

# Evaluation of the knowledge and attitudes on stroke among family medicine residents in Ankara province

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## ABSTRACT

**Aims:** Stroke is a major cause of morbidity and mortality worldwide and in Türkiye. A significant proportion of patients in family medicine practice are individuals at risk for stroke. This study aimed to assess the knowledge and attitudes regarding stroke among family medicine residents working in medical faculties and training and research hospitals in Ankara.

**Methods:** This descriptive cross-sectional study included 241 family medicine residents working in Ankara. Sociodemographic characteristics, knowledge, attitudes, and training status related to stroke were collected using a structured questionnaire. Data were analyzed using IBM SPSS version 25.0.

**Results:** Of the participants, 140 (58.1%) were female and 101 (41.9%) were male. The mean knowledge score was  $79.63 \pm 7.89$ , and the mean attitude score was  $86.78 \pm 5.94$ . Only 31 participants (12.9%) had completed a neurology rotation. Forty-seven participants (19.5%) had previously received training on stroke; 34 (14.1%) considered themselves sufficient in stroke management, while 131 (54.4%) considered themselves partially sufficient. Seventy-one participants (29.5%) reported adequate knowledge of stroke risk factors. Knowledge scores were significantly higher among those who had completed a neurology rotation ( $p=0.027$ ). Participants who had received stroke-related training felt more competent in the subject ( $p<0.001$ ). No significant correlation was found between age, years in practice, or duration of residency and knowledge or attitude scores.

**Conclusion:** Although family medicine residents demonstrated generally adequate knowledge about stroke, there were gaps in training and practical experience. The rates of participation in neurology rotations and stroke-related educational programs were low. Completing a neurology rotation was associated with higher knowledge scores. Incorporating neurology rotations into residency training may positively enhance residents' knowledge and attitudes toward stroke, which is crucial for public health.

**Keywords:** Family medicine, stroke, cerebrovascular disease, knowledge, attitude

## INTRODUCTION

Stroke is a major cause of morbidity and mortality worldwide and in Türkiye. According to World Health Organisation (WHO) data, stroke ranks second among causes of death worldwide and affects approximately 15 million people each year. Of these, approximately 5 million die, while 5 million continue to live with permanent disabilities.<sup>1</sup> It is the fourth leading cause of death in the United States.<sup>2</sup> According to 2023 data from the Turkish Statistical Institute (TÜİK), cerebrovascular diseases account for approximately 6.8% of all deaths in Türkiye, making it the third leading cause of death.<sup>3</sup>

Stroke not only reduces an individual's quality of life but also imposes a significant economic burden on the healthcare

system and society. Therefore, early recognition, prevention of risk factors, and effective management of stroke are of great importance at both the individual and societal levels. Primary healthcare services, and particularly family physicians, play a critical role in stroke prevention.<sup>4</sup>

The most important risk factors for stroke include preventable conditions such as hypertension, diabetes, dyslipidaemia, atrial fibrillation, smoking, and obesity.<sup>5,6</sup> Family physicians' ability to recognise and manage these risk factors may be decisive in reducing the incidence of stroke.<sup>7</sup>

Additionally, stroke is a clinical condition that requires a race against time in terms of diagnosis and treatment. Therefore,

early detection, appropriate management, and prompt referral are of great importance.<sup>8</sup> In this process, the role of primary care providers, especially family physicians and family medicine residents undergoing specialised training, is critical.

The literature indicates that healthcare professionals' knowledge of stroke symptoms and their ability to respond appropriately directly affect the success of the intervention process.<sup>9,10</sup> However, various studies have shown that family physicians and primary care healthcare professionals do not have sufficient knowledge about stroke and that their level of knowledge in this area varies.<sup>11-13</sup>

Research on the knowledge levels and attitudes of family medicine residents regarding stroke in Türkiye is limited. Most of the existing studies in the literature focus on groups such as nurses, medical students, or emergency department staff.<sup>14</sup>

In our study, the knowledge and attitudes of family medicine residents regarding stroke will be evaluated. This will help increase the awareness of family physicians, who will provide primary care, regarding stroke.

