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The level of knowledge on acute stroke among teachers in public and private schools in western region, Saudi Arabia: a cross-sectional study

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ABSTRACT

Background: Stroke is a major global health issue, ranking second in mortality and third in disability worldwide. In Saudi Arabia, it is the third leading cause of death, following ischemic heart disease and road injuries. Teacher awareness of stroke signs, symptoms, and risk factors is crucial for enhancing community awareness, and enabling early identification, risk modification, and prevention. The present study aimed at assessing the knowledge level on acute stroke among teachers in Public and Private Schools western region, Saudi Arabia.

Methods: A descriptive cross-sectional study was conducted among public and private school teachers using an online questionnaire distributed via Google Forms. The survey collected demographic and work-related data, as well as teachers' knowledge of stroke warning signs, symptoms, risk factors, treatments, response actions, and prior stroke experiences. Data were analyzed using Statistical Package for the Social Sciences.

Results: A total of 289 teachers enrolled in our study. Among them, 277 (95.8%) had heard of the term "stroke," and 73.4% knew that sudden numbness or weakness of the face, arm, or leg is a symptom of stroke. The most commonly known risk factor was high blood pressure (89.6%). We also found that 51.9% of teachers had fair knowledge about stroke, while 37% demonstrated a good knowledge level. On the other hand, no significant relationship was found between teachers' level of knowledge about stroke and other demographic or work-related data ($p > 0.05$). However, the results indicate that a good knowledge level about stroke was significantly higher among teachers who knew someone who had experienced a stroke ($p < 0.05$).

Conclusion: The present study found stroke-related knowledge among teachers in the western region was fairly good, school campaigns and health education programs are recommended to raise the awareness of community.

Keywords: Stroke awareness, teacher knowledge, risk factors, Saudi Arabia.

Introduction

Stroke is a fatal and devastating disease; it is one of the leading causes of mortality and physical impairment worldwide [1]. According to the World Health Organization (WHO), stroke is defined as "rapidly developing clinical signs of focal [or global] disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin [2]". Stroke can be ischemic or hemorrhagic. Ischemic stroke is caused by a thrombus or embolus resulting in tissue

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damage due to obstruction of cerebral blood flow. It resembles about [85%] of all strokes, while hemorrhagic stroke (15%) can result from a rupture of the supplying artery leading to impaired blood flow to the brain [3].

There are various risk factors for stroke, which can be classified into modifiable and non-modifiable categories. Age, sex, and ethnicity are non-modifiable risk factors for both ischemic and hemorrhagic strokes, whereas hypertension, smoking, diet, and physical inactivity are more commonly recognized as modifiable risk factors [4]. Stroke is a major cause of death and disability worldwide, second only to ischemic heart disease. The incidence and mortality rates of stroke vary between countries and ethnic groups [5]. In Saudi Arabia (SA), stroke is a well-recognized cerebrovascular disorder that leads to increased morbidity and mortality rates, resulting in a significant economic and social burden. Although comprehensive statistics on the prevalence of stroke in SA are lacking, recent research conducted in 2020 estimated the stroke rate in SA to be 29 cases per 100,000 people annually [6].

Enhancing the survival rate and reducing the morbidity of illness for stroke patients is largely dependent on the quality of care they receive. Hence. Early intervention and management of stroke patients not only contribute to a lower mortality rate but also reduce disability and improve survival and independence [7]. Multiple studies were conducted to evaluate the level of awareness regarding stroke among various populations. For example, in Brazil, 1788 public school students aged between 15 and 18 participated in the study [8]. Furthermore, 58.6 % of students are unaware of the signs and symptoms of a stroke. About stroke risk factors, 79.0% have no idea [8]. In addition, another study was applied to school students in the US, showing that the knowledge about stroke could have been better [9]. However, the study in Taif city, Saudi Arabia, regarding stroke public awareness and knowledge showed that of a total of 3,456, there are 61.7% aware of stroke [10]. An unhealthy lifestyle was the most identified risk factor in 84.5% [10]. Lack of awareness of stroke signs, symptoms, and risk factors can delay intervention that can cause permanent complications, and may lead to death [11,12]. Therefore, identifying the level of awareness is necessary to regulate school educational programs. Moreover, up to our knowledge, limited study has documented a level of knowledge regarding stroke among teachers in Saudi Arabia. Hence, we aimed to estimate the awareness and knowledge of stroke among school teachers in Western regions.

