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EVALUATING THE LEVEL OF AWARENESS REGARDING CERVICAL SPINE INJURY AND APPROPRIATE FIRST AID RESPONSE AMONG SCHOOL TEACHERS IN SAUDI ARABIA

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Abstract

Background: In a setting where injurious activities are to be expected, the best prevention of the worst outcomes possible is always needed. We intend in our study to shed light on the school environment and the high risk it holds of cervical spinal injuries. We aim to point out deficiencies in knowledge that would most likely be a barrier to best management and unfortunate outcomes prevention. That, inspired by previous studies one of which indicated 43.9% of patients (Saudi, male) who had spinal cord injuries were victims of cervical spine, and the apparent shortage of appropriate knowledge Saudi citizens have on those injuries.

Objectives: To assess the level of awareness regarding cervical spine injury and appropriate first aid response among schoolteachers in Saudi Arabia.

Methodology: A descriptive cross-sectional study, using a structured questionnaire followed by using Microsoft Office Excel for data entry and Statistical Package of Social Science Software (SPSS) program for analyzation. The minimal sample size of 384 was determined using the Qualtrics calculator with a confidence level of 95%.

Results: The total sample size was 519 with 70.1% were females and 29.9% were males. As regard knowledge and awareness score about cervical spine injury and appropriate first aid response among

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school teachers, there was 48.6% exhibited a high level of awareness regarding cervical spine injury and appropriate first aid response. Additionally, 29.1% of the participants, demonstrated a moderate level of knowledge on the subject. While 22.4% of the total sample, displayed a low level of awareness concerning cervical spine injury and appropriate first aid response. Moreover, there was a statistically significant relation to age (p value=0.049), and specialty (p value=0.016). While there was a statistically insignificant relation to gender, education level, nationality, region, monthly income and whether the participants had taken first aid course.

Conclusion: Knowledge of first aid is critical for teachers to provide solutions in case of the occurrence of accidents especially for critical cases such as cervical injury. Our study concluded that the school teachers had good knowledge and awareness about the first aid measures of cervical injury with about 49% exhibited good knowledge and about 29% exhibited moderate knowledge about this regard. However, more training workshops were recommended for improving the first-aid practice of teachers.

Keywords: Cervical Spinal Injury, Schoolteachers, First Aid.

Introduction:

Cervical spinal injuries (CSI) have always been a feared consequence of diverse types of intense actions humans partake in throughout their lives, they are the product of innumerable unfortunate injuries that happen around the cervical spinal cord [1]; no matter the sequelae, it would always be off-putting, be it death, disability, or psychological trauma.

The variability in CSI outcomes depends, to an extent, on the very first moments of the trauma. For those kinds of injuries being hard to treat, physicians have always emphasized the adequate control and handling (first aid) those first moments needed for the patient to come out with the least possible damage [2]. It is, therefore, a shared responsibility of each person from the location of the incident to the hospital bed.

Road traffic accidents were the most frequent cause of traumatic spinal injury (TSI) globally, followed by falls [3].

Motor Vehicle Accidents are the bulk of spinal trauma cases, of which 50% of the casualties were drivers and 80% were passengers who weren't wearing seatbelts. Injuries to other body parts were linked to nearly 50% of spinal injuries [4]. Another study stated motor vehicle collisions (MVC) were the most frequent cause of severe spinal injuries [5]. Another study stated motor vehicle collisions (MVC) were the most frequent cause of severe spinal injuries [6].

The cervical region fractures were the most frequent anatomical area, next by the lumbar and thoracic locations [7]. 100 (44%) of the patients had cervical spine injuries, and 74 (30%) involved lumbar spine injuries. 25 percent of the patients presented with quadriplegia or paraplegia as a fixed neurologic impairment. There was a 1.3% mortality rate[4] Young adults and teenagers below the age of 40 made up the majority of the cases. Out of 120 patients, 55 sustained fractures of the cervical spine [8]. Overall, respiratory impairment, dysphagia, pneumonia, urinary tract infection and delirium had quite significant occurrences following cervical spinal injury [9].

