

# Hypertensive and Diabetic Patients' Knowledge of Myocardial Ischemia and Stroke Symptoms in Al-Ahsa, Saudi Arabia

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## Abstract

**Background:** The level of knowledge about ischemic heart disease (IHD) and stroke symptoms varies between different studies. Early recognition of symptoms is crucial for timely receipt of care and to improve outcomes. This study aims to assess the level of knowledge of IHD and stroke symptoms among diabetic and hypertensive patients in Al Ahsa, Saudi Arabia.

**Methods:** A questionnaire-based cross-sectional survey conducted in outpatient clinics in several hospitals and primary care centers. We enrolled 339 participants who had diabetes, hypertension or both. Data were collected between October 2020 and June 2021. A score of 1 was given for each correct answer. A total score of  $\geq 5$  was considered excellent, between 2-4 adequate, and  $\leq 1$  poor.

**Results:** Poor knowledge score of IHD symptoms showed in 24.8% of participants and 26.3% had poor knowledge score of stroke symptoms. Chest pain was recognized as the most common symptom of IHD by 31%. When facing an emergency situation, 42% responded by taking the patient to the hospital and 45% by calling the emergency phone number

A higher degree of education, higher income, and previously received information were correlated with a higher knowledge score, while history of IHD in the participants was not correlated with a better score.

**Conclusions:** Knowledge of IHD and stroke symptoms was poor in a quarter of at-risk patients in Al Ahsa, Saudi Arabia. The history of IHD in the participants did not correlate with a better knowledge score. Our findings call for more efforts to establish and expand the awareness campaign.

**Keywords:** Awareness, knowledge, stroke symptoms, ischemic heart disease symptoms, diabetes, hypertension.

## Introduction

Heart disease is the leading cause of death and disability worldwide (1). Ischemic heart diseases (IHDs) are serious medical emergencies and significant contributors to heart disease, with an annual incidence of 750,000 cases in the United States (2). Symptoms of IHD include chest pain, which can radiate to the left side of the neck or left arm, sweating, shortness of breath, palpitations, and fatigue (3). Hypertension and diabetes are considered some of the main risk factors for IHDs (4).

Improving IHD awareness and knowledge among at high-risk hypertensive and diabetic patients remains an important goal, as it is integral to prevent diseases and promote healthy lifestyles (5).

Barriers to increased awareness include living in rural areas, having low health literacy, aging, having shortcomings in clinicians and public health education, having failed to continue education beyond high school, not owning insurance, and having a yearly income of less than \$50,000 (5,6). Furthermore, identifying IHD symptoms by patients to take immediate action by calling emergency services is crucial to ensure the timely receipt of emergency care that improves the chance of survival (2).

The level of knowledge about the manifestations of IHD varies between distinct studies. The highest reported level of knowledge was seen among the residents of North Carolina and revealed that 80% of middle-aged and high school educated people recognized the IHD symptoms. The authors noted that the knowledge of IHD symptoms decreased as the cardiovascular risk increased (6). In a sample from New York-Presbyterian Hospital, Columbia University, a study reported that 67% had a background of IHD symptoms and that the rest did not know about the manifestations of IHD, possibly due to lower education, being Hispanic, and ranking from average to high in the Framingham risk score for coronary heart disease (5). In addition, comparable numbers were reported in Singapore, and the score of knowledge for the common symptoms of IHD was 57.8% among Singapore residents (7). Furthermore, a striking low level of knowledge was found in Asian and African populations. Only 16% of the Tanzanian participants identified IHD manifestations and only 7.4% of the participants knew the entire correct IHD symptoms in Beijing (8,9). In Saudi Arabia, a study conducted in Riyadh revealed that 38.4% of the general public did not know that weakness, lightheadedness, or fainting are common symptoms of having IHD, and that 67.2% of them had poor awareness of the clinical picture of cardiovascular diseases (10).

In regard to stroke symptom knowledge, a study on the public in the United States validated that at least 94.1% of the public were able to identify at least one stroke symptom, with the most commonly identified symptom being sudden numbness or weakness of the face, arm, or leg (11). Meanwhile, in Saudi Arabia, it has been confirmed that 63.3% of Riyadh's population had a moderate level of awareness of the signs and symptoms of stroke (12).

Information on the level of knowledge about IHD and stroke symptoms is still limited in other regions of Saudi Arabia. Therefore, this study aimed to assess the level of knowledge about IHD and stroke symptoms among diabetic and/or hypertensive patients in Al Ahsa, Saudi Arabia.

## Materials and Methods

This cross-sectional study was conducted in Al Ahsa, eastern province of Saudi Arabia, from October 2020 to June 2021. The target population was Saudi adult patients who have hypertension (HTN), diabetes mellitus (DM), or both. Non-Saudi participants or those below the age of 18 years were excluded. The questionnaire comprised the following 3 sections: (1) sociodemographic and background data, (2) knowledge about IHD symptom assessment, and (3) knowledge about stroke symptom assessment. Additionally, an electronic Google form survey and paper questionnaires were used. The electronic Google form survey was distributed on various social media platforms such as WhatsApp, Twitter, and Telegram. Paper questionnaires were distributed in the outpatient clinics of King Fahd Hospital, Prince Saud Bin Jalawy Hospital Al Omran General Hospital, and Al Yahya and Al Sheba Primary Healthcare Centers. All available patients during the data creened and, if eligible, included in the study after obtaining informed consent.