Subjects and Methods

This descriptive cross-sectional study was conducted in public and private schools in the Western region of Saudi Arabia. The inclusion criteria consisted of teachers from these schools, while those who refused to participate were excluded. A non-probability convenience sampling technique was employed, including all teachers who received the survey and agreed to participate. Data were collected using an online questionnaire distributed via Google Forms, with electronic links accompanied by the survey's objectives. The questionnaire gathered demographic and work-related data, along with teachers' knowledge about stroke warning signs, symptoms, risk factors, treatments, actions to take during a stroke, and any previous experience with stroke. Knowledge was assessed through 16 questions, assigning a score of "1" for each correct answer and "0" for incorrect answers, yielding a total knowledge score ranging from 0 to 16. Participants were categorized as having poor knowledge (<50% correct), fair knowledge (50%-75% correct), or good knowledge (>75% correct) [13]. Data analysis was performed using Statistical Package for the Social Sciences version 26, with qualitative variables expressed as numbers and percentages and analyzed using the chi-squared test (χ^2), while quantitative variables were expressed as mean ± standard deviatio. Multivariate logistic regression analysis assessed factors associated with good stroke knowledge among teachers, with odds ratios (OR) calculated at a 95% confidence interval (CI). A p-value of < 0.05 was considered statistically significant.

Results

Among the studied subjects, 22.1% of teachers were aged 46-50 years, and 73% were over 40. Of these, 72.7% were female, 85.5% were of Saudi nationality, and 82% were married. The majority (73.7%) worked in government schools, 48.4% were from Jeddah city,

Table 1. *Distribution of studied teachers according to their demographic and work-related data (No.: 289).*

Variable	No. (%)
Age (years)	
25-30	17 (5.9)
31-35	25 (8.7)
36-40	36 (12.5)
41-45	54 (18.7)
46-50	64 (22.1)
51-55	62 (21.5)
56-60	22 (7.6)
>60	9 (3.1)
Gender	
Female	210 (72.7)
Male	79 (27.3)
Nationality	
Saudi	247 (85.5)
No-Saudi	42 (14.5)
Marital status	
Widow	8 (2.8)
Single	18 (6.2)
Married	237 (82)
Divorced	26 (9)
School type	
Private school	76 (26.3)
Governmental school	213 (73.7)
City	
Taif	42 (14.5)
Konfoitha	1 (0.3)
Madinah	24 (8.3)
Jeddah	140 (48.4)
Rabegh	1 (0.3)
Makkah	72 (24.9)
Yano	9 (3.1)
Educational level	
Primary school	75 (26)
Secondary school	116 (40.1)
Middle school	98 (33.9)

and 40.1% taught in secondary schools (Table 1). Of the 289 teachers surveyed, 277 (95.8%) had heard of the term "stroke" (Figure 1). Regarding their knowledge of stroke warning signs and symptoms, 73.4% recognized sudden numbness or weakness of the face, arm, or leg as a symptom, and 72.7% knew that loss of balance or coordination is a sign of stroke. Additionally, 68.2% identified trouble walking as a symptom, while 67.1% recognized trouble seeing in one or both eyes.

Concerning stroke risk factors, high blood pressure was the most commonly known (89.6%), followed by smoking (82.4%). Most teachers (93.8%) believed that stroke requires prompt treatment (Table 2). Table 3 shows that 46.7% of teachers correctly knew that calling an ambulance should be the first action if someone exhibits signs of stroke.

About one-quarter (25.3%) reported knowing someone who had a stroke, and among these, 55% were relatives.

