

## Original Research

# The extent of awareness of southern Jordanian people to the difference between venous thrombosis and arterial thrombosis

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### Abstract

**Objective:** Venous thrombosis (VTE) and arterial thrombosis are two different diseases. Although they differ in causes, types, and treatment, they share many risk factors. Many people are not able to differentiate between them. So assessing the awareness of people toward these two diseases and determining the variables that affect their awareness was the aim of the study. **Methods:** This is a cross-sectional validated questionnaire which was conducted on social media. It targeted the southern Jordanian public above 18 years between October and December 2022. **Results:** A total of 630 people participated in the current study. Only 42.2% knew the cause of arterial thrombosis compared to 58.7% in case of venous thrombosis. More than half (63.2%) of the participants knew that there is a difference between venous and arterial thrombosis. DVT (36.8%) and PE (23%) were correctly identified as types of VTE, while only myocardial infarction was identified as a type of arterial thrombosis by 52.2% of respondents. About 69.5% and 80.2% of respondents think that venous and arterial thrombosis are fatal, respectively. Regarding the socio-demographic variables that affect the awareness of the public, old age, high educational level, working, and earning at least 500 JD per month were significantly associated with better awareness of the study population about venous and arterial thrombosis with a p-value of 0.0027, < 0.001, 0.0017, and < 0.001 respectively. **Conclusion:** The current study reveals that there is a lack of awareness about VTE and arterial thrombosis and the difference between them among the southern Jordanian public. VTE and arterial thrombosis are preventable diseases, so more attention should be given by increasing the educational campaign and the initiatives of public health about the difference between them in terms of signs and symptoms, risk factors, and complications.

## INTRODUCTION

Thrombosis disorders are one of the most common disorders worldwide. Venous thrombosis (VTE) and arterial thrombosis are two different disorders. VTE defines as the formation of a blood clot inside the veins that carry the deoxygenated blood to the heart.<sup>1</sup> VTE and its complications considered the third most widespread acute cardiovascular diseases, with considerable global morbidity.<sup>2</sup> Worldwide, more than 200,000 cases of VTE are diagnosed yearly.<sup>3</sup> It includes deep vein thrombosis (DVT) and pulmonary embolism (PE).<sup>4</sup>

A rupture at atherosclerotic plaque in the artery that carry the oxygenated blood from the heart results in arterial thrombosis.<sup>5</sup> The formed thrombus can obstruct crucial arteries such as the brain or heart and causes life-threatening conditions such as stroke or coronary artery disease (CAD).<sup>6</sup> 17.9 million of people died from CVDs according to World Health Organization (WHO).<sup>7</sup>

Worldwide, the numbers of deaths from stroke and Ischemic heart disease have increased by 25% and 35%, respectively. In Jordan, from 2009 to 2019, Ischemic heart disease and stroke are the first and the second most common causes of death, respectively.<sup>8</sup>

Although these two diseases differ in epidemiology, pathophysiology, types, and treatments, they share many risk factors such as increasing age, obesity and immobility.<sup>9</sup> VTE is considered a complication for having cancer, fractures or recent surgeries, pregnancy, estrogen use, and blood stasis such as prolonged immobilization which are unrelated to atherosclerosis.<sup>10,11</sup> Arterial thrombosis associated with hypertension, diabetes, hyperlipidemia, smoking and obesity.<sup>11,12,13</sup>

Since many people may not be able to distinguish between arterial and venous thrombosis, which will affect their health, increasing awareness about them and the difference between them will affect the quality of the patient's life because when people are aware of the nature of the disease, its symptoms and what may increase its occurrence, it becomes easier to deal with the disease and the possibility of rapid intervention and reducing the number of deaths is better.

## METHODS

### Study design and instrument

This study is a cross-sectional online questionnaire. It was distributed on social media to collect the data in the period between October and December 2022. The study targets the population of southern Jordan. The provinces in the south of Jordan are Al-Karak, Al-Tafila, Ma'an, and Al-Aqaba. The

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distance between these provinces and Amman (the center of Jordan) is 130, 217, 184, and 333 Km, respectively. Eighteen aged people were included in the questionnaire. The items of the survey were collected from previously validated research.<sup>14, 15,16,17</sup> The survey was translated from Arabic to English and from English to Arabic and validated by conducting a pilot test on 50 people. This group were excluded from the study.