Further, the data were coded, entered, and analyzed using the Statistical Package for Social Science version 26 (IBMR. USA). Descriptive statistics using frequencies and percentages were used to present categorical variables, and mean and standard deviation for continuous variables.

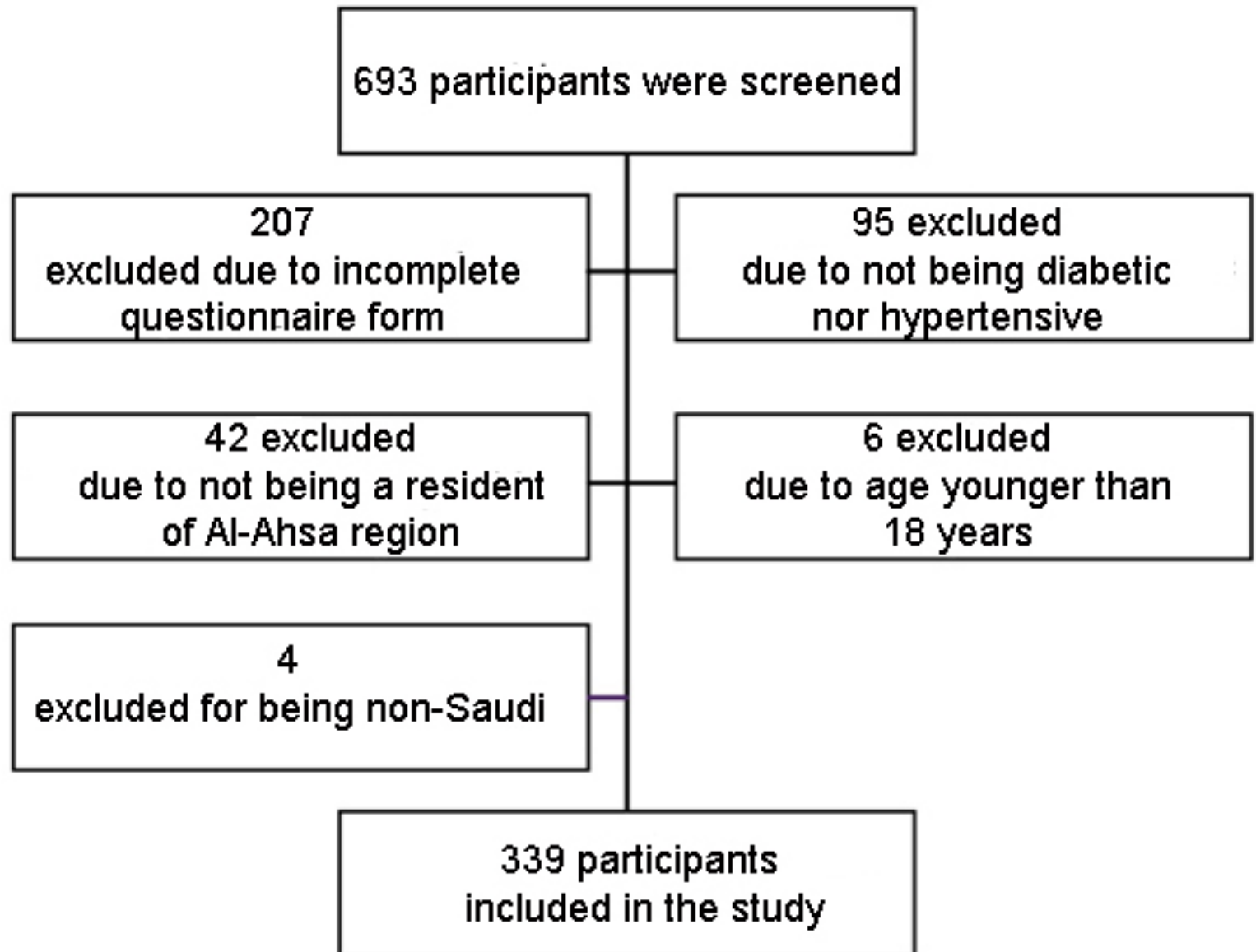
The scoring system to measure the knowledge about IHD and stroke symptoms was evaluated separately by giving a score of 1 for each correct answer. If the total score was  $\geq$  to 5, the result was considered excellent, if it was between 2-4, it was considered adequate, and if it was  $\leq$  1, it was considered poor knowledge.

The association between categorical variables was analyzed using the chi-square test, and a p value of  $< 0.05$  was considered statistically significant.

## Results

A total of 339 participants were included in the study (Figure 1). The age distribution displayed that 48.1% were between 36 and 55 years old. Women comprised 57.5% of the participants, and 80.2% are married. Regarding education, 53% held a diploma or higher, and the majority (46%) earn less than 5,000 SR a month. DM is present in 34.5% and HTN in 42.5%, and both are present in 23% (Table 1).