According to a previous study, a cervical spine injury can have severe consequences and lead to long-term disability [10]. For young people, a cervical spine injury can have life-altering outcomes [13]. 501

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participants in all, just under half (45.9%) of the participants realized the clinical characteristics of spinal cord injury (SCI), despite the fact that the majority of individuals were familiar with the fundamental components of the spine[11]. According to a recent survey, the public in the Kingdom of Saudi Arabia (KSA) knows less about cervical spine injuries and is more aware of the value of keeping people immobilized until emergency personnel arrive at the scene of an accident [12].

We took interest in our study on where those injuries are feared most and need care and advanced planning. A youth's life is mostly spent at school, where the risk of injuries is high for intense activities between students. A teacher is their very first step for excellent managing and ahead of time prevention. Therefore, complete knowledge of Cervical Spinal Injuries First Aid is a necessity.

A study shows that the mechanism of cervical spinal injuries in young patients (up to 16 years) is mostly caused by falls. Athletic adolescents at that age spend a large amount of their time in school [13]. To our knowledge, no previous research was conducted to measure the level of awareness toward cervical spinal injury and suitable first aid response among schoolteachers in KSA.

Objectives:

To evaluate the level of awareness regarding cervical spine injury and appropriate first aid response among schoolteachers in Saudi Arabia.

Materials and Methods:

Study design:

Our study was a descriptive cross-sectional study, using a structured questionnaire. It was conducted from July 2023 - July 2024 in all regions of Saudi Arabia.

Study setting:

Participants, recruitment, and sampling procedure: The studied group included teachers from various schools in Saudi Arabia who took part in completing the questionnaire.

Inclusion and Exclusion criteria:

We have included male and female teachers from all schools in Saudi Arabia. School administration workers, students, and schoolteachers who had previous cervical spine fractures were excluded.

Sample size:

By using the Qualtrics calculator and a 95% degree of confidence, the minimum sample size was estimated to be 384 using the following formula:

n= P (1-P) * Zα 2 / d 2, with a confidence level of 95%. n: Calculated sample size.

Z: The z-value for the selected level of confidence (1- a) = 1.96. P: An estimated knowledge.

Q: (1 – 0.50) = 50%, i.e., 0.50.

D: The maximum acceptable error = 0.05. Hence, the calculated minimum sample size was: n = (1.96)2 X 0.50 X 0.50/ (0.05) 2 = 384.

Method for data collection and instrument (Data collection Technique and tools):

Self-administrated Questionnaire was prepared and distributed by data collectors to collect data from schoolteachers in Saudi Arabia. The questionnaire included questions regarding the teachers' sociodemographic (age, gender, and educational level) as well as questions about level of knowledge of cervical spine injuries and awareness of correct response of cervical injuries among teachers in Saudi Arabia.

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Scoring system:

20 questions in our survey; any correct answer received a score of (1), whereas those who choose (incorrect, I don't know) received a score of (0).

The participants were divided into three groups according to their scores. Individuals scoring below 11 were categorized as having a low level of awareness, while those scoring between 12 and 16 were classified as having a moderate level of awareness and Individuals scoring above 16 were considered to have a high level of awareness.

Analyzes and entry method:

Data was administered through computer using the "Microsoft Office Excel Software" program (2016) for windows. Data was transferred to the Statistical Package of Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) to be statistically analyzed.

Results:

The total sample size was 519 with 70.1% were females and 29.9% were males. The distribution of participants across different age groups reveals that individuals aged 40 to 49 constitute the largest proportion at 31.6%, followed by those aged 29 or less at 30.3%. Regarding education level, the data indicates that most participants had a university degree (83.8%), with only a small percentage holding a Doctorate (1.3%). The participants' specializations were predominantly in scientific majors (52.8%), followed by literary majors (45.3%). The marital status of the participants shows that a significant proportion were married (64.0%), while a smaller percentage were single (31.2%). Most participants were Saudi nationals (98.3%), with only a small percentage being non-Saudi (1.7%). The distribution of participants across different regions of Saudi Arabia varied, with the West Region having the highest representation at 42.4%. In terms of monthly income, most participants fell within the 5000 - 10000 SAR bracket (47.2%). Interestingly, a notable finding from the data is that a significant proportion of participants (60.9%) reported not having taken a first aid course, highlighting a potential gap in readiness for responding to emergencies Table (1).