The survey included 20 closed-ended questions prepared to ask about:

- 1) Socio-demographic information such as age, gender, educational level, work nature, place of residence, and monthly income.
- 2) History of VTE or arterial thrombosis.
- 3) Questions about if the respondent knows what a VTE or arterial thrombosis is. Its causes, types, and risk factors. If the respondent's answer to the question regarding the knowledge of these two diseases is yes, he will complete the answer to the questions related to their causes and types, but if the answer is no, he will leave the question of causes and types and move on to the questions of risk factors. One answer was allowed to the questions of causes, and more than one answer to the questions of types and risk factors. If the respondent does not know what venous thrombosis or arterial thrombosis is, he will leave the questions related to knowledge, types, and risk factors of these two diseases and move on to the question of the difference between the two diseases.
- 4) Questions to assess how well people know the difference between VTE and arterial thrombosis and if these two diseases are fatal or not. One answer was allowed.
- 5) Questions to assess whether there is awareness about these two diseases and whether they support spreading awareness about them. One answer was allowed.

## Data Analysis

Data were coded and analyzed using R programming language.

The socio-demographic information, the question of history, the knowledge, causes, types, and risk factors of VTE and arterial thrombosis, the questions to assess how well people know the difference between VTE and arterial thrombosis, the questions about the awareness in the society about the diseases, and if they are both fatal or not were presented in tables of frequencies as percentages and numbers.

In order to measure and compare the knowledge of individuals, a scoring system was established based on previous studies.<sup>18,19</sup> For each of the knowledge questions, a mark is allocated whenever the respondent chooses the right answer. If the individual chooses an answer other than the right answer, no points are allocated or taken. The score ranges from 0 (no right answers chosen) to 41 (all right answers chosen).

The right answers were shown in the following [table \(1\)](#).

A two-sample t-test was established for the awareness score to identify the significant associations between the different demographic variables and the awareness of the respondents. A p-value of less than 0.05 was considered statistically significant.

## ETHICAL APPROVAL

The study was performed after obtaining the Institutional Research Board (IRB) (ethical approval at al-Balqa'a Applied University).

## RESULTS

### Descriptive

The number of respondents in the current study was 630

VTE	Correct answers	Points	Arterial	Correct answers	Points
<b>Causes</b>	Clot formation (yes)	1	<b>Causes</b>	Accumulation of fat in an artery (yes)	1
<b>Types</b>	DVT (yes)	1	<b>Types</b>	DVT (no)	1
	PE (yes)	1		PE (no)	1
	Myocardial infarction (no)	1		Myocardial infarction (yes)	1
	Ischemic stroke (no)	1		Ischemic stroke (yes)	1
<b>Risk factors</b>	Increasing age (yes)	1	<b>Risk factors</b>	Increasing age (yes)	1
	Long term hospital stay (yes)	1		Long term hospital stay (no)	1
	HTN and DM (yes)	1		HTN and DM (yes)	1
	Family history (yes)	1		Family history (yes)	1
	Surgeries (yes)	1		Surgeries (no)	1
	Having cancer (yes)	1		Having cancer (no)	1
	Obesity (yes)	1		Obesity (yes)	1
	Long term immobility (yes)	1		Long term immobility (no)	1
	Pregnancy (yes)	1		Pregnancy (no)	1
	Estrogen-based medications (yes)	1		Estrogen-based medications (no)	1
	Smoking (yes)	1		Smoking (yes)	1
	Varicose vein (yes)	1		Varicose vein (no)	1
	High blood cholesterol (yes)	1		High blood cholesterol (yes)	1
	Lack of exercise (yes)	1		Lack of exercise (yes)	1
<b>Complications</b>	Venous thrombosis is fatal (yes)	1	<b>Complications</b>	Arterial thrombosis is fatal? (yes)	1
<b>Difference</b>	There is a difference between venous and arterial thrombosis. (yes)	1			



people. Regarding the demographic variables in **table 2**, more than half of the study sample are aged between 18 and 30 with a percentage of (55.9 %). The sample is predominated by females (68.7%). Most of the respondents have Bachelor's degrees (53%), but the sample represents participants from virtually all possible educational levels. Only a minority of the study participants are medical-field professionals (19.8%), this may reflect that they are a minority in the study population. The participants were evenly recruited in terms of their residence with a percentage of (50.3%) for the city and (49.7%) for the countryside. 37.6% of respondents have a monthly income of less than 500 JD, and the majority of the respondents (96.7%)