**Figure 1: Enrollment process of participants in the study**



**Table 1: Demographics and characteristics of participants**

| Variables          | Total number of participants (n=339), n (%) |                       |                     |                            |                        |                           |
|--------------------|---|-----------------------|---------------------|----------------------------|------------------------|---------------------------|
| Gender             | Male  |                       |                     | Female                     |                        |                           |
|                    | 144<br>(42.5%)                              |                       |                     | 195<br>(57.5%)             |                        |                           |
| Educational level  | Illiterate                                  | Elementary school     | Intermediate school | High school                | Diploma                | Bachelor degree or higher |
|                    | 29<br>(8.6%)                                | 38<br>(11.2%)         | 26<br>(7.7%)        | 66<br>(19.5%)              | 58<br>(17.1%)          | 122<br>(35.9%)            |
| Social state       | Single                                      |                       | Married             |                            | Missing                |                           |
|                    | 66<br>(19.5%)                               |                       | 272<br>(80.2%)      |                            | 1<br>(0.3%)            |                           |
| Age group          | 18-35 years old                             |                       | 36-55 years old     |                            | More than 55 years old |                           |
|                    | 101<br>(29.8%)                              |                       | 163<br>(48.1%)      |                            | 75<br>(22.1%)          |                           |
| Income level       | Less than 5000 SR / month                   | 5000-10000 SR / month |                     | More than 10000 SR / month |                        | Missing                   |
|                    | 157<br>(46.3%)                              | 79<br>(23.3%)         |                     | 100<br>(29.5%)             |                        | 3<br>(0.9%)               |
| Current occupation | Student                                     | House-wife            | Unemployed          | Office-job                 | Non-office job         | Retired                   |
|                    | 34<br>(10%)                                 | 98<br>(28.9%)         | 26<br>(7.7%)        | 66<br>(19.5%)              | 70<br>(20.7%)          | 45<br>(13.3%)             |
| Having DM or HTN   | HTN   |                       | DM                  |                            | Both                   |                           |
|                    | 144<br>(42.5%)                              |                       | 117<br>(34.5%)      |                            | 78<br>(23%)            |                           |

**Score of knowledge about IHD symptoms**

The maximum score of knowledge about IHD symptoms was 7; the minimum score was 0, and the mean score was  $2.7 \pm 1.6$ . Eighty-four participants (24.8%) scored poor; 202 (59.6%) scored adequate; and 53 (15.6%) scored excellent. Table 2 and Figure 2 illustrate the awareness of the participants about symptoms of IHD.

**Score of knowledge about stroke symptoms**

The maximum score of knowledge of stroke symptoms was 7; the minimum score was 0, and the mean score was  $2.6 \pm 1.5$ . Eighty-nine participants (26.3%) scored poor; 216 (63.7%) scored adequate; and 34 (10%) scored excellent. Table 3 and Figure 2 depict the awareness of the participants about stroke symptoms.