Table (1): Sociodemographic characteristics of participants (n=519)

Parameter		***No.***	***Percent (%)***
Age	29 or less	157	30.3
	30 to 39	104	20.0
	40 to 49	164	31.6
	50 to 59	90	17.3
	more than 60	4	0.8
Gender	Female	364	70.1
	Male	155	29.9
Education level	Diploma	62	11.9
	University	435	83.8

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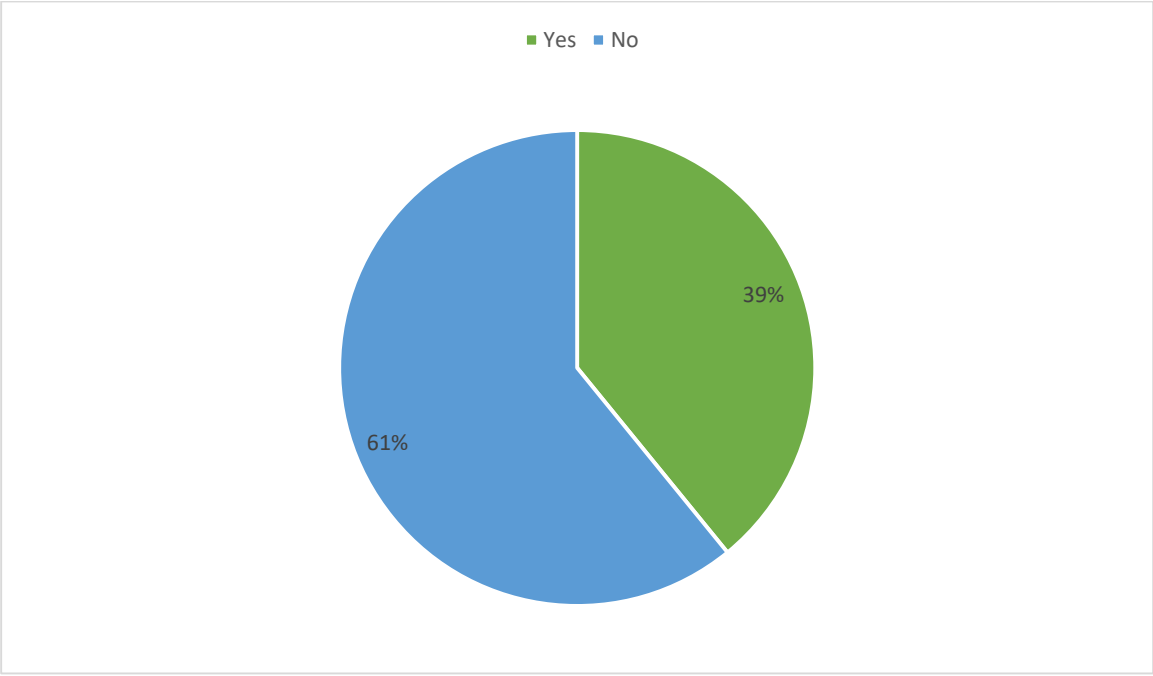
	Master	15	2.9
	Doctorate	7	1.3
Specialty	Scientific major	274	52.8
	Literary major	235	45.3
	Administrative major	10	1.9
Marital status	Single	162	31.2
	Married	332	64.0
	Divorced	23	4.4
	Widowed	2	0.4
Nationality	Saudi	510	98.3
	Non-Saudi	9	1.7
Region	North Region	36	6.9
	South Region	146	28.1
	East Region	117	22.5
	West Region	220	42.4
Monthly income	5000 - 10000 SAR	245	47.2
	11000 - 15000 SAR	144	27.7
	16000 - 20000 SAR	99	19.1
	More than 20000 SAR	31	6.0
Did you take a first aid course?	Yes	203	39.1
	No	316	60.9

Figure (1): Illustrates if the participants had taken a first aid course.



As illustrated in table (2), It is evident from the data that there are varying levels of understanding

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among teachers regarding cervical spine injuries and appropriate first aid responses. For instance, a significant percentage of participants correctly identified the number of cervical vertebrae, recognized the use of a cervical collar for stabilizing the spine, and acknowledged the potential long-term implications of cervical spine injuries. However, there were also notable gaps in knowledge, as indicated by responses such as uncertainty about certain symptoms, risk factors, and complications associated with cervical spine injuries. The data underscores the importance of enhancing awareness and education among teachers regarding cervical spine injuries to ensure timely and effective responses in case of emergencies.