The variable	n	%
<b>Age</b>		
18-30	352	55.9
31-50	226	35.9
More than 50	52	8.2
<b>Gender</b>		
Female	433	68.7
Male	197	31.3
<b>Educational level</b>		
Primary	8	1.3
Secondary	62	9.8
College	137	21.8
Bachelor's	334	53
Postgraduate	89	14.1
<b>Work nature</b>		
Medical field	125	19.8
Non-medical field	221	35.1
No work	284	45.1
<b>Residence</b>		
The countryside	313	49.7
The city	317	50.3
<b>Monthly income</b>		
Less than 500	237	37.6
500-1000	191	30.3
More than 1000	40	6.4
No income	162	25.7
<b>Medical history</b>		
Yes	21	3.3
No	609	96.7

have no medical history of either venous or arterial thrombosis.

In **table 3**, fortunately, most of the study participants have previously heard of venous thrombosis with 74 percent and arterial thrombosis with 76.4 percent. 58.7% of respondents knew the cause of venous thrombosis, compared to 42.2% in the case of arterial thrombosis. Pulmonary embolism and DVT are not correctly identified as types of venous thrombosis with a 23% and 36.8% percent, respectively. Myocardial infarction (52.2%) was will identified as a type of arterial thrombosis, while ischemic stroke (28.7%) wasn't well-identified as an arterial type.

Regarding **Table 4**, long-term hospital stay (10.3%), pregnancy (17.6%), estrogen-based medications (20.5%), surgeries (18.6%), having cancer (8.4%), and varicose veins (22.2%) were not correctly identified by the majority of respondents as risk factors for venous thrombosis. Long-term immobility (39.5%), increasing age (42.7%), family history (39.2%), and lack of exercise (39%) were correctly identified by less than half of respondents. Obesity is associated with increasing the risk of VTE and was correctly identified by more than half of the respondents (59.2%). HTN and DM, and high blood cholesterol were identified by (51.1%), and (50.8%) of respondents, respectively, as risk factors for VTE. Regarding the risk factors of arterial thrombosis, HTN and DM (54.6%) and obesity (54%) were correctly identified by more than half of the respondents. Increasing age (43.5%), family history (35.2%), smoking (42.9%), high blood cholesterol (48.7%), and lack of exercise (34.8%), which are strongly associated with arterial thrombosis were identified by less than half of the respondents.

In **table 5**, nearly two-thirds (63.2%) of the recruited sample are positive that there is a difference between arterial and venous thrombosis. About 69.5% and 80.2% of respondents think that venous and arterial thrombosis are fatal, respectively. Fortunately, 86.2% of the study sample confirm that the overall health awareness is poor and unsatisfactory. Also, 93.2% of respondents support increasing health awareness regarding these two diseases.

#### Descriptive of the knowledge score:

From the following graph the knowledge score seem to be

Venous thrombosis	Yes (n)	%	Arterial thrombosis	Yes (n)	%
<b>Know or hear about venous thrombosis</b>	466	74	<b>Know or hear about arterial thrombosis</b>	481	76.4
<b>Causes of venous thrombosis</b>			<b>Causes of arterial thrombosis</b>		
A tumor in the vein	8	1.3	A tumor in the vein	28	4.4
Accumulation of fat in the veins	114	18.1	Accumulation of fat in the artery*	266	42.2
Clot formation*	370	58.7	Clot formation	181	28.7
Lack of oxygen	22	3.5	Lack of oxygen	42	6.7
I don't know	72	11.4	I don't know	77	12.2
<b>Types of venous thrombosis**</b>			<b>Types of arterial thrombosis**</b>		
Deep venous thrombosis (DVT)*	232	36.8	Deep venous thrombosis (DVT)	147	23.3
Pulmonary embolism*	145	23	Pulmonary embolism	148	23.5
Myocardial infarction	294	46.7	Myocardial infarction*	329	52.2
Ischemic stroke	157	24.9	Ischemic stroke*	181	28.7
I don't know	110	17.5	I don't know	107	17

