

# Levels of public awareness regarding cervical spine injury and the suitable first aid response among adults in Saudi Arabia

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## ABSTRACT

**الأهداف:** تقييم مستوى الوعي العام فيما يتعلق بإصابات العمود الفقري العنقي بين البالغين المقيمين في المملكة العربية السعودية.

**المنهجية:** أجريت دراسة مقطعية وصفية خلال الفترة من شهري يونيو ونوفمبر 2020م. وتضمنت استبيانات منظمة، ومعلومات عن الخصائص الاجتماعية والديموغرافية للمشاركين، وحالة تدريب المستجيب الأول، والوعي بصدمة العمود الفقري العنقي والاستجابة المناسبة للإسعافات الأولية.

**النتائج:** أكمل المسح 4914 مستجيباً (العمر=31.6±11.8 سنة). أبلغ معظم المشاركين (75.2%) عن حوادث المرور على الطرق كعامل خطر لإصابة العمود الفقري العنقي. علاوة على ذلك، ذكر 79.4% من المشاركين أن إصابة العمود الفقري العنقي قد تكون مصحوبة بتلف في النخاع الشوكي. وجدنا كذلك إعاقة حركية وحسية وصعوبة التنفس كمضاعفات مرتبطة بإصابات العمود الفقري العنقي بنسبة 52.1% و 39% و 28.8% من المشاركين على التوالي. كان أقل من واحد من كل 3 مشاركين على دراية بصدمة العمود الفقري العنقي أو استجابة الإسعافات الأولية المناسبة.

**الخلاصة:** أظهرت الدراسة ضعف في الوعي العام فيما يتعلق بصدمة العمود الفقري العنقي بين سكان المملكة العربية السعودية، على الرغم من أن معظم المشاركين في الدراسة كانوا على دراية بضرورة تثبيت ضحايا الصدمات في موقع الحادث حتى وصول فريق الاستجابة للطوارئ.

**Objectives:** To evaluate the level of public awareness regarding cervical spine injuries among adult residents of the Kingdom of Saudi Arabia (KSA).

**Methods:** This descriptive cross-sectional study was carried out between June and November 2020. It involved structured questionnaires, collecting information on participant socio-demographic characteristics, first responder training status, and the awareness of cervical spine trauma and suitable first aid response.

**Results:** A total of 4914 respondents (age, 31.6 ± 11.8 years) completed the survey. Most participants (75.2%) reported road traffic accidents as a risk factor for cervical spine injury. Moreover, 79.4% of the participants reported that cervical spine injury

may be accompanied by damage to the spinal cord. Motor and sensory disability, and trouble breathing were recognized as complications associated with cervical spine injuries by 52.1%, 39%, and 28.8% of the participants, respectively. Fewer than one in 3 participants was aware of cervical spine trauma or the suitable first aid response.

**Conclusion:** Public awareness regarding cervical spine trauma is poor among the KSA residents, although most study participants were aware trauma victims should be immobilized at the site of the accident until the arrival of an emergency response team.

**Keywords:** cervical spine, public awareness, emergency, trauma, spinal cord

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Worldwide victims of trauma due to road traffic accidents (RTAs), fall from heights or workplace injuries have gained authorities attention to increase public awareness towards the safe way to respond to these injuries. Cervical spine injuries are rare but can cause significant life-long disability. The cervical spine includes 7 vertebrae and that protect the spinal cord;<sup>1,2</sup> however, its anatomical structure and the associated flexibility make it vulnerable to injury.<sup>3</sup> Different types of

injury are associated with distinct mechanisms. Trauma is the most common cause of cervical spine injury, including that resulting from RTAs, falls, penetrating or blunt trauma, and sports-related injuries.<sup>4,5</sup> Non-trauma-related causes include compression fractures from osteoporosis, arthritis, cancer, and inflammation of the spinal cord. Cervical injury tends to occur due to the flexion, extension, rotation, contusion, or compression of the spinal cord.<sup>6</sup>

The management of cervical disc injuries requires a highly qualified team that includes a trauma surgeon, anesthesiologist, emergency department physician, and nurse practitioner, among others. In the immediate aftermath of an injury, it is paramount that the patient remains still, and that neck movements are minimized, maintaining the stability of the cervical spine, in particular, during transport.<sup>7,8</sup> Poor management of cervical spine injury may lead to respiratory and cardiovascular function defects due to neurological deficits associated with the injury.<sup>9</sup> Injured cervical spine tends to be unstable; in fact, failure to stabilize it prior to a definitive treatment increases the risk of secondary injury to the spinal cord.<sup>10</sup>