Table (2): Parameters related to knowledge and awareness of cervical spine injury among teachers in Saudi Arabia (n=519).

Parameter		***No.***	***Percent (%)***
What is the number of cervical vertebrae?	5	132	25.4
	7	257	49.5
	9	65	12.5
	12	65	12.5
The cervical spine is connected by a ligament and divided by an intervertebral disk?	Yes	293	56.5
	No	30	5.8
	I don't know	196	37.8
Physical and medical therapy may be required for the whole life after cervical spine injury?	Yes	417	80.3
	No	18	3.5
	I don't know	84	16.2
Early detection of cervical spine injuries will prevent future complication	Yes	418	80.5
	No	24	4.6
	I don't know	77	14.8
For stabilizing the cervical spine, we use a cervical collar to minimize the movement of vertebra?	Yes	392	75.5
	No	13	2.5
	I don't know	114	22.0
What is the Possible sign and symptom of cervical spine injury? **	Numbness in extremities	300	57.8
	Unable to move hand	247	47.59
	Decrease the level of consciousness	99	19.1
	Pain in the arms	196	37.76
	Don't know	170	32.75
	Bleeding per nose	33	6.36
Possible risk factor for cervical cord injury **	RTA	370	71.3
	Sports injuries	304	58.57
	Using multiple pillows during sleep	156	30.1

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	Increase in aging	171	32.95
	Long Using device	243	46.82
	Fall	295	56.84
	Don't know	81	15.6
What is the following disease may increase the risk of cervical spine injury? **	Rheumatoid arthritis	397	76.49
	Brain tumor	128	24.66
	Diabetes mellitus	94	18.11
	Obesity	234	45.1
What are the Complications of cervical injury? **	Motor disability	387	74.56
	Sensory disability	168	32.37
	Affected breathing	150	28.9
	Urine incontinence	66	12.72
	Stool incontinence	48	9.25
	Smell & taste issues	35	6.74
	Do not know	126	24.28
The cervical vertebrae injury may lead to damage to the spinal injury?	Yes	300	57.8
	No	27	5.2
	I don't know	192	37.0
injury of cervical spine can cause life-long disability?	Yes	173	33.3
	No	111	21.4
	I don't know	235	45.3
What is the first step in the approach of a patient with suspected cervical spine injury?	I will try to not move the patient and call for emergency service	388	74.8
	Changing patient position	19	3.7
	I will raise the leg of the patient	8	1.5
	Do not know	104	20.0

*** **Results** **may** **overlap***

Figure (2): Illustrates the first step in the approach of a patient with suspected cervical spine injury among participants.

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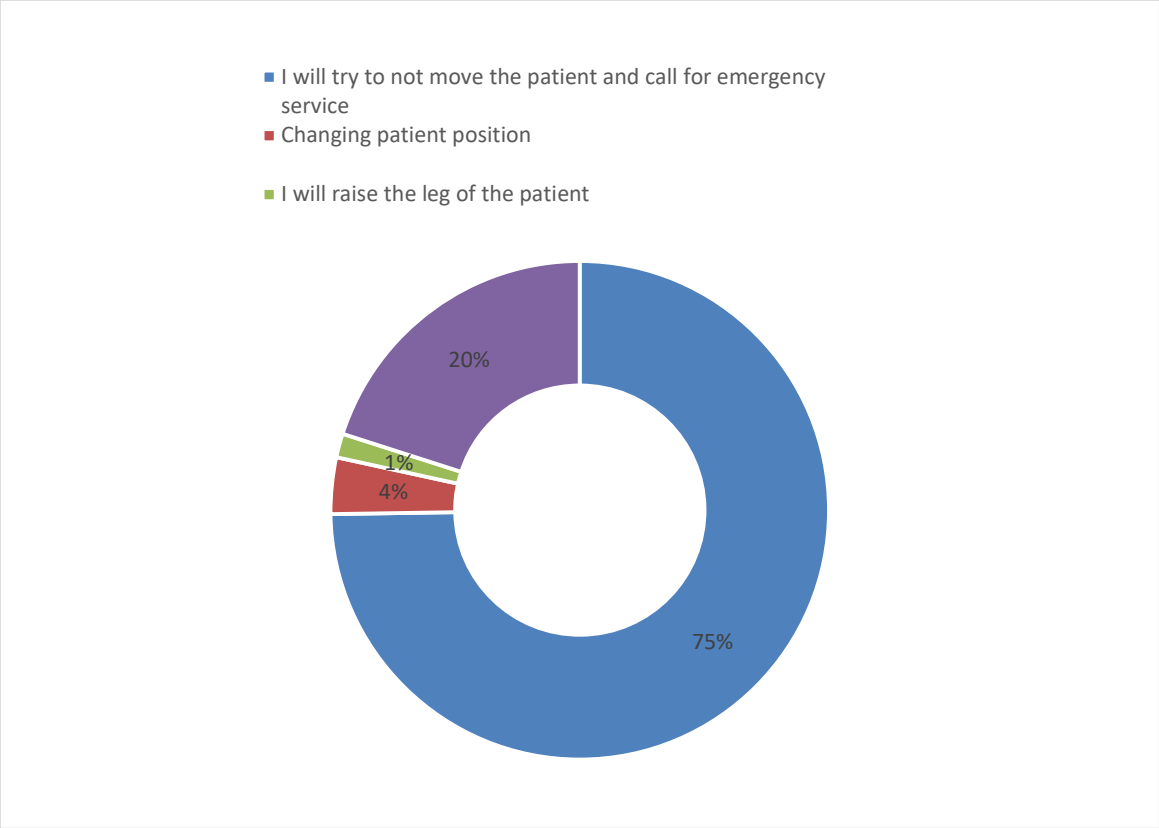