Figure 2: Awareness level of IHD and stroke symptoms

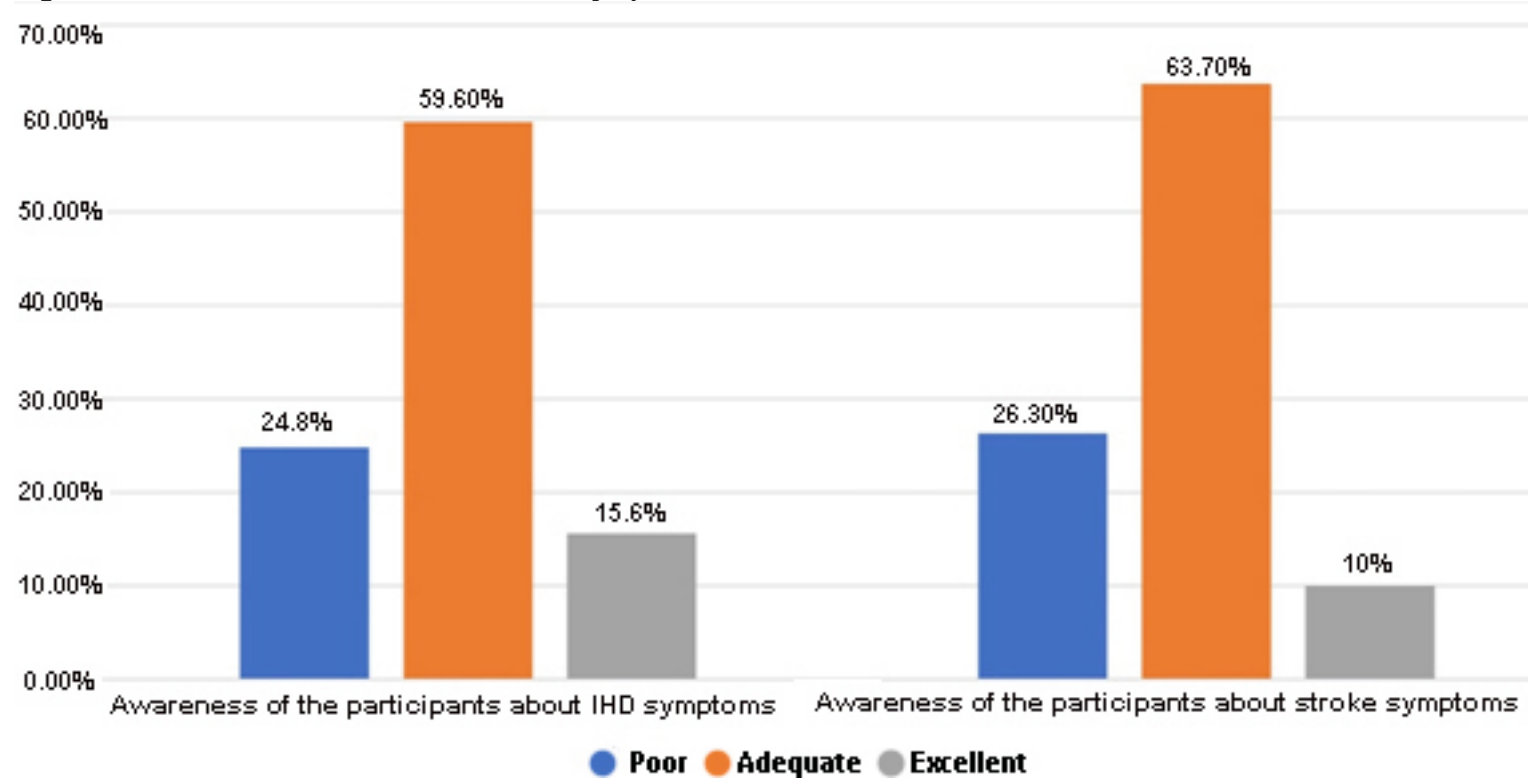


Table 2: Awareness of participants towards IHD symptoms

| Questions  | Yes, n (%)          | No, n (%)              | Not sure, n (%)          | Missing, n (%)                               |  |              |
|--|---------------------|------------------------|--------------------------|--|--|--------------|
| Previously received information regarding symptoms of IHD?       | 129 (38%)           | 210 (62%)              | 0                        | 0  |  |              |
| Pain or discomfort in the jaw, neck, or back is a symptom of IHD | 72 (21.2%)          | 124 (36.6%)            | 143 (42.2%)              | 0  |  |              |
| Feeling weak, dizzy, or faint are symptoms of IHD                | 98 (28.9%)          | 109 (32.2%)            | 131 (38.6%)              | 1 (0.3%)                                     |  |              |
| Chest pain or discomfort is a symptom of IHD                     | 176 (52%)           | 52 (15.3%)             | 111 (32.7%)              | 0  |  |              |
| Unclear vision in one or both eyes is a symptom of IHD           | 82 (24.2%)          | 127 (37.5%)            | 130 (38.4%)              | 0  |  |              |
| Pain or discomfort in the arms or shoulder is a symptom of IHD   | 137 (40.4%)         | 101 (29.8%)            | 100 (29.5%)              | 1 (0.3%)                                     |  |              |
| Shortness of breath is a symptom of IHD                          | 172 (50.7%)         | 67 (19.8%)             | 100 (29.5%)              | 0  |  |              |
| What is the single most common symptom of IHD?                   |                     |                        |                          |  |  |              |
| Pain or discomfort in the arms or shoulder                       | Shortness of breath | Dizziness and fainting | chest pain or discomfort | Sudden difficulty seeing in one or both eyes | Pain/discomfort in the jaw, neck or back | I don't know |
| 45 (13.3%)   | 75 (22.1%)          | 28 (8.3%)              | 105 (31%)                | 9 (2.7%)                                     | 13 (3.8%)                                | 64 (18.9%)   |

**Table 3: Awareness of participants toward stroke symptoms**

| Questions   | Yes, n (%)                            | No, n (%)                    | Not sure, n (%)                             | Missing, n (%)              |                     |                    |
|---|---------------------------------------|------------------------------|---|-----------------------------|---------------------|--------------------|
| Have you received information about stroke symptoms?  | 105<br>(31%)                          | 233<br>(68.7%)               | 0   | 1<br>(0.3%)                 |                     |                    |
| Sudden confusion or difficulty speaking are symptoms of a stroke?                                     | 156<br>(46%)                          | 81<br>(23.9%)                | 101<br>(29.8%)                              | 1<br>(0.3%)                 |                     |                    |
| Sudden numbness or weakness of the face, arm, or leg, especially on one side, is a symptom of stroke? | 155<br>(45.7%)                        | 81<br>(23.9%)                | 102<br>(30.1%)                              | 1<br>(0.3%)                 |                     |                    |
| Sudden difficulty seeing in one or both eyes is a symptom of stroke?                                  | 94<br>(27.7%)                         | 106<br>(31.3%)               | 138<br>(40.7%)                              | 1<br>(0.3%)                 |                     |                    |
| Sudden chest pain or discomfort is symptoms of a stroke?  | 97<br>(28.6%)                         | 117<br>(34.5%)               | 124<br>(36.6%)                              | 1<br>(0.3%)                 |                     |                    |
| Sudden trouble walking, dizziness, or losses of balance are symptoms of a stroke?                     | 137 (40.4%)                           | 91<br>(26.8%)                | 108<br>(31.9%)                              | 3<br>(0.9%)                 |                     |                    |
| Severe headache with no known cause is a symptom of a stroke?   | 115<br>(33.9%)                        | 102<br>(30.1%)               | 120<br>(35.4%)                              | 2<br>(0.6%)                 |                     |                    |
| <b>If you thought someone was having IHD or a stroke, what would be the first thing you would do?</b> |                                       |                              |   |                             |                     |                    |
| <b>Bring them to the hospital</b>   | <b>Tell them to call their doctor</b> | <b>Call emergency number</b> | <b>Call their spouse or a family member</b> | <b>Don't know/ Not sure</b> | <b>Give Aspirin</b> | <b>Perform CPR</b> |
| 142<br>(41.9%)  | 6<br>(1.8%)                           | 152<br>(44.8%)               | 11<br>(3.2%)                                | 18<br>(5.3%)                | 2<br>(0.6%)         | 8<br>(2.4%)        |