Public awareness regarding cervical spine trauma and the suitable first aid response is crucial, as every person is at risk of such injury, which may occur as a result of an RTA or a fall. Proper handling of such cases until the arrival of an emergency response team may save victims' lives or prevent permanent damage or disability. The present study is aimed to assess the levels of public awareness regarding cervical spine trauma, the signs indicative of trauma, and the suitable first aid response among the adult residents of the Kingdom of Saudi Arabia (KSA).

**Methods.** The study protocol received ethical approval (No. ECM #2020-1209) from the Research Ethics Committee at King Khalid University, Abha, KSA. This study used a cross-sectional design, targeting the KSA residents aged 18 years or older and willing to participate in the study. Data were collected using a structured self-administered online questionnaire. The questionnaire was uploaded onto social media platforms by the researchers and their relatives and friends between June and November 2020. All accessible and

eligible individuals were invited to complete the online questionnaire. The questionnaire was created for the purpose of this study, based on the extensive literature review and consultation with a panel of 5 experts in spine surgery, orthopedics and emergency medicine affiliated with the Medical College of King Khalid University, Abha, KSA invited to verify the tool's clarity and validity. The questionnaire included 3 sections. The first section enquired on participants' socio-demographic characteristics, including information on trauma response training. The second section examined the participants' levels of awareness regarding cervical spine injury, including the knowledge of associated risk factors, complications, causes, clinical presentation, and the suitable first aid response, for example, immobilization. The third section collected information on the participants' declared response to patients with cervical spine trauma. The inclusion criteria were all adults excluding minors.

**Statistical analysis.** Raw data were coded and input in Statistical Package for Social Sciences for Windows, version 22 (IBM Corp, Armonk, NY, USA). All statistical analyses were performed using 2-tailed tests. *P*-values of <0.05 were considered indicative of a statistically significant finding. The levels of awareness were quantified by summing up the scores obtained for each awareness-related item, whereby correct answers were assigned one point. A score of <60% of the total number of points represented "poor" awareness; in contrast, a score of >60% of the total number of points represented "good" awareness. Demographic characteristics, the overall levels of awareness, and participants' declared interventions were reported as descriptive statistics, using frequencies and percentages. Cross-tabulation was used to assess the levels of awareness according to participants' characteristics and first aid training status; these associations were assessed using the Pearson Chi-square test.

**Results.** A total of 4914 respondents (58.3% male, 41.9% university graduates, and 32.6% students) completed the survey. Participant age ranged from 18 to 65 years, with the mean age of  $31.6 \pm 11.8$  years. A total of 50.2% of the respondents had a monthly income of <5000 SR. A total of 46.4% respondents were married and 19.1% were trained emergency responders (Table 1).

Table 2 present survey findings regarding the levels of public awareness of cervical spine trauma. Most respondents (75.2%) knew of RTAs as risk factors for cervical spine injury; meanwhile, 15.6% knew of no such risk factors. Moreover, 79.4% of the participants reported that cervical spine injury could be accompanied

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**Table 1** - Sociodemographic characteristics of the study participants (Saudi Arabia).

Characteristics	n	(%)
<b>Age, years</b>		
<20	790	(16.1)
21-30	2088	(42.5)
31-40	783	(15.9)
41-50	828	(16.8)
50+	425	(8.6)
<b>Gender</b>		
Male	2865	(58.3)
Female	2049	(41.7)
<b>Educational level</b>		
Secondary or below	1251	(25.5)
University student	1603	(32.6)
University/above	2060	(41.9)
<b>Monthly income, SAR</b>		
<5000	2466	(50.2)
5000-10000	1155	(23.5)
>10000	1293	(26.3)
<b>Marital status</b>		
Single	2483	(50.5)
Married	2280	(46.4)
Divorced/widowed	151	(3.1)
<b>Trained as first responder</b>		
Yes	941	(19.1)
No	3973	(80.9)

by damage to the spinal cord, while 71.3% of the participants reported that injuries to the cervical spine could lead to life-long disability. Motor and sensory disability, and breathing problems were recognized as cervical spine injury complications by 52.1%, 39%, and 28.8% of the participants, respectively. Finally, 55.1% of the respondents reported that patients with cervical spine injury may require life-long medical and physical management.