\*Correct answer. \*\*More than one answer



Risk factors of venous thrombosis**	Yes (n)	%	Risk factors of arterial thrombosis**	Yes (n)	%
Increasing age*	269	42.7	Increasing age*	274	43.5
Long term hospital stay*	65	10.3	Long term hospital stay	51	8.1
HTN and DM*	322	51.1	HTN and DM*	344	54.6
Family history*	247	39.2	Family history*	222	35.2
Surgeries*	117	18.6	Surgeries	122	19.4
Having cancer*	53	8.4	Having cancer	79	12.5
Obesity*	373	59.2	Obesity*	340	54
Long term immobility*	249	39.5	Long term immobility	194	30.8
Pregnancy*	111	17.6	Pregnancy	81	12.9
Estrogen-based medications*	129	20.5	Estrogen-based medications	118	18.7
Smoking*	299	47.5	Smoking*	270	42.9
Varicose vein*	140	22.2	Varicose vein	107	17
High blood cholesterol*	320	50.8	High blood cholesterol*	307	48.7
Lack of exercise*	246	39	Lack of exercise*	219	34.8

\*Correct answer. \*\*More than one answer

Questions	Yes (n)	%
<b>Is there a difference between venous and arterial thrombosis?</b>		
Yes, there are a difference*	398	63.2
No, there are no difference	58	9.2
I don't know	174	27.6
<b>Is venous thrombosis fatal?</b>		
Yes*	438	69.5
No	74	11.8
I don't know	118	18.7
<b>Is arterial thrombosis fatal?</b>		
Yes*	505	80.2
No	39	6.2
I don't know	86	13.6
<b>Is there enough awareness about these two diseases in your area?</b>		
Yes	87	13.8
No	543	86.2
<b>Do you support increasing health awareness regarding these two diseases?</b>		
Yes	587	93.2
No	43	6.8

\*Correct answer

normally distributed, as the mean and median are very close to each other, and the standard deviation (SD) isn't very large.

The knowledge score was calculated per participants and came out to follow an approximately normal distribution with mean ( $\pm$ SD) of 20.9 ( $\pm$ 5.1).

However, the following graph shows that the approximately normal distribution of the knowledge score may be multi-modal instead of the typical mono-modal bell shaped curve of the normal distribution.

#### The two-sample t-test for knowledge score:

A two-sample t-test was used to identify the demographic

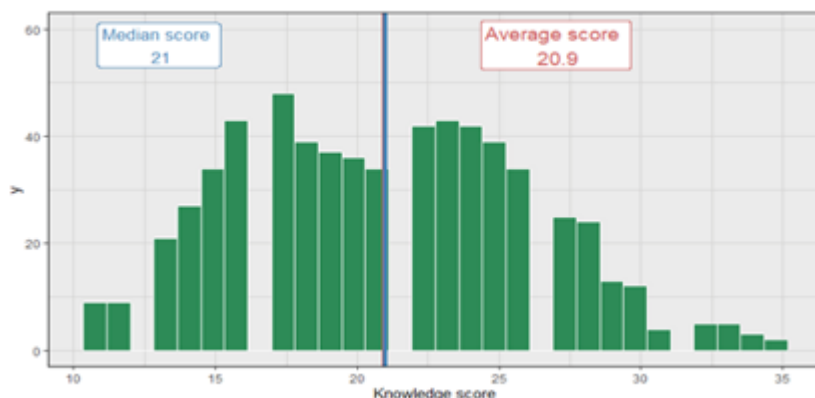
factors that influence the knowledge status of the South Jordanian population. The following table (6) shows the results.