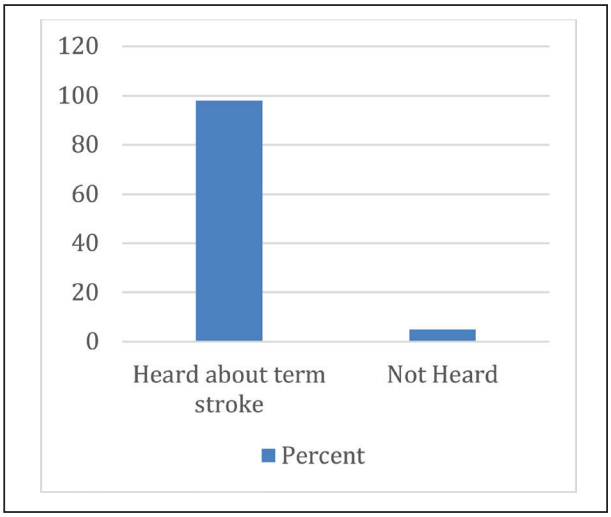

Figure 1. *Percentage distribution of studied teachers according to previous hearing about the term "stroke" (n = 289).*

Table 3. *Distribution of studied teachers according to action taken if someone shows signs and symptoms of stroke and previous experience related to any stroke attack (n = 289).*

Variable	No. (%)
If someone shows signs and symptoms of stroke, what do you think you should do first?	
Give them Aspirin	73 (25.3)
Take them to the hospital, or clinic	53 (18.3)
Contact him/her family	6 (2.1)
Call an ambulance (this is the appropriate action)	135 (46.7)
Call the health care provider	22 (7.6)
Do you know anyone who had stroke?	
No	216 (74.7)
Yes	73 (25.3)
If yes, what is the relation (No.:73)	
Brother	2 (2.7)
Father	6 (8.2)
Friends	8 (10.9)
Mother	6 (8.2)
Neighbor	3 (4.1)
Others	8 (10.9)
Relatives	40 (55)
How old at time of stroke attack? (No.:73)	59.81 ± 14.72
What are the symptoms appearing? (No.:73)	
Headache	42 (57.5)
Vomiting	26 (35.6)
Weakness of face, arm or leg	58 (79.4)
Trouble speaking or understanding speech	65 (89)
Trouble seeing in one or both eyes	44 (60.2)
Trouble walking, dizziness, loss of balance or coordination	68 (93.1)
How was the situation handled? (No.:73)	
Give them Aspirin	7 (9.5)
Take them to the hospital, or clinic	21 (28.7)
Call an ambulance (this is the appropriate action)	41 (56.4)
Call the health care provider	4 (5.4)

Table 2. *Distribution of studied teachers according to their knowledge about warning signs and symptoms, risk factors and treatment of stroke (n = 289).*

Variable	No No. (%)	I don't know No. (%)	Yes No. (%)
How do you identify the warning signs and symptoms of stroke?			
Do you think sudden nosebleed is a stroke symptom?	94 (32.5)	72 (24.9)	123 (42.6)
Do you think sudden numbness or weakness of face, arm or leg is a symptom of stroke?	32 (11.1)	45 (15.6)	212 (73.4)
Do you think sudden trouble seeing in one or both eyes is a stroke symptom?	39 (13.5)	56 (19.4)	194 (67.1)
Do you think sudden trouble walking is a stroke symptom?	39 (13.5)	53 (18.3)	197 (68.2)
Do you think loss of balance or coordination is a stroke symptom?	40 (13.8)	39 (13.5)	210 (72.7)
Do you think high temperature is a symptom of stroke?	104 (36)	83 (28.7)	102 (35.3)
How do you identify the risk factors of stroke?			
Do you think smoking is the risk factor of stroke?	24 (8.3)	27 (9.3)	238 (82.4)
Do you think High blood pressure is the risk factor of stroke?	15 (5.2)	15 (5.2)	259 (89.6)
Do you think Diabetes is the risk factor of stroke?	58 (20.1)	65 (22.5)	166 (57.4)
Do you think heart disease is the risk factor of stroke?	29 (10)	37 (12.8)	223 (77.2)
Do you think Family history is the risk factor of stroke?	58 (20.1)	57 (19.7)	174 (60.2)
Do you think Obesity or Overweight is the risk factor of stroke?	49 (17)	53 (18.3)	187 (64.7)
Do you think High level of cholesterol is the risk factor of stroke?	28 (9.7)	39 (13.5)	222 (76.8)
Stroke treatment			
Do you think Stroke requires prompt treatment?	2 (0.7)	16 (5.5)	271 (93.8)