A total of 46.9% and 37.4% of the participants, respectively, reported calling an emergency response team and minimizing movement during transportation as the suitable first aid measures in cases of cervical spine injury. Approximately 78% and 68.4% of the participants knew that early diagnosis of cervical spine injury can help prevent future complications and that proper management at the accident site can prevent permanent spinal cord damage, respectively. The most commonly (72.9%) reported way of immobilizing patients was keeping them in the same position until the arrival of an emergency response team, provided the location was secure. In cases requiring resuscitation,

**Table 2** - Public awareness of the correct response to cervical spine trauma among Saudi Arabia residents.

Response	n	(%)
<b>Cervical injury risk factors</b>		
RTA	3695	(75.2)
Sports	99	(2.0)
Inflammation	208	(4.2)
Tumor	123	(2.5)
Long use of devices	10	(0.2)
Incorrect sitting posture	6	(0.1)
Fall	5	(0.1)
Do not know	768	(15.6)
<b>Is it possible for a cervical spine injury to be accompanied by damage to the spinal cord?</b>		
Yes	3900	(79.4)
No	84	(1.7)
Do not know	930	(18.9)
<b>Can injuries to the cervical spine lead to life-long disability?</b>		
Yes	3502	(71.3)
No	222	(4.5)
Do not know	1190	(24.2)
<b>Complications of cervical injury</b>		
Motor disability	2559	(52.1)
Sensory disability	1918	(39.0)
Affected breathing	1414	(28.8)
Urine incontinence	1191	(24.2)
Stool incontinence	1132	(23.0)
Smell & taste problems	386	(7.9)
Do not know	2249	(45.8)
<b>May a patient with cervical spine injury require medical and physical management for their whole life?</b>		
Yes	2707	(55.1)
No	624	(12.7)
Do not know	1583	(32.2)
<b>The first management for cervical spine injury patient</b>		
Minimizing movement during transport	1838	(37.4)
Changing patient position	84	(1.7)
Call emergency services	2304	(46.9)
Do not know	688	(14.0)
<b>Early prediction of cervical spine injury will help in preventing complications</b>		
Yes	3818	(77.7)
No	179	(3.6)
Do not know	917	(18.7)
<b>Proper management at accident site may prevent permanent spinal cord damage</b>		
Yes	3292	(68.4)
No	371	(7.7)
Do not know	1153	(23.9)

RTA: road traffic accidents

86.3% of the respondents declared they would call for an emergency response team and start resuscitation while ensuring spine immobilization. The respondents declared that the following signs were indicative of a cervical spinal cord injury: inability to move hands (32.9%), numbness (24.3%), pain in the arms (15.7%), and neck deformity (12.8%); a total of 60.8% of the respondents recognized all these signs as indicative of cervical spine injury. Among diseases that increase the risk of cervical spine injury, the participants recognized rheumatoid arthritis (74.5%), obesity (41.9%), and diabetes mellitus (16.6%). Overall, 1565 (31.8%) participants had good awareness of cervical spine trauma and management.

**Table 2** - Public awareness of the correct response to cervical spine trauma among Saudi Arabia residents (continuation).

Response	n	(%)
<i>To safely stabilize a patient requires which of the following</i>		
Keeping the patient same position if the place is safe until emergency services arrive	3582	(72.9)
Correct deformity pulls arms neck and Legs	398	(8.1)
Set patient up	41	(0.8)
Do not know	893	(18.2)
<i>How would you respond should the patient require resuscitation?</i>		
Call emergency services, start resuscitation, ensuring spine immobilization	4243	(86.3)
Transport patient to nearest hospital in my vehicle	83	(1.7)
Do nothing	91	(1.8)
Do not know	497	(10.1)
<i>Which of the following signs may be indicative of a cervical cord injury?</i>		
Unable to move hand	1618	(32.9)
Pain in arms	770	(15.7)
Numbness	1195	(24.3)
Neck deformity	629	(12.8)
All of the above	2989	(60.8)
Do not know	68	(1.4)
<i>Which of the following diseases may increase the risk of cervical spine injury?</i>		
Down's syndrome	745	(15.2)
Rheumatoid arthritis	3660	(74.5)
Diabetes milieus	818	(16.6)
Obesity	2060	(41.9)
<i>Overall awareness level</i>		
Poor	3349	(68.2)
Good	1565	(31.8)