The variable	The knowledge score (Avg (SD))	p-value
<b>Age</b>		
18-30	20.4 (4.9)	0.0027*
More than 30	21.6 (5.4)	
<b>Gender</b>		
Female	21.2 (5)	0.1478
Male	20.5 (5.3)	
<b>Educational level</b>		
Pre-bachelor	19.8 (4.6)	< 0.001*
Bachelor or post	21.5 (5.3)	
<b>Employment</b>		
Employed	21.5 (5.4)	0.0017*
No work	20.2 (4.7)	
<b>Residence</b>		
The city	21.1 (5.1)	0.3577
The countryside	20.8 (5.2)	
<b>Monthly income</b>		
Below 500	20.3 (5)	< 0.001*
Above 500	22.1 (5.1)	

\*Significant at 0.05 level.

A statistically significant difference was shown between the age groups, individuals aged more than 30 years have significantly better average knowledge scores (p-value = 0.0027). Between individuals holding at least a bachelor's and individuals with less advanced educational background, primary and secondary education level is associated with less knowledge (p-value < 0.001). Between employed and unemployed individuals, working in the medical or non-medical field is associated with better knowledge. Unemployed individuals seem to be the least knowledgeable (p-value = 0.0017). Between individuals gaining at least 500 JD per month and those getting less than 500 JD, earning less than 500 JD per month is associated with





less knowledge (p-value < 0.001).

There is no notable difference in the knowledge between the two genders (p-value = 0.1478) and no statistically significant difference in the knowledge between individuals from urban or rural areas (p-value = 0.3577).

## DISCUSSION

This study is the first study that assesses the level of awareness of the public, particularly the southern Jordanian public of both VTE and arterial thrombosis and the difference between them. The study may be helpful to the researcher to conduct it in their countries to increase awareness about two diseases with considerable mortality worldwide. The study demonstrates the lack of awareness of the public about them. Regarding VTE, a minority of the people were able to define DVT (36.8%) and PE (23%) as a type of VTE, but they correctly defined the cause as a clot formation within the vein. Since people knew the cause of VTE, but they did not know the correct types, this reflects a poor knowledge about the disease. A study conducted in public by Michele G. Beckman, which founds that only 38% of the respondents knew that DVT, a type of VTE was a clot in a vein.<sup>20</sup> The current study are consistent with other studies. The awareness about DVT and PE in a study conducted on the Saudi Arabia population demonstrates a low level of awareness, with only 18.6% and 38.7% knowledge about DVT and PE, respectively.<sup>16</sup> In a study conducted on hospitalized patients to assess their awareness, the study found that only 36% and 22.2% of them knew that DVT and PE, respectively, were caused by blood clots in the vein.<sup>15</sup> Also, in Hind Almodaimagh's study, 31.6% and 17.9% of patients knew about DVT and PE, respectively.<sup>14</sup>

The awareness of the study population toward arterial thrombosis and the cause of arterial thrombosis was higher than of VTE. More than half of people were be able to define the myocardial infarction as a type of arterial thrombosis, while less than half of them defines the ischemic stroke as a cause. These results indicate the lack of knowledge about the disease since only 42.2% of the study population knew that the accumulation of fat in the artery is main cause of arterial thrombosis. A study was conducted by Aaron M. Wendelboe

to determine the global burden of thrombosis demonstrate that the awareness of public toward DVT (44%) and PE (54%) was lower than stroke (85%) and myocardial infarction (88%).<sup>21</sup> Another study conducted in Saudi Arabia reveals that awareness toward MI (83.3%) and stroke (78.2%) was higher than DVT (46.4%) and PE (35.6%).<sup>22</sup>

The awareness of respondents to the risk factors of VTE was lower than of arterial thrombosis. Family history, long term hospital stay, surgeries, cancer, immobility, pregnancy, varicose vein, estrogen-based medications, increasing age, and lack of exercise all are highly associated with increasing risk of VTE and the current study demonstrates the lack of knowledge about these risk factors. Obesity and hypercholesterolemia are associated with an increased risk of arterial thrombosis more than venous thrombosis, in the current study, identified as risk factors for VTE by more than half of the respondents compared with the other highly associated risk factors. The current study results are consistent with other studies in which aging, pregnancy, family history, having cancer, surgeries, hospital stay, and estrogen-based medications were not correctly identified as risk factors.<sup>21,16,15,14,23</sup> Immobility which is a common risk factor related to VTE was correctly identified in the same studies.