**Relationship between knowledge about IHD symptom scores and biodemographic data**

There was a significant relationship between knowledge about IHD symptom scores and the following variables: previously received information on the symptoms of ischemic heart disease ( $p = 0.000$ ), higher educational and income levels ( $p = 0.001$  for both), employment status ( $p = 0.038$ ), and a history of stroke ( $p = 0.019$ ). The participants who did not have a history of cardiac catheterization or cardiac surgery had a higher score of knowledge ( $p = 0.002$ ).

Contrarily, there was no significant relationship between the score of knowledge about IHD symptoms and the age group; gender; social status; and a history of IHD, DM, or HTN. Table 4 presents the relationship between knowledge about IHD symptom scores and bio-demographical data of the participants.

**Relationship between knowledge about stroke symptom scores and biodemographic data**

There was a significant relationship between knowledge about stroke symptom scores and the following variables: previously received information regarding symptoms of stroke ( $p = 0.002$ ), higher educational and income levels ( $p = 0.003$  for both), and employment status ( $p = 0.019$ ). The participants who did not have a history of cardiac catheterization or cardiac surgery had a higher score of knowledge ( $p = 0.015$ ).

Conversely, there was no significant relationship between knowledge about stroke symptom scores and age group; gender; social status; and a history of IHD, stroke, DM, or HTN. Table 5 shows the relationship between knowledge about stroke symptom scores and bio-demographical data of the participants.

Table 4: The relationship between demographic information of participants and their awareness score of IHD symptoms

| Factors  |                              | Poor       | Adequate    | Excellent  | p-value§ |
|--|------------------------------|------------|-------------|------------|----------|
| Age group  | 18-35 years old              | 23 (25.8%) | 66 (30.6%)  | 12 (35.3%) | 0.825    |
|  | 36-55 years old              | 44 (49.4%) | 103 (47.7%) | 16 (47.1%) |          |
|  | More than 55 years old       | 22 (24.7%) | 47 (21.8%)  | 6 (17.7%)  |          |
| Gender   | Male                         | 36 (40.5%) | 94 (43.5%)  | 14 (41.2%) | 0.874    |
|  | Female                       | 53 (59.6%) | 122 (56.5%) | 20 (58.8%) |          |
| Social status  | Single                       | 17 (19.1%) | 43 (19.9%)  | 6 (18.2%)  | 0.966    |
|  | Married                      | 72 (80.9%) | 173 (80.1%) | 27 (81.8%) |          |
| Educational level  | Illiterate                   | 9 (10.1%)  | 20 (9.3%)   | 0          | 0.003*   |
|  | Elementary school            | 13 (14.6%) | 21 (9.7%)   | 4 (11.8%)  |          |
|  | Intermediate school          | 8 (9%)     | 17 (7.9%)   | 1 (2.9%)   |          |
|  | High school                  | 23 (25.8%) | 42 (19.4%)  | 1 (2.9%)   |          |
|  | Diploma                      | 10 (11.2%) | 40 (18.5%)  | 8 (23.5%)  |          |
|  | Bachelor degree or higher    | 26 (29.2%) | 76 (35.2%)  | 20 (58.8%) |          |
| Current occupation   | Student                      | 8 (9%)     | 24 (11.1%)  | 2 (5.9%)   | 0.019*   |
|  | House wife                   | 31 (34.8%) | 62 (28.7%)  | 5 (14.7%)  |          |
|  | Unemployed                   | 10 (11.2%) | 16 (7.4%)   | 0          |          |
|  | Office job                   | 16 (18%)   | 42 (19.4%)  | 8 (23.5%)  |          |
|  | Non-office job               | 12 (13.5%) | 43 (19.9%)  | 15 (44.1%) |          |
|  | Retired                      | 12 (13.5%) | 29 (13.4%)  | 4 (11.8%)  |          |
| Income level   | Less than 5000 SR per month  | 49 (55.7%) | 102 (47.7%) | 6 (17.7%)  | 0.003*   |
|  | 5000 - 10000 SR per month    | 16 (18.2%) | 52 (24.3%)  | 11 (32.4%) |          |
|  | More than 10000 SR per month | 23 (26.1%) | 60 (28%)    | 17 (50%)   |          |
| Have DM or HTN   | HTN                          | 39 (43.8%) | 89 (41.2%)  | 16 (47.1%) | 0.170    |
|  | DM                           | 26 (29.2%) | 76 (35.2%)  | 15 (44.1%) |          |
|  | Both                         | 24 (27%)   | 51 (23.6%)  | 3 (8.8%)   |          |
| History of IHD   | Yes                          | 8 (9%)     | 8 (3.7%)    | 1 (2.9%)   | 0.496    |
|  | No                           | 81 (91%)   | 207 (95.8%) | 33 (97.1%) |          |
|  | I don't know                 | 0          | 1 (0.5%)    | 0          |          |
| History of stroke  | Yes                          | 4 (4.5%)   | 6 (2.8%)    | 0          | 0.463*   |
|  | No                           | 85 (95.5%) | 209 (96.8%) | 34 (100%)  |          |
|  | I don't know                 | 0          | 1 (0.5%)    | 0          |          |
| Have you had cardiac catheterization or surgery to diagnose or treat cardiovascular disease? | No                           | 73 (82%)   | 198 (91.7%) | 33 (97.1%) | 0.015*   |
|  | I don't know                 | 16 (18%)   | 18 (8.3%)   | 1 (2.9%)   |          |
| Have you received information regarding symptoms of stroke?                                  | Yes                          | 23 (25.8%) | 86 (39.8%)  | 20 (58.8%) | 0.002*   |
|  | No                           | 66 (74.2%) | 130 (60.2%) | 14 (41.2%) |          |