**Table 3** presents the findings regarding the participants' declared responses to witnessing cervical spine injury. A total of 73.5% of the participants reported that they would help the victims of RTAs or falls. In addition, 85.4% of the participants agreed that a suitable response could help the victims, while 71.2% of the participants reported that spinal injury may permanently reduce the victim's quality of life. The need for spinal movement precautions in unconscious trauma patients was reported by 82.4% of the participants. A total of 93.1% of the respondents declared that they

**Table 3** - Self-reported first responses to witnessed cervical spine injury among Saudi Arabia residents.

Responses	n	(%)
<i>I will help people involved in a car accident or fall</i>		
Yes	3614	(73.5)
No	1300	(26.5)
<i>A proper response can help the victim</i>		
Yes	4197	(85.4)
No	113	(2.3)
Do not know	604	(12.3)
<i>Cervical spine injury can affect patient quality of life until death</i>		
Yes	3501	(71.2)
No	274	(5.6)
Do not know	1139	(23.2)
<i>I would take spinal movement precaution in an unconscious trauma patient</i>		
Yes	4047	(82.4)
No	867	(17.6)
<i>I will try not to move the patient and call emergency services</i>		
Yes	4573	(93.1)
No	122	(2.5)
Do not know	219	(4.5)
<i>I will call emergency services before beginning first aid intervention</i>		
Yes	4171	(84.9)
No	743	(15.1)
<i>I will take extreme care at all times to maintain the alignment of the head, neck and spine</i>		
Yes	4717	(96.0)
No	197	(4.0)
<i>If the patient is responsive and I suspect cervical spine injury I will do the following</i>		
Reassure them and tell them to remain still	4119	(83.8)
Check their neck mobility	249	(5.1)
Try to change their position	54	(1.1)
Do not know	492	(10.0)

would try not to move the patient and that they would call an emergency response team instead. Moreover, 84.9% of the participants reported that they would call for an emergency response team before delivering any first aid interventions. A total of 96% of the participants declared they would take extreme care to maintain the alignment of the head, neck, and spine; finally, 83.8% of the respondents declared they would reassure trauma victims with suspected cervical spine injury and tell them not to move, if they were responsive.

**Table 4** presents the levels of public awareness regarding cervical spine trauma, stratified by participant characteristics. Good awareness was detected among 58.4% of older adult participants and 16.1% aged <20 years; this difference was statistically significant ( $p=0.001$ ). Moreover, 43.3% of the participating men and 15.8% women, had good awareness of these injuries ( $p=0.001$ ). Furthermore, good awareness

was detected among 41% of university graduates and 31.3% participants with a lower educational attainment ( $p=0.002$ ). Finally, 97.1% of the participants who were trained and 16.4% were not trained as trauma first responders, had good awareness of cervical spine injuries ( $p=0.001$ ).

**Discussion.** The present study is aimed to assess the levels of public awareness regarding cervical spine trauma and the suitable form of first aid response. Appropriate evaluation and protection of the cervical spine during resuscitation after trauma is challenging. Improper handling of a patient with cervical trauma can cause permanent disability or death.<sup>11-13</sup> Proper management confirms that excessive movement may aggravate any initial damage to the spine, thus increasing the chance of a secondary injury. The initial assessment of a cervical spine injury can be difficult, in particular, when there are no obvious signs or symptoms. An assessment in the field requires the evaluation of patient consciousness, airway obstruction, breathing pattern, and circulatory function to detect any signs of injury. In the absence of any life-threatening conditions, the level of consciousness of the individual should be determined and a neurological assessment should be performed.<sup>14,15</sup> In conscious patients, the evaluation should start with inquiring regarding feelings of numbness, painful dysesthesias or paresthesia, weakness, or neck pain. An initial examination can detect apparent neurological deficits, which can manifest as a partial or total loss of ability to move limbs, gross weakness, numbness, or significant pain on palpation of the cervical region.<sup>16,17</sup> Knowing the suitable type of first aid response to cervical spine trauma may save a patient's life.