The stroke patients had a mean age of 59.81 ± 14.72 years, with the most common symptoms being trouble walking, dizziness, and loss of balance or coordination (93.1%). Among those who knew a stroke patient, 56.4% handled the situation correctly by calling an ambulance. Figure 2 illustrates that 51.9% of teachers had fair knowledge about stroke, while 11.1% had poor knowledge, and 37% had good knowledge. Table 4 shows that teachers from Jeddah city had a significantly higher percentage of good knowledge about stroke compared to teachers from other cities ($p < 0.05$). However, no significant relationship was found between teachers' knowledge level and other demographic or work-related data ($p > 0.05$). Figure 3 shows that good knowledge about stroke was significantly higher among teachers who knew someone who had experienced a stroke ($p < 0.05$).

A multivariate logistic regression analysis identified being a resident of Jeddah city as the only independent predictor of good knowledge about acute stroke (Table 5).

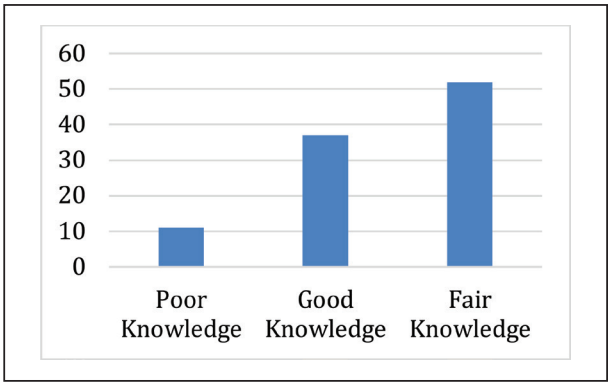

Figure 2. *Percentage distribution of studied teachers according to their level of knowledge about stroke (n = 289).*

Table 4. *Relationship between teachers' level of knowledge about stroke and their demographic and work-related data (n = 289).*

Variable	Knowledge level			χ^2	*p*-value
	Poor No. (%)	Fair No. (%)	Good No. (%)		
Age (years) ≤40 >40	 9 (28.1) 23 (71.9)	 42 (28) 108 (72)	 27 (25.2) 80 (74.8)	0.26	0.857
Gender Female Male	 22 (68.8) 10 (31.3)	 109 (72.7) 41 (27.3)	 79 (73.8) 28 (26.2)	0.32	0.852
Nationality Saudi No-Saudi	 30 (93.8) 2 (6.3)	 129 (86) 21 (14)	 88 (82.2) 19 (17.8)	2.69	0.26
Marital status Widow Single Married Divorced	 0 (0.0) 5 (15.6) 25 (78.1) 2 (6.3)	 5 (3.3) 7 (4.7) 123 (82) 15 (10)	 3 (2.8) 6 (5.6) 89 (83.2) 9 (8.4)	6.8	0.339
School type Private school Governmental school	 5 (15.6) 27 (84.4)	 37 (24.7) 113 (75.3)	 34 (31.8) 73 (68.2)	3.74	0.154
City Taif Konfoitha Madinah Jeddah Rabegh Makkah Yanbo	 1 (3.1) 0 (0.0) 4 (12.5) 11 (34.4) 0 (0.0) 16 (50) 0 (0.0)	 22 (14.7) 0 (0.0) 15 (10) 73 (48.4) 1 (0.7) 31 (20.7) 8 (5.3)	 19 (17.8) 1 (0.9) 5 (4.7) 56 (52.3) 0 (0.0) 25 (23.4) 1 (0.9)	25.07	**0.014**
Educational level Primary school Secondary school Middle school	10 (31.3) 14 (43.8) 8 (25)	40 (26.7) 57 (38) 53 (35.3)	25 (23.4) 45 (42.1) 37 (34.6)	1.87	0.758

N.B.: (χ^2 = 8.9, *p*-value = **0.012**).