Table (3) reveals the parameters related to the first response of cervical spine injury among teachers in Saudi Arabia, with a sample size of 519 participants. The findings reveal both encouraging and concerning trends in the teachers' awareness and preparedness to handle such critical situations. It is heartening to note that a significant percentage of teachers (86.3%) recognize the importance of a prompt and appropriate response in preserving the life of a patient with a cervical spine injury. However, there are areas that require immediate attention and improvement, such as the relatively low percentage (10.0%) of teachers who indicated their willingness to start movement in unconscious patients with trauma, which goes against the established medical guidelines. Moreover, the data highlights a need for further education and training, as evidenced by the responses indicating uncertainty or incorrect approaches in certain scenarios. Ensuring that teachers are equipped with the necessary knowledge and skills to respond effectively to medical emergencies, including cervical spine injuries, is paramount not only for the well-being of students but also for the broader community.

Table (3): Parameters related to first response of cervical spine injury among teachers in Saudi Arabia (n=519).

Parameter	***Yes***	***No***	***I don't know***
I will assist persons who have been involved in a vehicle accident or who have fallen.	316 60.9%	133 25.6%	70 13.5%

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A good response can preserve the patient's life with cervical spine injury.	448 86.3%	13 2.5%	58 11.2%
Cervical spine injury can impair a patient's quality of life till death.	371 71.5%	44 8.5%	104 20.0%
I will start a movement in unconscious patients with trauma.	52 10.0%	407 78.4%	60 11.6%
I will try to not move the patient and will contact ambulance.	465 89.6%	21 4.0%	33 6.4%
I will take great care to keep the head, neck, and spine in the proper position at all times.	432 83.2%	22 4.2%	65 12.5%
Before I begin first aid, I shall contact emergency services.	455 87.7%	26 5.0%	38 7.3%

Table (4) presents the score results derived from the survey conducted among the participants. The data reveals that out of the total 519 respondents, 252 individuals, accounting for 48.6% of the sample, exhibited a high level of awareness regarding cervical spine injury and appropriate first aid response. Additionally, 151 respondents, constituting 29.1% of the participants, demonstrated a moderate level of knowledge on the subject. On the other hand, 116 individuals, representing 22.4% of the total sample, displayed a low level of awareness concerning cervical spine injury and appropriate first aid response. This distribution of responses provides valuable insights into the current level of preparedness and understanding among school teachers in Saudi Arabia regarding cervical spine injuries and the necessary first aid measures.

Table (4): Shows knowledge and awareness about cervical spine injury and appropriate first aid response among school teachers score results.

	Frequency	**Percent**
High level	252	48.6
Moderate level	151	29.1
Low level	116	22.4
Total	519	100.0

Table (5) shows that the knowledge and awareness of cervical spine injury among teachers has statistically significant relation to age (p value=0.049), and specialty (p value=0.016). It also shows statistically insignificant relation to gender, education level, nationality, region, monthly income and whether the participants had taken first aid course.