**Table 5: The relationship between demographic information of participants and their awareness score of stroke symptoms**

| Factors  |                              | Poor       | Adequate    | Excellent  | p-value§ |
|--|------------------------------|------------|-------------|------------|----------|
| Age group  | 18-35 years old              | 23 (25.8%) | 66 (30.6%)  | 12 (35.3%) | 0.825    |
|  | 36-55 years old              | 44 (49.4%) | 103 (47.7%) | 16 (47.1%) |          |
|  | More than 55 years old       | 22 (24.7%) | 47 (21.8%)  | 6 (17.7%)  |          |
| Gender   | Male                         | 36 (40.5%) | 94 (43.5%)  | 14 (41.2%) | 0.874    |
|  | Female                       | 53 (59.6%) | 122 (56.5%) | 20 (58.8%) |          |
| Social status  | Single                       | 17 (19.1%) | 43 (19.9%)  | 6 (18.2%)  | 0.966    |
|  | Married                      | 72 (80.9%) | 173 (80.1%) | 27 (81.8%) |          |
| Educational level  | Illiterate                   | 9 (10.1%)  | 20 (9.3%)   | 0          | 0.003*   |
|  | Elementary school            | 13 (14.6%) | 21 (9.7%)   | 4 (11.8%)  |          |
|  | Intermediate school          | 8 (9%)     | 17 (7.9%)   | 1 (2.9%)   |          |
|  | High school                  | 23 (25.8%) | 42 (19.4%)  | 1 (2.9%)   |          |
|  | Diploma                      | 10 (11.2%) | 40 (18.5%)  | 8 (23.5%)  |          |
|  | Bachelor degree or higher    | 26 (29.2%) | 76 (35.2%)  | 20 (58.8%) |          |
| Current occupation   | Student                      | 8 (9%)     | 24 (11.1%)  | 2 (5.9%)   | 0.019*   |
|  | House wife                   | 31 (34.8%) | 62 (28.7%)  | 5 (14.7%)  |          |
|  | Unemployed                   | 10 (11.2%) | 16 (7.4%)   | 0          |          |
|  | Office job                   | 16 (18%)   | 42 (19.4%)  | 8 (23.5%)  |          |
|  | Non-office job               | 12 (13.5%) | 43 (19.9%)  | 15 (44.1%) |          |
|  | Retired                      | 12 (13.5%) | 29 (13.4%)  | 4 (11.8%)  |          |
| Income level   | Less than 5000 SR per month  | 49 (55.7%) | 102 (47.7%) | 6 (17.7%)  | 0.003*   |
|  | 5000 - 10000 SR per month    | 16 (18.2%) | 52 (24.3%)  | 11 (32.4%) |          |
|  | More than 10000 SR per month | 23 (26.1%) | 60 (28%)    | 17 (50%)   |          |
| Have DM or HTN   | HTN                          | 39 (43.8%) | 89 (41.2%)  | 16 (47.1%) | 0.170    |
|  | DM                           | 26 (29.2%) | 76 (35.2%)  | 15 (44.1%) |          |
|  | Both                         | 24 (27%)   | 51 (23.6%)  | 3 (8.8%)   |          |
| History of IHD   | Yes                          | 8 (9%)     | 8 (3.7%)    | 1 (2.9%)   | 0.496    |
|  | No                           | 81 (91%)   | 207 (95.8%) | 33 (97.1%) |          |
|  | I don't know                 | 0          | 1 (0.5%)    | 0          |          |
| History of stroke  | Yes                          | 4 (4.5%)   | 6 (2.8%)    | 0          | 0.463*   |
|  | No                           | 85 (95.5%) | 209 (96.8%) | 34 (100%)  |          |
|  | I don't know                 | 0          | 1 (0.5%)    | 0          |          |
| Have you had cardiac catheterization or surgery to diagnose or treat cardiovascular disease? | No                           | 73 (82%)   | 198 (91.7%) | 33 (97.1%) | 0.015*   |
|  | I don't know                 | 16 (18%)   | 18 (8.3%)   | 1 (2.9%)   |          |
| Have you received information regarding symptoms of stroke?                                  | Yes                          | 23 (25.8%) | 86 (39.8%)  | 20 (58.8%) | 0.002*   |
|  | No                           | 66 (74.2%) | 130 (60.2%) | 14 (41.2%) |          |

