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LEVEL OF AWARENESS OF SCOLIOSIS AMONG STUDENTS AT SÜLEYMAN DEMİREL UNIVERSITY FACULTY OF MEDICINE

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ABSTRACT

Objective: To determine the level of scoliosis awareness among medical students and to examine demographic factors associated with awareness, including age, gender, and academic year.

Materials and Methods: This cross-sectional, survey-based study was conducted among undergraduate medical students enrolled in Süleyman Demirel University Faculty of Medicine between March 1 and April 30, 2025. A structured questionnaire developed through literature review and expert opinion was administered online. The questionnaire collected demographic data and consisted of 11 items assessing awareness of scoliosis. Of the 1.555 students invited, 906 valid questionnaires were included in the final analysis. Descriptive statistics were calculated, and differences in awareness levels according to demographic variables were analyzed using the chi-square test.

Results: The majority of participants were female (56.1%) and were aged between 18 and 22 years. Most respondents were first- and fourth-year students (28.5% and 25.6%, respectively). Overall, 93.2% of participants had heard of scoliosis; 70.5% reported moderate awareness, and 11.1% reported good awareness. Awareness levels differed significantly according to age group (p=0.012) and academic year (p<0.001), with higher proportions of good awareness observed among third- and sixth-year students. No significant difference in awareness levels was observed by gender (p=0.417). Although belief in the availability of treatment options was high (74.3%), awareness of scoliosis symptoms was limited to 59.1%. Participation in scoliosis awareness campaigns was very low (2.1%), whereas most participants (90.7%) supported organizing awareness activities in schools and public spaces.

Conclusion: Medical students demonstrated basic awareness of scoliosis; however, notable gaps remain, particularly in recognizing symptoms and participating in awareness campaigns. Although awareness increases with academic progression, integrating scoliosis awareness into structured curricula, social responsibility initiatives, and community-based education programs may enhance student engagement and contribute to improved public health outcomes.

Keywords: Scoliosis, awareness, medical students, medical education, public health

INTRODUCTION

Scoliosis is a three-dimensional skeletal deformity characterized by a lateral curvature of the spine greater than 10 degrees from the midline, typically presenting in an "S" or "C" shape. This deformity is not limited to lateral deviation of the vertebrae but is also marked by vertebral rotation around their own axis. Scoliosis is a complex spinal disorder that can lead to both structural and functional impairments[1].

The diagnosis of scoliosis begins initially with a clinical evaluation. The patient's posture, asymmetries between shoulder and hip levels, and curvature of the waistline are carefully observed. The most used clinical assessment method is the Adam's forward bend test, during which the patient is asked to bend forward, and rib prominence or asymmetry in the thoracic or lumbar regions is examined[2]. To confirm the diagnosis, standing posteroanterior and lateral radiographs are required. The spinal curvature is measured on these radiographs using the Cobb angle, and a diagnosis of scoliosis is established when the angle is 10 degrees or greater[3].

Scoliosis is classified into various categories based on factors such as age of onset, etiology, location, and severity of the curvature. The most common form in the general population is adolescent idiopathic scoliosis (AIS)[4]. The overall prevalence of this form emerges during adolescence has been reported in the literature to range between 0.47% and 5.2%[5]. Females have a higher risk of developing scoliosis compared to males, with a

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female-to-male ratio ranging from 1.5:1 to 3.1. Besides, higher Cobb angles are considerably more frequent in females than in males[4].

Early diagnosis decelerates the progression of scoliosis and reduces the need for surgical intervention. The level of knowledge among healthcare professionals regarding scoliosis plays a crucial role in the early detection of affected individuals and their timely referral to medical facilities. Thus, it is especially important that medical students possess adequate knowledge about the definition, clinical findings, epidemiology, and treatment approaches of scoliosis; this is crucial for proper patient referral and enhancing the effectiveness of the treatment process[6].