Table (5): Relation between knowledge and awareness of cervical spine injury among teachers in Saudi Arabia and sociodemographic characteristics.

Parameters		***Knowledge level***		***Total (N=519)***	***P value****
		High	***Moderate or low***		
Gender	Female	177	187	364	0.960

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		70.2%	70.0%	70.1%	
	Male	75	80	155	
		29.8%	30.0%	29.9%	
Age	29 or less	66	91	157	0.049
		26.2%	34.1%	30.3%	
	30 to 39	62	42	104	
		24.6%	15.7%	20.0%	
	40 to 49	81	83	164	
		32.1%	31.1%	31.6%	
	50 to 59	40	50	90	
		15.9%	18.7%	17.3%	
	more than 60	3	1	4	
		1.2%	0.4%	0.8%	
Education level	Diploma	30	32	62	0.949
		11.9%	12.0%	11.9%	
	University	210	225	435	
		83.3%	84.3%	83.8%	
	Master	8	7	15	
		3.2%	2.6%	2.9%	
	Doctorate	4	3	7	
		1.6%	1.1%	1.3%	
Specialty	Scientific major	137	137	274	0.016
		54.4%	51.3%	52.8%	
	Literary major	106	129	235	
		42.1%	48.3%	45.3%	
	Administrative major	9	1	10	
		3.6%	0.4%	1.9%	
Marital status	Single	69	93	162	N/A
		27.4%	34.8%	31.2%	
	Married	171	161	332	
		67.9%	60.3%	64.0%	
	Divorced	10	13	23	
		4.0%	4.9%	4.4%	
	Widowed	2	0	2	
		0.8%	0.0%	0.4%	
Nationality	Saudi	247	263	510	0.672
		98.0%	98.5%	98.3%	
	Non-Saudi	5	4	9	
		2.0%	1.5%	1.7%	
Region	Northern region	20	16	36	0.197

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		7.9%	6.0%	6.9%	
	Southern region	62	84	146	
		24.6%	31.5%	28.1%	
	Eastern region	54	63	117	
		21.4%	23.6%	22.5%	
	Western region	116	104	220	
		46.0%	39.0%	42.4%	
Monthly income	5000 - 10000 SAR	113	132	245	0.065
		44.8%	49.4%	47.2%	
	11000 - 15000 SAR	83	61	144	
		32.9%	22.8%	27.7%	
	16000 - 20000 SAR	44	55	99	
		17.5%	20.6%	19.1%	
	More than 20000 SAR	12	19	31	
		4.8%	7.1%	6.0%	
Did you take a first aid course?	No	151	165	316	0.661
		59.9%	61.8%	60.9%	
	Yes	101	102	203	
		40.1%	38.2%	39.1%	

P value was considered significant if ≤ 0.05.

Discussion:

Cervical spine injuries, though infrequent, can lead to substantial and enduring impairment. The cervical spine, comprising seven vertebrae, acts as a shield for the spinal cord [14]. Due to its anatomy and flexibility, the cervical spine is the part of the spine most prone to injury. Understanding the mechanism of injury is crucial in recognizing the potential type of injury a patient may face. Trauma, such as motor vehicle accidents, falls, penetrating or blunt trauma, sports-related or diving injuries, is the primary cause of cervical injury [15]. Nontraumatic factors like compression fractures from osteoporosis, arthritis, or cancer, as well as spinal cord inflammation, can also contribute to cervical injury. Various forms of trauma, including flexion, extension, rotation, contusion, and compression of the spinal cord, can result in cervical injury. First aid involves the provision of initial care for injuries or illnesses by individuals without medical training until professional medical assistance is available [16]. Injuries are a leading cause of morbidity and mortality worldwide, particularly in middle- and low-income countries [17]. Inadequate management of cervical spine injuries can lead to respiratory and cardiovascular complications due to neurological deficits associated with the injury. Failure to stabilize an injured cervical spine before definitive treatment increases the risk of further spinal cord damage [18].

