. [a]*Broccoli* C. Bananas D. Peeled cucumbers	209 (52.1%)
While on Coumadin (warfarin) medication, in which of the following would you go directly to the emergency room? A. Small bruises B. Your appetite dramatically increases C. [a]*Nosebleed which will not stop bleeding* D. Gums which bleed for a few seconds after brushing teeth	184 (45.9%)
You just remembered that you just forgot to take your evening Coumadin (warfarin) medication dose last night. You would? A. [a]*Skip the dose of Coumadin (warfarin) you missed* B. Take the missed Coumadin (warfarin) dose right now C. Wait and take 2 doses of Coumadin (warfarin) this evening D. Take one-half of the missed dose of Coumadin (warfarin) right now	122 (30.4%)
While on Coumadin (warfarin) you? A. Should not eat spinach B. Can eat spinach one time a month C. Can eat as much spinach as you would like whenever you would like D. [a]*Can eat spinach but need to eat the same amount regularly every week*	69 (17.2%)
While out with friends for dinner, you have just finished your third glass of wine. This amount of alcohol consumed in a single evening will do? A. Cause a decrease in your INR B. [a]*Cause an increase in your INR* C. Not affect you or your Coumadin (warfarin) in any way D. Make you sick when taking Coumadin (warfarin) medication	43 (10.7%)
While in your pharmacy, you notice multivitamins are on sale. After some thought, you decide that you may need a multivitamin. You would do? A. Purchase the multivitamin and begin taking it regularly B. Not take a multivitamin because it will cause a blood clot while taking Coumadin (warfarin) C. Start taking it and bring the multivitamin to your next Coumadin Clinic visit to show the pharmacist D. [a]*Purchase the multivitamin but not start taking it until you talked with the pharmacist at your Coumadin Clinic*	365 (91.0%)
If you ran out of your prescription for your Coumadin (warfarin) you would do? A. Borrow Coumadin (warfarin) from a friend, as long as it is the same dose as yours B. [a]*Call and ask for refills for that day so you do not miss a dose of Coumadin (warfarin)* C. Wait until your next appointment that is just a few days away to get a new prescription D. Do nothing because you have taken Coumadin (warfarin) long enough, otherwise there would be more refills on your prescription	46 (11.5%)
Which of the following is an effect of Coumadin (warfarin) medication that will most likely be experienced? A. Stroke B. Leg clot C. [a]*Bruising* D. Blood in the urine	297 (74.1%)
You have a cold, which includes a runny nose and a cough. You do?	205 (51.1%)

Table 2 (*continued*)