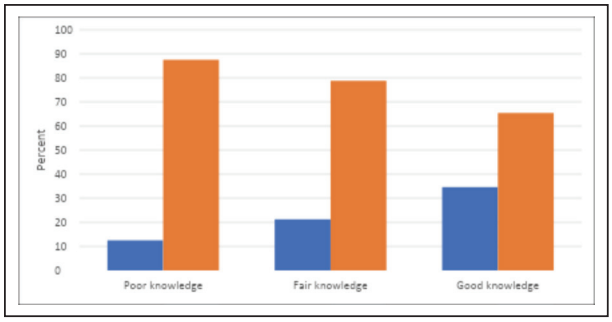

Figure 3. *Relationship between teachers' level of knowledge about stroke and if they knew someone who had stroke (n = 289).*

Table 5. *Multivariate logistic regression analysis of risk factors of NES among studied patients.*

Variable	B	Wald	*p*-value	Odds ratio (CI:95%)
Age (years)	0.15	0.11	0.733	0.17 (0.57-1.88)
Gender	0.79	2.89	0.089	0.45 (0.18-1.12)
Nationality	0.54	0.28	0.594	0.72 (0.23-1.89)
Marital status	0.32	0.46	0.496	0.62 (0.28-0.186)
School type	0.28	0.16	0.682	0.75 (0.19-2.94)
City	0.32	5.35	**0.021***	1.72 (1.54-2.95)
Educational level	0.07	0.08	0.776	0.07 (0.66-1.73)
Do you know anyone who had stroke?	0.92	0.26	0.103	0.52 (0.83-2.67)
* Significant *p* value.				

Discussion

Stroke is a deadly and devastating disease and it is one of the leading causes of mortality and physical disability worldwide [1]. It is defined as rapidly developing clinical signs of focal (or global) disturbance of cerebral function lasting more than 24 hours or leading to death and for which there is no apparent cause other than a vascular origin according to WHO [2]. As teachers are crucial in raising awareness, this study was aimed at assessing the awareness of stroke among teachers of public and private schools in the western region of Saudi Arabia. Significantly in our study 73% of teachers were aged > 40 years, this suggests that the teaching profession is dominated by experienced persons in the studied population. The study sheds light on the nationality and marital status of the teachers. A significant proportion, approximately 85.5%, held Saudi nationality, indicating a high level of representation of the local population in the

teaching profession. Regarding the work environment, the results indicate that a large majority of the teachers (73.7%) were employed in governmental schools. Also, 277 (95.8%) of teachers heard about the term stroke, this finding is indicative of a relatively high level of awareness among educators regarding this critical medical condition.

The study revealed that the well-recognized signs and symptoms of stroke in our population were trouble speaking or understanding speech (89%), weakness of face, arm, or leg (73.4%), followed by loss of balance or coordination (72.2%), sudden trouble waking (68.2%) and sudden trouble seeing in one or both eyes (67.1%). Approximately three-quarters of participants in a previous Saudi study identified dysarthria, or difficulty speaking or understanding speech, as the most common indication of stroke [14]. Adequate knowledge of stroke symptoms was observed in a 2023 Saudi study, which found that 35% of the general population recognized three early symptoms of stroke, while 32.1% identified four symptoms [14]. Similar studies in Jordan [15], Lebanon [16], and Ireland [17] also identified dysarthria as the most prevalent symptom of stroke. A study conducted in Nigeria among teachers reported similar findings, with 70.2% identifying difficulty in speech as the most recognized warning sign, 47.4% identifying visual problems, and 56.1% identifying loss of balance as a warning sign of stroke [13].

The most recognized risk factor of stroke in the present study was high blood pressure (89.6%), which agrees with several studies that showed high blood pressure as one of the most recognizable risk factors of stroke [13,16,18]. Smoking came second in the recognized risk factors of stroke followed by heart disease and high levels of cholesterol. Hypertension and smoking were also frequently recognized as stroke risk factors in studies conducted in the United States [19] and Spain [20]. Participants' knowledge about stroke treatment in this study showed that (93.8%) of them agreed that stroke requires prompt treatment. Similar results were obtained from other studies [21,22].

The present study found that more than half of the participants assumed that calling an ambulance was the first action to take. Romero et al. [23] a study conducted in Bogota, Colombia on a school community included (student's parents, teachers, and administrative staff) also shows that in the event of a stroke, all respondents were aware that medical attention should be sought [23]. These results imitate that observed by Monteleone et al. [22], where 60.15% of the participants would call an ambulance when someone is having a stroke [22]. This finding is contrary to a previous study conducted in West Bengal, India in 2007 on a general population. This study revealed that a significant number of families of stroke patients did not perceive the symptoms seriously and opted to wait for spontaneous recovery. Furthermore, the study highlighted that the majority of participants expressed a reluctance to seek medical attention for minor symptoms such as headaches, dizziness, or unilateral weakness [24].