§ P-value has been calculated using chi-square test.

\* Significant at p &lt; 0.05 level.



## Discussion

This study affirmed that approximately a quarter of the hypertensive and/or diabetic patients in Al Ahsa had poor knowledge about IHD and stroke symptoms. Regarding IHD, the most identified symptom was chest pain or discomfort. These findings are consistent with those of other studies in different parts of the world [13-16]. In current study, 22.6% identified pain or discomfort in the jaw, neck, or back as one of the symptoms of IHD, which is lower than what Alabdali et al. reported at a higher rate of 36.9% in their population in the western region of KSA [17]. Although the lack of awareness of IHD symptoms results in postponed treatment and higher morbidity and mortality [18], approximately 60% of our participants did not receive any information regarding IHD symptoms despite being at risk of developing such a disease. The lack of information was reflected in marking a wrong answer or "I do not know" in 60% of the time. We found that patients who had previously received information on disease symptoms had a satisfactory level of knowledge compared with those who had not, which is consistent with other reports [19]. This indicates the importance of establishing electronic and in-person health-care campaigns to raise awareness of IHD and stroke. Individuals with a personal history of heart disease and those with a history of IHD in a family member were more aware of the complexity of IHD symptoms than people without such exposures [20]. Consistent with the findings of Rashmi Kothari et al., we found that 44% of the participants will call the emergency phone number for answer to "If you thought someone had a heart attack or stroke, then what would be the first thing you would do?" [21]. Educational campaigns must focus not only on awareness of IHD and stroke symptoms and signs, but also on the proper response by calling emergency lines immediately if experiencing any symptoms or facing any person with IHD or stroke signs.

Although others had reported a gender difference in regard to awareness of IHD and stroke symptoms, our study did not detect any difference. It had been postulated that women have more knowledge about IHD compared with men, which could be due to greater exposure to social media, such as television and newspapers, and due to shorter working hours compared with men, thus; women become more aware of the symptoms of IHD. Interestingly, this was not found in the knowledge level of stroke symptoms, probably reflecting less coverage in these media [22]. Conversely, another study has asserted that males had higher knowledge regarding IHD symptoms, because they are aware that their gender contributes as a risk factor for having IHD [23]. As expected, greater knowledge about IHD was observed among patients with higher levels of education, which is probably due to exposure to diverse health information through their higher education levels [24]. Furthermore, subjects who have higher levels of education can understand health information and apply it compared with those with lower education [7,25]. Consistent with what has been reported, the present research confirmed that unemployment remains correlated with less knowledge about the symptoms of the disease. This is likely reflecting lower levels of education and income

in these people [26, 27]. Moreover, this study detected a worrying signal that patients who have had either cardiac catheterization or surgery to diagnose or treat cardiovascular disease are less knowledgeable about IHD symptoms than those who had not. This raises the suspicion that the opportunity was not used during that encounter to educate them. This observation was reported earlier in 2008 and unfortunately persisted until the time of our study [28].

The majority of the patients relied on personal or family history as their primary source of stroke knowledge. These interpersonal contacts remain to be a highly effective means of disseminating medical information [29]. Satisfactory knowledge regarding CVS was reported among 70.8% of the patients who received information about stroke symptoms from others in comparison with 64.1% of others who did not receive any information from others, but had adequate knowledge. Our study further validated that 65% of the patients who had DM or both DM and HTN had satisfactory knowledge compared with 31.1% of those who were hypertensive only.

## Conclusions

Knowledge about IHD and stroke symptoms was poor in approximately a quarter of at-risk patients in Al Ahsa, Saudi Arabia. A history of IHD in the participants did not correlate with a better knowledge score. Our findings call for more efforts in establishing and expanding the awareness campaign. Additional effort is crucial to establish and expand the awareness campaign among the at-risk population of the Al Ahsa region in the community and during visits to primary care centers, outpatient clinics, and during admission to hospitals. Various education methods and tools must be utilized to match the age, and education level of patients and the time allowed.

### List of abbreviations

|     |                        |
|-----|------------------------|
| IHD | Ischemic Heart Disease |
| DM  | Diabetes Mellitus      |
| HTN | Hypertension           |

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### Consent of patients

Informed consent was obtained from the participants.