Chronic diseases such as hypertension, diabetes, and hyperlipidemia, obesity, and smoking are highly associated with arterial thrombosis.<sup>24,25</sup> Regarding the awareness of arterial thrombosis risk factors, 54.6% and 54% of respondents correctly identified HTN and DM, and obesity as risk factors, respectively.

Increasing age, family history, smoking, hyperlipidemia, and lack of exercise are highly associated risk factors for arterial thrombosis. They were identified by less than half of the study participants. In Anan Jarab's study, hypertension, hypercholesterolemia, smoking, and obesity were identified by the majority of respondents as risk factors for VTE,<sup>15</sup> but these factors are highly associated with arterial more than venous thrombosis.

Although 63.2% of respondents answer that there is a difference between venous and arterial thrombosis, the previous results of the current study demonstrate that there is a lack of knowledge



about them, particularly in terms of types and risk factors by answering some questions about the two diseases as they are one disease. Even though venous thrombosis distinctly differs from arterial thrombosis, particularly in the causes and types. Since there are no studies that assess the awareness of public to the difference between the two diseases, more evaluation is needed. The reasons for lack of awareness of these two diseases may be due to the lack of adequate courses, lectures and publications that spread awareness among members of society, the lack of understanding of the General Society of the pathological nature of the disease may also affect.

About seventy percent and eighty percent of the respondents consider venous thrombosis and arterial thrombosis, respectively, fatal diseases. Nearly 43.8% of the Khaleel Alyahya study respondents agreed that a blood clot could cause death.<sup>16</sup> Another study in Saudi Arabia was conducted to assess the awareness of the population about blood clots and found that 54.9% of the respondents agreed with the ability of clots to cause deaths.<sup>22</sup> In the A. M. WENDELBOE study,<sup>26</sup> Hind Almodaimagh study,<sup>14</sup> and Anan S Jarab study<sup>15</sup> the awareness of respondents to the possibility of death with clots was consistent with the current study with a percent of 82.6%, 76.7%, and 80.4% respectively.

This study also presented the factors that may affect the level of awareness of society toward VTE and arterial thrombosis and found that individuals aged more than 30 years have significantly better knowledge compared with individuals aged less than 30 years. Two other studies have also proven that older people have more awareness of venous thrombosis.<sup>15,22</sup> Older aged people may be more knowledgeable about thrombosis because they are considerably more at risk and more likely to have comorbid conditions.

Also, the study demonstrates that a higher educational level is associated with better awareness, which makes it easier to diagnose and deal with the disease and its symptoms and facilitates better medical interventions. The study results are consistent with previous studies. Two studies were conducted on different populations in Saudi Arabia demonstrate that a higher educational level is associated with better awareness.<sup>27,28</sup>

Also, the study demonstrated that working people are better aware of thrombosis. A study conducted by Abdulsalam M

Halboup on the population of Sana'a-Yemen shows that people with professions are more likely to be aware of the thrombosis diseases.<sup>17</sup> Working may increase the level of awareness of the employees since the medical field workers are in more contact with patients and healthcare providers, which may contribute to publishing medical information among community members by these workers.

The current study also demonstrates that people with higher incomes have more awareness about these two diseases, this may be due to their ability to pay more for the periodic examinations to check their body health. In a study conducted to assess the awareness of US young adults about stroke symptoms, the study shows that high incomes are associated with more awareness.<sup>29</sup>

The study has some limitations. First, the close-ended questions may affect the participant's answers by answering with guessing rather than answering with knowledge. Second, social media was used to draw the study's sample, which might bias the results of people who have difficulties using technology.

## CONCLUSION

The overall study reveals that there is a lack of awareness about VTE and arterial thrombosis and the difference between them among the southern Jordanian public. VTE and arterial thrombosis are preventable diseases, so more attention should be given by increasing the educational campaign and the initiatives of public health about the difference between them in terms of signs and symptoms, risk factors, and complications. The best ways to increase the awareness must be determined by further research. Also, more research is needed to assess public awareness about arterial thrombosis because most of the awareness thrombosis studies talked about VTE awareness much more than arterial thrombosis.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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