## METHODS

Prior to the start of the study, approval was obtained from the Clinical Researches Ethics Committee of Ankara Training and Research Hospital, University of Health Sciences (Date: 28.12.2022, Decision No: 1171/2022). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

This study is a cross-sectional descriptive study. A face-to-face survey was conducted with family medicine resident doctors actively working in Ankara between 28 December 2022 and 25 June 2023. There were a total of 604 family medicine residents studying in Ankara province. The sample size was calculated as at least 236 people at a 95% confidence level, based on a population of 604 and a margin of error of 5%. A total of 241 individuals were included in the study. Of the 285 individuals invited, 28 refused to participate and 16 provided incomplete questionnaires; therefore, the final participation rate was 84.6%.

The questionnaire includes 5 questions on sociodemographic characteristics and 6 questions on participants' education, behaviour, and experiences related to stroke. The knowledge and attitude questions were developed by reviewing questions used in previous similar studies. There are 24 knowledge questions and 15 attitude questions, and the scores obtained from each were converted to a 100-point system. Symptom knowledge and risk factor knowledge were calculated as one point each, while statements were calculated as two points each.

### Statistical Analysis

IBM SPSS 25.0 (IBM Statistical Package for Social Sciences, version 25) software was used for data analysis in the study. The normality of distribution was tested using the Kolmogorov-Smirnov and Shapiro-Wilk tests. To examine the difference between group means, the Student t-test and

ANOVA variance analysis were used for variables showing normal distribution, while the Mann-Whitney U test and Kruskal Wallis test were used for variables not showing normal distribution. The Chi-square test was used to examine the relationships between nominal variables, and the Pearson correlation test and Spearman correlation test were used to examine the degree of relationship between numerical variables. The significance level was set at  $p < 0.05$  for all tests.

## RESULTS

A total of 241 family medicine residents working in family medicine clinics at medical faculties and training and research hospitals in Ankara province were included in the study. Of the participants, 140 (58.1%) were female and 101 (41.9%) were male; 204 (84.6%) of the residents worked full-time, and 37 (15.4%) worked on a contractual basis. When the distribution by year of residency was examined, 121 (50.2%) of the participants were in their first year, 36 (14.9%) were in their second year, and 84 (34.9%) were in their third year of residency. The sociodemographic characteristics of the participants are presented in **Table 1**.

**Table 1.** Sociodemographic characteristics of participants (n=241)

Sociodemographic characteristics		n	%
Gender	Female	140	58.1
	Male	101	41.9
Assistant status	Full-time	204	84.6
	Contractual	37	15.4
Assistant period	1	121	50.2
	2	36	14.9
	3	84	34.9

Only 31 participants (12.9%) had completed a neurology rotation. The number of participants who had previously received training on stroke was 47 (19.5%). Male gender ( $p=0.025$ ), full-time assistants ( $p=0.015$ ), and those who had received stroke training ( $p<0.001$ ) had statistically significantly higher perceptions of competence. On the other hand, no significant difference was found between having completed a neurology rotation and perceived competence ( $p=0.077$ ). A comparison of participants' characteristics and their perceived competence in stroke care is presented in **Table 2**.

Participants were found to have answered statements containing stroke risk factors correctly at a high rate. The most commonly known stroke risk factors were, in order, 'previous history of stroke' (97.9%), "smoking" (96.7%) and 'atrial fibrillation'. Among the risk factors presented to participants, only the statement 'Female gender is a risk factor for stroke' was incorrect, and 31.5% of participants answered 'yes' to this statement, indicating that they had provided an incorrect response. The participants' responses to statements containing information about stroke risk factors are presented in **Table 3**.

Most participants correctly identified stroke symptoms. The most commonly recognised stroke symptom was 'speech impairment' (98.8%), followed by 'consciousness impairment' (98.3%) and 'loss of balance' (95.9%). It was found that