Road traffic accidents was a commonly recognized risk factor for cervical spine trauma among the present study participants; RTA is the leading cause of trauma in Saudi Arabia.<sup>18,19</sup> Other risk factors such as sports and falls have been reported. Moreover, the present study revealed that more than 3% of the participants knew that cervical spine injury could be accompanied by damage to the spinal cord, which may result in life-long disability. Motor disabilities and sensory disabilities, followed by urinary and stool incontinence, were identified by the study participants as common complications of cervical spine injuries. The current study participants were aware that life-long disability resulting from cervical spine injury may increase the patients' need for long-term medical and physical management.

In the present study, nearly two-thirds of the participants recognized the main signs of cervical spine

**Table 4 -** Levels of public awareness regarding cervical spine trauma, stratified by survey participant demographic characteristics

Variables	Awareness level		P-value
	Poor	Good	
<i>Age, years</i>			
<20	663 (72.9)	127 (16.1)	0.001*
21-31	1593 (76.3)	495 (23.7)	
31-40	576 (73.6)	207 (26.4)	
41-50	340 (41.1)	488 (58.9)	
50+	177 (41.6)	248 (58.4)	
<i>Gender</i>			
Male	1624 (59.7)	1241 (43.3)	0.001*
Female	1725 (84.2)	324 (15.8)	
<i>Educational level</i>			
Secondary or below	860 (68.7)	391 (31.3)	0.002*
University student	1273 (79.4)	330 (20.6)	
University/above	1216 (59.0)	844 (41.0)	
<i>Monthly income, Saudi Riyals</i>			
<5000	1970 (79.9)	496 (20.1)	0.001*
5000-10000	747 (64.7)	408 (35.3)	
>10000	632 (48.9)	661 (51.1)	
<i>Marital status</i>			
Single	1918 (77.2)	565 (22.8)	0.058*
Married	1339 (58.3)	941 (41.3)	
Divorced/widowed	92 (60.9)	59 (39.1)	
<i>Trained as first responder</i>			
Yes	27 (2.9)	914 (97.1)	0.001
No	3322 (83.6)	651 (16.4)	

Values are presented as number and percentage (%). Comparisons were performed with the Pearson  $\chi^2$  test. \*P-value of <0.05 was considered indicative of a statistically significant difference.

injury, and approximately 75% of participants knew how to safely immobilize a patient with such an injury. Concurrently, fewer than one in 2 of the respondents knew the number to call to summon an emergency response team that could attend to such a case. In total, one-third of the study participants had good awareness of cervical spine trauma and the suitable first aid response. The awareness level was higher among the older and male participants than among their counterparts, likely due to previous experience with similar injuries. Moreover, having attained higher levels of education and having a history of first aid training were associated with higher levels of cervical spine injury awareness.

A previous study by Samamni et al<sup>20</sup> examined the levels of awareness regarding the “text neck” syndrome among young adults. The study revealed that 35% of young adults had heard of the “text neck” syndrome, but only 8% of the study participants knew what it entailed, while 21% of them knew how to prevent it. A separate study assessed the levels of public awareness of spinal injuries in the KSA population.<sup>21</sup> Most of the participants had good knowledge regarding the basic structures of the spine; approximately 45.9% of them knew the clinical features of spinal cord injury. Males were significantly more knowledgeable. The respondents’ level of education was significantly associated with the extent of their knowledge of spine anatomy and injury.

In the present study, approximately 75% of the respondents reported that they would help patients with cervical spine trauma, as their prompt response could prevent permanent disability. Moreover, nearly all of the participants (93%) reported that they would not move the patient and that they would call for an emergency response team, except for cases that may require urgent help. Furthermore, more than 95% of the participants said that they would aim to maintain the alignment of the head, neck, and spine to prevent secondary injury.

**Study limitations.** The main limitations of our study can be its design lacking utilization of further explanatory roles aiming to better explain the questionnaire items to participants assuring full understanding of the questions and use of links and web sites with educational materials and videos to help the educate public and to compare pre and post questionnaire answering knowledge.

In conclusion, the present study findings suggest that the levels of public awareness regarding cervical

spine trauma is low among the KSA population, except for the need of immobilization until the arrival of an emergency response team at the accident site. In the present study, most of the participants did not know the emergency number to call or how to provide resuscitation. The levels of public awareness of cervical spine trauma and the suitable first aid response require improvement, as these types of injury can be fatal, while a suitable response may prevent complications or death. This improvement can be achieved by providing health education sessions through mass or social media, and by education first aid in school and university curriculums.

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