Variables	Correctly answered (%)
A. Could safely take Nyquil (Acetaminophen, Dextromethorphan and Doxylamine) to help get rid of the runny nose and cough B. Take your friend's medication that he/she uses for a bad cold because he/she is also on Coumadin (warfarin) medication C. [a]*Would call the Coumadin Clinic and tell him/her you are on Coumadin (warfarin) medication and ask what you can take for your cold* D. Decide it is safer to suffer through the cold because most cold medications will interact with your Coumadin (warfarin) medication	
When making a dental appointment while taking Coumadin (warfarin) medication, you need to remember you? A. Cannot have procedures done on your teeth while taking Coumadin (warfarin) B. [a]*Must tell your dentist you are taking Coumadin (warfarin) well in advance of having any procedure done* C. Can have procedures done and there is not a need to tell the dentist about the Coumadin (warfarin) D. Can have the dental procedure done if when you arrive at your dental appointment you tell the dentist you are taking Coumadin (warfarin)	131 (32.7%)
When the need arises to take an antibiotic (to get rid of an infection) while taking Coumadin (warfarin), you need to? A. Take half of the prescribed length of therapy, and then call the Coumadin Clinic B. Refuse to take any new medication because you are taking Coumadin (warfarin) C. Wait until your next Coumadin Clinic visit and then tell the pharmacist about the antibiotic D. [a]*Call the Coumadin Clinic right away and let them know you are starting a new medication*	315 (78.6%)
Coumadin (warfarin) works? A. In my liver to make my blood thicker B. [a]*In my liver to make my blood thinner* C. In my kidneys to make my blood thicker D. In my kidneys to make my blood thinner	196 (48.9%)
The best time of day for me to take my Coumadin (warfarin) is? A. At lunchtime B. [a]*In the evening* C. In the morning before breakfast D. Any time of day when I remember	381 (95.0%)
Which of the following is an effect of my Coumadin (warfarin) medication that I will most likely experience if my INR is too high? A. A clot in the leg B. [a]*Minor bleeding* C. Clot in the lung D. Bleeding in the brain	163 (40.6%)
Which of the following drinks can decrease the effectiveness of your Coumadin (warfarin)? A. Deans 2% low-fat milk B. Hershey's chocolate shake C. Tropicana orange juice D. [a]*Ensure nutritional supplement*	10 (2.5%)
While taking Coumadin (warfarin), which of the following represents a situation when you should to go to the emergency room? A. [a]*You cough up blood* B. Your nose bleeds slightly while blowing it C. You gums bleed after brushing your teeth then it stops quickly D. You have a cut yourself while shaving and you control the bleeding	164 (40.1%)
Your neighbor brings over this great "all natural" herbal supplement she just bought from her chiropractor. She swears that this helps all her aches and pains and recommends that you take it when you ache. Your decision is to? A. Take her advice, realizing that you could use this herbal supplement B. Start taking the herbal supplement and tell your pharmacist at the next office visit	67 (16.7%)

Table 2 (*continued*)

Variables	Correctly answered (%)
C. [a]*Ask your pharmacist if the herbal supplement will interact with your medications before you take it*	
D. Avoid taking herbal supplements altogether because all medications interact with Coumadin (warfarin)	
Once you have reached a stable Coumadin (warfarin) dose, a PT/INR blood test?	236 (58.9%)
A. Should be checked once a year	
B. Should be checked once every 3 months	
C. [a]*Should be checked at least once every 4 weeks*	
D. Does not need to be checked once you are on a stable Coumadin (warfarin) dose	
The results of your PT/INR test tell the pharmacist?	109 (27.2%)
A. [a]*How thick or thin your blood is while taking Coumadin (warfarin)*	
B. How well your kidneys are working since taking Coumadin (warfarin)	
C. What your average blood sugar level was since taking Coumadin (warfarin)	
D. How much alcohol you have been drinking since taking Coumadin (warfarin)	
While taking Coumadin (warfarin), you should call your Coumadin Clinic when you get?	12 (3.0%)
A. A backache	
B. An upset stomach	
C. A tension headache	
D. [a]*Diarrhea for more than 1 day*	
While on Coumadin (warfarin) you need to be routinely monitored for which of the following?	353 (88.0%)
A. [a]*PT/INR tests*	
B. Potassium levels	
C. Blood glucose levels	
D. Kidney function tests	
Which of the following may have a significant effect on how well your Coumadin (warfarin) works?	15 (3.7%)
A. Changes in your mood	
B. Changes in sleep habits	
C. How much water you drink	
D. [a]*Using over the counter medications*	
While taking Coumadin (warfarin), which of the following should lead you to the emergency room?	188 (46.9%)
A. Loss of appetite	
B. Brown loose stools	
C. [a]*Urine becomes red in color*	
D. A quarter size bruise on your arm	
Which of the following foods could affect how well your Coumadin (warfarin) works?	227 (56.6%)
A. Celery	
B. Carrots	
C. [a]*Cole slaw*	
D. Green beans	
You have generic and brand Coumadin (warfarin) tablets at home that are both the same dose. You should?	363 (90.5%)
A. Take both because they work differently	
B. [a]*Take only brand or only generic, but not both*	
C. Not take either until you call the Coumadin Clinic	
D. Alternate days by taking brand on one day and generic on the next day	
Once your Coumadin (warfarin) is stopped, how long does it take to get the medication to get out of your system?	4 (1%)
A. 5 h	
B. [a]*5 days*	
C. 5 weeks	
D. 5 months	
After starting Coumadin (warfarin), how long (in months/years) would you expect to be taking Coumadin (warfarin)?	193 (48.1%)
A. 1 year	
B. 1 month	
C. [a]*It depends on each person's needs*	
D. If you start Coumadin (warfarin), you will have to be on the medication for the rest of your life	
Which of the following activities are more risky while taking Coumadin (warfarin)?	141 (35.2%)
A. [a]*Playing football, because you can hit your head*	
B. Taking a bath, because soap interacts with Coumadin (warfarin)	