**Table 2.** Comparison of participants' self-perceived competence in stroke care with certain characteristics (n=241)

Characteristics		The state of considering oneself competent about the subject of stroke			P*
		Yes n (%)	No n (%)	In part n (%)	
Gender	Female (n=140)	13 (9.3)	50 (35.7)	77 (55.0)	0.025
	Male (n=101)	21 (20.8)	26 (25.7)	54 (53.5)	
Assistant status	Full-time (n=204)	29 (14.2)	57 (27.9)	118 (57.8)	0.015
	Contractual (n=37)	5 (13.5)	19 (51.4)	13 (35.1)	
Neurology rotation completed	Yes (n=31)	8 (25.8)	6 (19.4)	17 (54.8)	0.077
	No (n=210)	26 (12.4)	70 (33.3)	114 (54.3)	
Stroke training received	Yes (n=47)	15 (31.9)	6 (12.8)	26 (55.3)	<0.001
	No (n=194)	19 (9.8)	70 (36.1)	105 (54.1)	

Chi-square test, p&lt;0.05 is statistically significant

**Table 3.** Distribution of participants' responses to statements containing information about stroke risk factors

Statements about stroke risk factors	Answers	
	Yes n (%)	No n (%)
A history of stroke is a risk factor for stroke. (C)	236 (97.9)	5 (2.1)
Smoking is a risk factor for stroke. (C)	233 (96.7)	8 (3.3)
Atrial fibrillation is a risk factor for stroke. (C)	232 (96.3)	9 (3.7)
Hypertension is a risk factor for stroke. (C)	228 (94.6)	13 (5.4)
A history of transient ischaemic attack is a risk factor for stroke. (C)	224 (92.9)	17 (7.1)
Advanced age is a risk factor for stroke. (C)	224 (92.9)	17 (7.1)
Diabetes is a risk factor for stroke. (C)	218 (90.5)	23 (9.5)
Dyslipidaemia is a risk factor for stroke. (C)	216 (89.6)	25 (10.4)
Female gender is a risk factor for stroke. (I)	76 (31.5)	165 (68.5)

C: Correct, I: Incorrect

participants incorrectly identified 'facial flushing' (19.5%) and 'coldness in the extremities' (36.9%) as stroke symptoms. The distribution of responses to information-based statements about stroke symptoms is presented in [Table 4](#).

**Table 4.** Distribution of participants' responses to statements containing information about stroke symptoms

Statements about stroke symptoms	Answers	
	Yes n (%)	No n (%)
Speech impairment is a symptom of stroke. (C)	238 (98.8)	3 (1.2)
Consciousness impairment is a symptom of stroke. (C)	237 (98.3)	4 (1.7)
Loss of balance is a symptom of stroke. (C)	231 (95.9)	10 (4.1)
Blurred vision/double vision is a symptom of stroke. (C)	229 (95.0)	12 (5.0)
Dizziness is a symptom of stroke. (C)	211 (87.6)	30 (12.4)
Headache is a symptom of stroke. (C)	205 (85.1)	36 (14.9)
Facial flushing is a symptom of stroke. (I)	57 (19.5)	194 (80.5)
Coldness in the extremities is a symptom of stroke. (I)	89 (36.9)	152 (63.1)

C: Correct, I: Incorrect

The majority of participants demonstrated a positive attitude by responding "I agree" to statements related to prevention of stroke. All participants responded "I agree" to the statement "Smoking cessation is recommended", followed by 'Regular physical activity is recommended' (99.2%), 'Weight reduction is recommended for patients with a high body mass index' (99.2%), and 'Blood pressure levels should be monitored, and treatment should be arranged for patients with high blood pressure' (99.1%). Regarding the single incorrect statement, 'Antioxidant vitamin supplements have been proven to reduce the risk of stroke.' 43.2% responded with 'I agree,' giving an incorrect answer, while 8.7% responded with 'I disagree,' giving the correct answer, and 48.1% indicated 'I am undecided.' The distribution of participants' agreement with statements related to stroke prevention is presented in [Table 5](#).