Primary care physicians are not typically available in schools. Prompt administration of first aid by school teachers can reduce the negative impact of injuries on students, underscoring the importance of teachers possessing sufficient knowledge and proficiency in basic first aid techniques [19]. In Saudi Arabia, there were approximately 30,263 reported cases of neck and back injuries. Building awareness

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about first aid is essential to address accidents when they occur, which can be achieved through the implementation of training programs [20]. In Saudi Arabia, teachers are the primary caregivers in schools for children, acting as their first line of defense and initial responders to student emergencies. Therefore, teachers should be equipped to handle emergencies and crises that students may encounter [21]. Thus, we aimed in this study to evaluate the level of awareness regarding cervical spine injury and appropriate first aid response among schoolteachers in Saudi Arabia.

As regard knowledge and awareness score about cervical spine injury and appropriate first aid response among school teachers, we have found that 252 individuals, accounting for 48.6% of the sample, exhibited a high level of awareness regarding cervical spine injury and appropriate first aid response. Additionally, 151 respondents, constituting 29.1% of the participants, demonstrated a moderate level of knowledge on the subject. On the other hand, 116 individuals, representing 22.4% of the total sample, displayed a low level of awareness concerning cervical spine injury and appropriate first aid response. On the other hand, in 2020, Taklual *et al*. performed a study to investigate the awareness level about first aid measures of cervical injury among elementary school teachers in Ethiopia. They found that school teachers have low knowledge of first aid [22]. Moreover, AlYahya *et al*. (2019) conducted a study to assess the levels of knowledge of teachers in the Riyadh city related to basic first aid practices and its variables. They found that 60.1% of teachers had high level of knowledge about first aid practices which was more than our findings [23]. Another study from Saudi Arabia reported that more than half of teachers 62.88% did not attend any training about first aid and 51.26% had poor knowledge which is higher than our study results [24]. Another study demonstrated that there was an unsatisfactory level of first aid knowledge among primary school teachers [25]. A study from Al-Robaiaay showed that sports teachers had poor knowledge about first aid. In Madinah, 44.76% was the percentage of good first aid knowledge of overall school instructors. They also measured 60.55% of school instructors have a positive attitude toward first aid training [26]. Moreover, a study from Egypt reported that the knowledge of primary school teachers about first aid measures regarding cervical injury was inadequate [27]. A study from Iraq reported that 95% of teachers had total fair knowledge and 5% had poor knowledge. On the other hand, An Indian study showed that 77.5% of government school teachers had an average level of knowledge toward first aid, whereas 12.5% and 10% had good and poor knowledge, respectively [28]. Another Indian study reported that 13% and 87% of school teachers in Mangalore had poor and moderate knowledge, respectively [29]. Another study found that 72.5% had good knowledge [30].

Regarding the relation between knowledge and awareness of cervical spine injury among teachers in Saudi Arabia and sociodemographic characteristics, we have found a statistically significant relation to age (p value=0.049), and specialty (p value=0.016). While there was a statistically insignificant relation to gender, education level, nationality, region, monthly income and whether the participants had taken first aid course. Similarly, it was reported that teachers older than 35 years had higher knowledge about first aid more than younger teachers (p value < 0.05) [31]. In contrast, another study reported that educational status, previous first aid training, service year, and information on first aid were the determinant of first aid knowledge [32].

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Conclusion:
Our study concluded that the school teachers had good knowledge and awareness about the first aid measures of cervical injury with about 49% exhibited good knowledge and about 29% exhibited moderate knowledge about this regard. However, there is still a need to increase awareness among school teachers in Saudi Arabia regarding cervical spine injury and appropriate first aid response by further education and training in this area to ensure that teachers are equipped with the necessary knowledge and skills to respond effectively in emergency situations. By enhancing the level of awareness and preparedness among teachers, we can potentially reduce the risk of further injury and improve the overall safety and well-being of students in schools. Moving forward, it is imperative for educational institutions and relevant authorities to prioritize the implementation of training programs and guidelines to address this critical issue. Ultimately, the well-being and safety of students should always remain a top priority for educators and school administrators.

Acknowledgement:

We thank the participants who all contributed samples to the study.

Ethical approval
EAn informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

Funding
The study did not receive any external funding.

Conflict of interests
The authors declare that there are no conflicts of interest.

Informed consent:
Written informed consent was obtained from all individual participants included in the study.

Data and materials availability
All data associated with this study are present in the paper.

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