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## Appendices

### Appendix 1: English Version of Hypertensive and Diabetic Patients Knowledge of Heart Attack Symptoms Questionnaire.

#### Section 1 (biographical data):

\* Are you a hypertensive or diabetic patient?

1. Hypertensive.
2. Diabetic.
3. Both.

\* Your gender is:

1. Male.
2. Female.

\* Your nationality is:

1. Saudi.
2. non-Saudi.

\* Living:

1. In Al-Ahsa.
2. Outside Al-Ahsa.

\* Your age group (years) is:

1. 18-35.
2. 36-55.
3. Older than 55.

\* Marital status:

1. Single.
2. Married.

\* Your level of education is:

1. Non educated.
2. Primary school.
3. Intermediate school.
4. High school.
5. University.

\* Income (monthly):

1. Less than 5000.
2. 5000-10000.
3. More than 10000.

\* Current work:

1. unemployed.
2. Housewife.
3. Office-based job.
4. Non-office base job.
5. Retired.
6. Student.

\*Have you ever had a previous heart attack?

1. Yes.
2. No.

\*Have you ever had a percutaneous coronary intervention or cardiovascular surgery?

1. Yes.
2. No.

\*Have you ever had a previous stroke?

1. Yes.
2. No.

## Section 2 (knowledge of heart attack symptoms)

:

1. Have you ever received any information related to heart attack by others?

1. Yes.
2. No.

2. (Do you think) pain or discomfort in the jaw, neck, or back are symptoms of heart attack?

1. Yes.
2. No.
3. I don't know / I am not sure.

3. (Do you think) feeling weak, lightheaded, or faint are symptoms of heart attack?

1. Yes.
2. No.
3. I don't know / I am not sure.

4. (Do you think) chest pain or discomfort are symptoms of heart attack?

1. Yes.
2. No.
3. I don't know / I am not sure.

5. (Do you think) sudden trouble seeing in one or both eyes are a symptom of heart attack?

1. Yes.
2. No.
3. I don't know / I am not sure.

6. (Do you think) pain or discomfort in the arms or shoulder are symptoms of heart attack?

1. Yes.
2. No.
3. I don't know / I am not sure.

7. (Do you think) shortness of breath is a symptom of heart attack?

1. Yes.
2. No.
3. I don't know / I am not sure.

8. In your opinion, what is the single most common symptom of heart attack?

- 1- Pain or discomfort in the jaw, neck, or back.
- 2- Feeling weak, lightheaded, or faint.
- 3- Chest pain or discomfort.
- 4- Sudden trouble seeing in one or both eyes.
- 5- Pain or discomfort in the arms or shoulder.
- 6- Shortness of breath.
- 7- Other .... which is (.....).
- 8- I don't know.

**Section 3 (knowledge of Stroke symptoms):**

1. Have you ever received any information related to Stroke from others?

- 1- Yes
- 2- No

2. (Do you think) sudden confusion or trouble speaking are symptoms of a stroke?

1. Yes
2. No
3. I don't know / I am not sure

3. (Do you think) sudden numbness or weakness of the face, arm, or leg, especially on one side, are symptoms of a stroke?

1. Yes
2. No
3. I don't know / I am not sure

4. (Do you think) sudden trouble seeing in one or both eyes is a symptom of a stroke?

1. Yes
2. No
3. I don't know / I am not sure

5. (Do you think) sudden chest pain or discomfort are symptoms of a stroke?

1. Yes
2. No
3. I don't know / I am not sure

6. (Do you think) sudden trouble walking, dizziness, or loss of balance are symptoms of a stroke?

1. Yes
2. No
3. I don't know / I am not sure

7. (Do you think) severe headache with no known cause is a symptom of a stroke?

1. Yes
2. No
3. I don't know / I am not sure

8. If you thought someone was having a heart attack or a stroke, what is the first thing you would do?

1. Take them to the hospital
2. Tell them to call their doctor
3. Call 997
4. Call their spouse or a family member
5. Do something else
6. I don't know / I am not sure

**Appendix 2: Informed Consent Form:**

We are students from the Colleges of Medicine and Surgery and Applied Medical Sciences. We are conducting this research study to determine the levels of knowledge about ischemic heart disease and stroke among diabetic and hypertensive patients in Saudi Arabia's Al-Ahsa region.

The approval of the research and ethics committee was obtained from King Fahd Hospital in Al-Ahsa. Your participation in this study is completely voluntary. You have the right to withdraw from the study at any time without any consequences.

We pledge to maintain patient privacy and data confidentiality, as no identification data will be collected to ensure that the patient's identity is not disclosed and the confidentiality of his information is not misused or circulated, and we confirm our commitment to ethical and professional rules to ensure the patient's personal safety.

Agreement: I got a detailed explanation of the study, its objectives and procedures, its benefits, and the complete freedom to participate. I agree to participate in this study voluntarily and without any kind of coercion or pressure. I understand that I have the right to withdraw from the study at any time without any consequences.

Date:.....

Signature: :.....