Table 2 (*continued*)

Variables	Correctly answered (%)
C. Playing cards because using your hands a lot will cause a blood clot	
D. Walking a lot, because exercise is not good for you while taking Coumadin (warfarin)	

[a] Correct answers.

Table 3

Predictive factors towards warfarin knowledge of study participants attending in cardiac and hematology clinics, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019 (n = 401).

Variables	Mean score ($\pm$SD)	F	P-value
Age		0.263	0.697
18-35	7.9 ($\pm$3.6)		
36-59	7.8 ($\pm$3.4)		
>60	7.4 ($\pm$3.1)		
Gender		1.559	0.074
Male	8.1 ($\pm$3.8)		
Female	7.5 ($\pm$3.4)		
Marital status		0.394	0.091
Single	7.8 ($\pm$3.7)		
Married	7.7 ($\pm$3.4)		
Widowed/divorce	7.9 ($\pm$3.1)		
Educational level		4.844	0.043[a]
Unable to read and write	5.2 ($\pm$4.6)		
Completed primary school	7.5 ($\pm$3.5)		
Completed secondary school	7.4 ($\pm$3.8)		
Diploma	7.8 ($\pm$3.7)		
Degree	10.2 ($\pm$2.8)		
Masters and above	8.9 ($\pm$3.3)		
Occupation		0.972	0.688
Unemployed	7.1 ($\pm$3.5)		
Labor	7.0 ($\pm$3.4)		
Governmental employer	7.9 ($\pm$3.7)		
Private employer	7.6 ($\pm$3.5)		
Private business	7.6 ($\pm$3.6)		
Duration of warfarin		3.548	0.000[a]
3 months–1 year	6.8 ($\pm$4.2)		
1 year–2 years	7.8 ($\pm$3.8)		
>2years	9.1 ($\pm$2.7)		

[a] Variables with statistically significant association.

system?) was only answered by few respondents 4 (1%) (Table 2).

3.4. Predictive factors associated with the patient's warfarin knowledge

In this study educational level and the duration of warfarin therapy were independent predictors towards patient's warfarin knowledge. The post hoc analysis revealed that patients with educational background of degree associated with a good knowledge of warfarin therapy than patients with other educational levels (P-value = 0.043*). Similarly patients who had been used warfarin for more than two years had relatively acquired more knowledge about their medication than other patients who were on warfarin for lesser duration (P-value = 0.000*) (Table 3).

4. Discussion

Lack of knowledge among patients who are receiving warfarin has been showed in which could be one of the important factors determining the degree of anticoagulation control and resulted in failure of achieving goal of treatment [1,15]. This makes it vital to evaluate the degree of knowledge of warfarin therapy among its user and provide necessary education and counseling regarding the medication to the patients [16–18].

The overall mean warfarin knowledge score of the study participants was 7.8 ($\pm$3.6) and only 4.2% of the respondents achieved the passing

score. The finding was comparable with a study which had been done in this setup, Tamrat *et el* reported that the patients warfarin mean knowledge score was 11.8 (±2.6) [19]. However, this finding was much lower than most previous studies, for instance, in a Chinese study, the mean score of warfarin knowledge was 62.3% (±8.8%) and 44.4% of the study respondents had succeed the passing score(20). Similarly, in a Brazilin study, patients were classified into good, medium and poor knowledge based on their scores and exactly half of the study respondents had good knowledge about their medication [21]. Furthermore, a study from India revealed that, 18.5% of patients had high knowledge score towards their warfarin treatment [22]. The better warfarin knowledge in the above study might be explained by a better socio demographic characteristic of the study participants compared to patients in the current study.