The current study revealed that nearly half of teachers (51.9%) showed a fair amount of knowledge, (37%) showed a good knowledge, while (11.1%) showed poor knowledge. As for studies done on the general population in Saudi Arabia, a study conducted in Taif city in 2021 showed that most of the participants had poor knowledge of (69.7%), while only (8.7%) had good knowledge and (21.6%) with fair knowledge [10]. Another study in Al-Ahsa city done in 2020 showed that most of the participants had poor knowledge of (76.6%) while good knowledge was (23.4%) [25]. Regarding other Arab countries, a study done in Lebanon in 2022 on the general population found that (48%) of people had poor stroke-related information, whereas (51.5%) had good knowledge [26]. According to international studies, a systematic review found that stroke knowledge across various populations was inadequate [27]. A similar conclusion was reached in a review of the findings of 15 investigations, which also revealed that a common understanding of stroke is poor [28].

The divergence observed between our research and previous studies may potentially be attributed to the demographic characteristics of our study participants, who primarily consist of teachers. The current study discovered no significant link between knowledge level and teachers' gender, nationality, or educational level. In contrast, a Saudi study of instructors from the Asser region discovered that teachers of Saudi nationality, men, and bachelor's degree holders had much greater knowledge levels regarding stroke [29].

Teachers from Jeddah city had a significantly higher percentage of those who had good level of knowledge (52.3%) and fair level of knowledge (48.4%) with *p*-value of (0.014) compared with teachers from other cities, Makkah (23.4%) of the participant who had a good level of knowledge and Taif (17.8%) of the teachers who had good level of knowledge regarding stroke, regarding poor knowledge Makkah city had the highest percentage of teachers having poor knowledge of stroke (50%). This result is consistent with a recent study conducted in Jeddah in 2021, in which the majority of participants (81.46%) recognized stroke and 59.2% correctly identified it [30].

Another finding that stands out from the results is that good knowledge level about stroke was significantly higher among teachers who knew someone who had stroke. This finding is consistent with that of Alluqmani et.al. [31] who carried out a study in Medina city on a general population. The study showed that respondents with a family history of stroke were significantly higher in identifying stroke signs, risk factors, and post discharge requirements [31]. This result is also supported from prior studies which found that a family history of stroke was an independent predictor of enhanced subject information [32,33]. This study has a few limitations. While the sample size was representative of the western region of Saudi Arabia, the inclusion of only a few participants from private schools limited our ability to compare awareness between public and private school teachers. Additionally, the majority of participants were female, which may affect the generalizability of the findings. Furthermore, many studies compared to ours

employed different variable scoring systems, potentially impacting the overall assessment of knowledge.

Despite these limitations, this study is, to the best of our knowledge, the first to explore stroke awareness among teachers in the western region of Saudi Arabia. It provides valuable insights into the knowledge of an essential community group responsible for education. Future studies should address these limitations by using standardized scoring systems and questionnaires, while also including a larger and more diverse sample population to enable broader comparisons and more robust conclusions.

Conclusion

This study assessed stroke awareness among school teachers in western Saudi Arabia. While 95% had heard of stroke, teachers showed good recognition of common symptoms like facial, arm, or leg weakness and loss of balance. High blood pressure and smoking were the most recognized risk factors. Knowledge levels varied, with nearly half showing moderate awareness, and higher knowledge noted among those familiar with someone who had a stroke. The study highlights the need for targeted campaigns and health education to enhance stroke awareness, promote prevention, and reduce morbidity and mortality in the community.

List of Abbreviations

CI	Confidence interval
OR	Odds ratios
SA	Saudi Arabia
WHO	World Health Organization

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate

Written informed consent was obtained from all the participants.

Ethical approval

This study was performed in accordance with the Declaration of Helsinki and all relevant guidelines and regulations. This study is approved by Umm Al-Qura University, Makkah, Saudi Arabia, Reference # HAPO-02-K-012-2023-04-1598, Date: 30/4/2023.

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