**Table 5.** Distribution of participants' agreement with statements related to fall prevention

Statements related to prevention of stroke	Answers		
	Agree n (%)	Disagree n (%)	Undecided n (%)
Quitting smoking is recommended. (C)	241 (100)	-	-
Regular physical activity is recommended. (C)	239 (99.2)	1 (0.4)	1 (0.4)
Weight reduction is recommended for patients with a high body-mass index. (C)	239 (99.2)	-	2 (0.8)
Blood pressure levels should be monitored, and treatment should be arranged for patients with high blood pressure. (C)	240 (99.1)	-	1 (0.4)
Appropriate treatment should be arranged for patients with high cholesterol levels. (C)	237 (98.3)	2 (0.8)	2 (0.8)
Blood sugar levels should be monitored, and treatment is recommended for patients diagnosed with diabetes. (C)	233 (96.7)	-	8 (3.3)
Antioxidant vitamin supplements have been proven to reduce the risk of stroke. (e.g., vitamin D supplements) (I)	104 (43.2)	21 (8.7)	116 (48.1)
In primary care, pulse assessment followed by active atrial fibrillation screening with electrocardiography may be beneficial in patients over 65 years of age. (C)	223 (92.5)	2 (0.8)	16 (6.6)

C: Correct, I: Incorrect

As a result of the assessment measuring the participants' knowledge levels, the average knowledge score was determined to be 79.63 (min. 48.39-max. 100). In the section evaluating attitude levels, the average attitude score was calculated to be 86.78 (min. 66.67-max. 100).

When examining the relationship between sociodemographic characteristics and knowledge scores, only those who had completed a neurology rotation had statistically significantly higher stroke knowledge scores (p=0.027). No significant differences were observed for other variables (p>0.05). No statistically significant relationship was found between gender, residency status, neurology rotation, and stroke education status and attitude scores (p>0.05). The comparison

of sociodemographic variables with knowledge and attitude scores is shown in [Table 6](#).

**Table 6.** Comparison of sociodemographic variables with knowledge and attitude scores

Sociodemographic characteristics		Knowledge score		Attitude score	
		Mean±SD	P	Mean±SD	P
Gender	Female	79.74±7.27	0.084	87.09±5.83	0.583
	Male	79.46±8.73		86.33±6.00	
Assistant status	Full-time	79.80±7.91	0.931	87.07±5.75	0.054
	Contractual	78.63±7.84		85.13±6.50	
Neurology rotation completed	Yes	80.02±10.00	0.027	84.51±6.47	0.497
	No	79.51±7.54		87.11±5.75	
Stroke training received	Yes	80.02±6.94	0.297	86.52±5.38	0.223
	No	79.41±8.09		86.80±6.06	

SD: Standard deviation. \*Student's t-test, p<0.05 is statistically significant

No significant correlation was found between knowledge and attitude scores and age, years of professional experience and length of assistantship (p>0.05). The results of the correlation analysis between participants' age, years of professional experience and length of assistantship and their knowledge and attitude scores are presented in [Table 7](#).

**Table 7.** Correlation analysis results between participants' age, years of professional experience, and duration of assistantship and their knowledge and attitude scores

Sociodemographic characteristics		Knowledge score		Attitude score	
Age	r	0.042		0.001	
	p	0.518		0.986	
Years of experience	r	0.027		-0.011	
	p	0.681		0.862	
Duration of residency	r	0.036		0.086	
	p	0.577		0.185	

Pearson correlation test, p<0.05 is statistically significant

## DISCUSSION

It was determined that 19.5% of family medicine residents working in Ankara who participated in the study had previously received training on stroke. Ding et al.<sup>13</sup> reported that 67.8% of primary care workers had participated in stroke training. In a study conducted by Traynelis<sup>15</sup> with 63 participants, 70% of the participants stated that they had completed a training programme on stroke. According to the data in the literature, it is seen that the rate of family physicians in Ankara participating in training on stroke is low. This indicates that training in this area is not sufficiently systematic during specialist training. This is a problem that is frequently highlighted in the literature. In a study by Albart et al.,<sup>16</sup> it was emphasised that primary care physicians have significant gaps in their knowledge about stroke and that training programmes are necessary.

Only 12.9% of family medicine residents participating in the study were found to have completed a neurology rotation. The reason for the low number of physicians completing a neurology rotation may be explained by the fact that neurology rotation is an elective rotation and is not frequently

chosen by residency students. In our study, the fact that the knowledge scores of participants who completed a neurology rotation were statistically significantly higher indicates that clinical experience has a positive effect on knowledge levels. This finding is consistent with studies supporting the impact of experiential learning on knowledge acquisition.<sup>7,9</sup> It highlights the importance of including these rotations in educational programmes to increase stroke awareness.