In the current study less than half of patients 48.9%, aware of how warfarin works. This value was lower than both studies which were conducted in Malaysia 71.2% and 66.5% respectively [15,18]. Furthermore, in a multi centered European study on patients with atrial fibrillation, 90% of the respondents identified that warfarin is a medicine with the purpose of thinning their blood [23]. In Indian study, almost the same number of study respondents (90%) knew the reason for prescribing warfarin was to prevent blood clotting [22].

Several study participants 88%, knew about their routine laboratory monitoring's which are vital to monitor their warfarin treatment. This finding was in line with the European study on atrial fibrillation patients, in that study 76% of the respondents recognized the specific laboratory monitoring and the frequency that tests should be conducted [23]. In the contrary more than two-third of the study participants (67.9%) don't have the basic knowledge about laboratory monitoring of warfarin therapy in the Indian study [22].

Another interesting concern about patients on warfarin is the interaction profile of the drug, since it's one of the medications with the narrow therapeutic index. In the present study patients were asked about to identify the safest medication that can help them of relief from a headache. Only a few number of the respondents (3.2%) identified the correct answer towards selecting the appropriate medication which can be taken with warfarin. This was much lower than the Malaysian study, the study reported that 42.9% of the respondents had good knowledge about the interaction between warfarin and other medications [18]. A multi-centered Africans study also revealed that more than half (55%) of the study participants had taken a potentially interacting medication alongside with their warfarin treatment [24].

In the AKA questioner there are four questions that are intended to assess the patients knowledge about the situation in which they needs to visit the emergency room right away. The average means score of those four questions were 34.0% and it was lower than most other similar studies. For instance in a cohort of Australian patients taking warfarin, beyond two-third (67.6%) of the respondents identified when to seek urgent medical attention [17]. In the Indian study 78% of the study participants aware of that the major signs or symptoms which they need to come to emergency room [22].

Educational level and the duration of warfarin therapy had a positive significant association with the patient's knowledge about warfarin and it was consistence with prior studies [3,15,20,25]. Besides in Malaysians study age and income were also had a significant association with patients knowledge of warfarin [15], however, those variables had no role in predicting the patients warfarin knowledge score the current study.

The limitation of the study was it's a single centered study and it was conducted in urban city of the country perhaps, this may not represent that the patients' warfarin knowledge found in rural area of the country. It was also difficult to reach on conclusion by one-time assessment of knowledge of patients. Another limitation of the study was that, it was difficult to assess post education and counseling knowledge level because patients appointment was varied that makes difficult to meet the same patients in the following appointment.

As a conclusion the overall patient's knowledge about warfarin treatment was poor when it was compared to most other studies [1,18, 20,22]. The longer duration of warfarin therapy and advanced educational level showed favored relationship towards better warfarin knowledge of the study participants.

Ethics approval and consent to participate

The study was approved by the ethics review board of the school of pharmacy, Addis Ababa University and written consent was taken from each of the study participants before starting the data collection.

Consent for publication

Not applicable.

Availability of data and material

The datasets analyzed during the current study are available from the corresponding author on request.

CRediT authorship contribution statement

Abdella Birhan Yabeyu: Writing – original draft, Formal analysis, Supervision, contributed to designing the study, manuscript preparation, and finalization, contributed to data analysis, and data interpretation, participated in the supervision of the study. **Meaza Adugna Ayanaw:** Formal analysis, contributed to data analysis, and data interpretationand, and. **Kaleab Taye Haile:** Formal analysis, Supervision, contributed to data analysis, and data interpretation, participated in the supervision of the study, All authors read and approved the final manuscript. **Zemene Demelash Kifle:** Formal analysis, contributed to data analysis, and data interpretation.

Declaration of competing interest

The authors declare that they have no competing interest.

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