Our study showed that male residents, full-time employees, and those who had previously received stroke training felt more competent in stroke care. In particular, the statistically significant increase in perceived competence following stroke training underscores the importance of such education in this field. This finding is consistent with other studies showing that healthcare workers' self-confidence and sense of competence increase through education.<sup>12</sup> However, it is noteworthy that the competence perceptions of residents who completed a neurology rotation were not significantly different from those who did not. This finding may indicate that the content and effectiveness of rotation programmes need to be reviewed. It is possible that the theoretical and practical knowledge acquired during the neurology rotation does not sufficiently reflect the residents' perceptions of clinical competence. Integrating more structured training focused on standardised and evidence-based clinical guidelines for stroke management and prevention into family medicine residency programmes may be beneficial.

The average knowledge score of participants was 79.63, which indicates a medium-high level of knowledge when compared to similar studies in the literature. A study conducted in India to assess the knowledge level of primary healthcare workers found a lower level of knowledge.<sup>11</sup> This suggests that medical education in Türkiye has a relatively stronger theoretical foundation in stroke. However, the fact that 31.5% of participants answered incorrectly to the statement 'female gender is a risk factor for stroke' indicates that misconceptions in this area are still widespread. While it is known that advanced age increases the risk of stroke in women, current international guidelines emphasise that gender alone is not an independent risk factor, and that the risk increases as a result of the interaction between age and other factors.<sup>17</sup> Family physicians play an important role in conveying such nuanced information to their patients to enable accurate risk assessment.

One of the most notable findings of the study is the significant difference in knowledge levels between those who have completed a neurology rotation and those who have not. This supports the notion that clinical experience directly influences stroke knowledge. Similarly, Pandian et al.<sup>9</sup> reported that healthcare workers' knowledge levels regarding stroke are directly related to their on-the-ground experience. In this context, it can be said that structured clinical rotations and practical training aimed at increasing stroke awareness among physicians working in primary care are particularly important. However, the fact that 87.1% of the participants had not completed a neurology rotation and 80.5% had not received formal training in this area indicates that there is significant room for improvement in terms of increasing knowledge levels. As emphasised in the literature, healthcare professionals working in primary care in particular are



reported to need training in rapid diagnosis, emergency referral and awareness of risk factors for stroke.<sup>10</sup>

Participants were found to have answered statements containing stroke risk factors correctly at a high rate. The most common risk factors for stroke were, in order, 'history of stroke' (97.9%), 'smoking' (96.7%), and 'atrial fibrillation' (96.3%). Among the risk factors presented to participants, only the statement 'female gender is a risk factor for stroke' was incorrect, and 31.5% of participants answered 'yes' to this statement, indicating an incorrect response. In a study involving 173 participants investigating patients' knowledge of stroke, smoking was found to be the most commonly known risk factor, and none of the participants were aware that male gender was a risk factor.<sup>18</sup> All participants recommended quitting smoking to prevent stroke. Based on these results, smoking is one of the most well-known risk factors for stroke, both in our own study and in the literature.

Most participants correctly identified stroke symptoms. The most commonly recognised stroke symptom was 'speech impairment' (98.8%), followed by 'consciousness impairment' (98.3%) and 'loss of balance' (95.9%). It was found that participants incorrectly identified 'facial flushing' (19.5%) and 'coldness in the extremities' (36.9%) as stroke symptoms. In a study examining nursing students' misconceptions about stroke, it was observed that many students limited the neurological assessment for stroke to impaired consciousness.<sup>19</sup> In a study by Ramírez-Moreno et al.<sup>20</sup> investigating the general population's knowledge of stroke, it was found that 73% of the general population knew at least one symptom, with the most commonly known symptoms being sudden weakness, dizziness, and headache. In a study by Pérez-Lázaro et al.,<sup>21</sup> it was observed that 63.5% of the population did not recognise stroke symptoms. These results show that family medicine residents in Ankara have a relatively high level of knowledge in this area, but also indicate that some misconceptions still persist and that awareness of stroke symptoms needs to be further improved.

The high percentage of participants who responded 'agree' to statements related to stroke prevention indicates that they generally have a positive attitude. The high average attitude score (86.78) indicates that family physicians are willing and prepared to play a key role in primary and secondary stroke prevention.<sup>14</sup> In particular, their awareness of the importance of managing known risk factors such as hypertension, diabetes, and smoking in stroke prevention was found to be high.

All participants agreed with the statement 'Quitting smoking is recommended.' for stroke prevention, followed by 'Regular physical activity is recommended' (99.2%), 'Weight reduction is recommended for patients with a high body-mass index' (99.2%), and 'Blood pressure levels should be monitored, and treatment should be arranged for patients with high blood pressure' (99.1%). The majority of participants responded 'I agree' to statements related to stroke prevention at a high rate, demonstrating a positive attitude towards stroke prevention. However, although the statement 'Antioxidant vitamin supplements have been proven to reduce the risk of stroke.' is incorrect, 43.2% of participants accepted it as

true. In fact, there is no scientific evidence to support the claim that antioxidants reduce the risk. Current guidelines and meta-analyses indicate that antioxidant supplements (especially vitamins C and E, beta-carotene) do not reduce the risk of stroke and may even have potential harmful effects in some cases.<sup>22</sup> Additionally, there is evidence that vitamin E supplements may increase the risk of haemorrhagic stroke.<sup>23</sup> This lack of information poses a significant problem for evidence-based medical practice. Family physicians must provide accurate guidance on popular but unproven treatment methods during patient consultations. Emphasising such current and evidence-based information in family medicine residency training programmes is critical for patient safety and effective treatment management.

In our study, a statistically significant difference was found between participants' neurology rotation status and their knowledge scores. In a study conducted by Traynelis,<sup>15</sup> participants who attended a continuing education programme on stroke scored significantly higher on a test prepared on stroke knowledge than those who did not participate. In a study conducted by Rababah et al.<sup>24</sup> involving doctors, registered nurses, and healthcare workers, a randomised test study was designed after a single-session stroke education programme was presented, and it was observed that the education programme had a positive effect on the stroke knowledge level of healthcare providers. Another study also showed that the knowledge level of emergency department staff increased after they were included in an education programme.<sup>25</sup> Based on these data, we believe that the participation rate of family medicine residents in Ankara in stroke education and the increase in the number of residents completing a neurology rotation will lead to an improvement in their knowledge and attitudes.

In our study, other sociodemographic variables such as gender, duration of residency, age, and years of professional experience did not show a significant relationship with either knowledge or attitude scores. This finding suggests that knowledge and attitude levels are shaped more by individual effort, clinical experience, and education.<sup>26</sup>

The fact that the average attitude score of the participants was higher than the average knowledge score indicates that residents have a high level of sensitivity towards stroke, but this positive attitude does not always translate into knowledge. This situation is defined in the literature as the 'knowledge-attitude gap,' and it is recommended that primary care physicians adopt methods to reduce this gap in their educational strategies.<sup>27</sup>

### Limitations

This study is important as one of the few studies evaluating the knowledge and attitudes of family medicine residents in Türkiye regarding stroke. However, the fact that the study was conducted only in Ankara limits the generalisability of the findings. Additionally, the fact that the data were collected through self-reporting increases the likelihood that the responses are based on perception. Finally, due to some knowledge questions remaining at a theoretical level, clinical practice competence may not have been fully reflected.

## CONCLUSION

The study showed that family medicine residents generally had sufficient knowledge about stroke, but there were gaps in their practical skills. The rates of family medicine residents in Ankara who completed a neurology rotation and participated in a training programme on stroke were low. Those who completed a neurology rotation had higher knowledge scores than those who did not. We believe that family medicine residents completing a neurology rotation will positively improve their knowledge and attitudes regarding stroke, which is important for public health.

## ETHICAL DECLARATIONS

### Ethics Committee Approval

The study was conducted after obtaining approval from the Clinical Researches Ethics Committee of Ankara Training and Research Hospital, University of Health Sciences (Date: 28.12.2022, Decision No: 1171/2022).

### Informed Consent

All patients signed and free and informed consent form.

### Referee Evaluation Process

Externally peer-reviewed.

### Conflict of Interest Statement

The authors have no conflicts of interest to declare.

### Financial Disclosure

The authors declared that this study has received no financial support.

### Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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