The treatment of scoliosis should be individualized with respect to the patient's age, degree of curvature, and accompanying symptoms. In mild cases, regular clinical follow-up and exercise programs may be sufficient, whereas physical therapy and specific exercises aimed at improving spinal stability are recommended for moderate cases. In advanced deformities, surgical intervention is an effective treatment option, particularly to preserve spinal balance and pulmonary functions. Due to the multifaceted nature of scoliosis, the treatment process should be managed through a multidisciplinary approach[4].

The aim of this study was to determine the level of scoliosis awareness among medical students and to examine factors associated with awareness levels, including age, gender, and academic year.

MATERIALS AND METHODS

This survey-based cross-sectional study was approved by the Süleyman Demirel University Scientific Research Publication Ethics Committee (approval no: 90/2, date: 29.01.2025), and all necessary permissions for conducting the research were obtained. All stages of the study were carried out in accordance with the principles of the Helsinki Declaration.

Participants and Procedure

This cross-sectional descriptive study was conducted among 1st, 2nd, 3rd, 4th, 5th, and 6th year undergraduate students enrolled at Süleyman Demirel University Faculty of Medicine. Data were collected between March 1 and April 30, 2025. The total registered student population at the faculty consists of 1555 individuals. Students who voluntarily completed the online questionnaire and met the inclusion criteria participated in the study.

In the introduction section of the questionnaire, participants were informed about the purpose, scope, and confidentiality principles of the study. The informed consent form was provided online, and only students aged 18 and above who were able to read and understand Turkish and who checked the box stating, "I voluntarily agree to participate in the study" were included. Participants who submitted incomplete questionnaires or did not provide consent were excluded from the study.

The questionnaire was developed by the researchers based on a review of relevant literature. Content validity was evaluated through expert opinion from two orthopedic surgeons and one medical education specialist. A pilot test was conducted with 20 medical students to ensure clarity and comprehensibility. The online questionnaire developed by the researchers consisted of two sections. The first section included questions about participants' demographic information, such as age, gender, and academic year. The second section comprised a knowledge assessment form with 11 questions aimed at measuring scoliosis awareness. Questions 5-14 were structured with response options appropriate to the content of each item (e.g., yes/no/undecided or multiple-choice formats), while the final question was open-ended (Table 1).

A total of 1555 students responded to the questionnaire. After excluding incomplete forms, 906 valid questionnaires (58%) were included in the final analysis. At Süleyman Demirel University Faculty of Medicine, scoliosis education is primarily delivered during the 5th-year orthopedics and traumatology clerkship.

The questionnaire was digitized using the Google Forms platform (Google LLC, California, USA) and distributed to participants via WhatsApp groups managed by the class representatives of Süleyman Demirel University Faculty of Medicine. Participants

Table 1. Questions listed in the scoliosis awareness level assessment form

Question no	Content of question
1	What is your gender?
2	What age group do you belong to?
3	Which academic year are you in?
4	Which region of Türkiye do you live in?
5	Have you heard of scoliosis before?
6	Has a close acquaintance ever been diagnosed with scoliosis?
7	(If the answer to the previous question is "Yes") How was scoliosis noticed?
8	What is your level of knowledge about scoliosis?
9	Which gender do you think is more affected by scoliosis?
10	Do you believe that scoliosis patients have treatment options?
11	Are you aware of the symptoms of scoliosis?
12	Have you participated in any campaign or event related to scoliosis awareness?
13	Do you think there is sufficient awareness about scoliosis in your region?
14	Do you support organizing exhibitions in schools, universities, and public spaces to increase scoliosis awareness?
15	What do you recommend raising scoliosis awareness?

Table 2. Demographic characteristics of participants and their perspectives on scoliosis awareness (n=906)

Characteristics	Categories	n (%)
Gender	Male	401 (43.9)
	Female	505 (56.1)
Age range (years)	18-20	306 (33.8)
	20-22	348 (38.4)
	22-24	217 (24.0)
	≥24	35 (3.9)
Academic year	1st year	258 (28.5)
	2nd year	130 (14.3)
	3rd year	182 (20.1)
	4th year	232 (25.6)
	5th year	80 (8.8)
	6th year	24 (2.6)
Region of residence in Türkiye	Mediterranean	647 (73.1)
	Eastern Anatolia	16 (1.8)
	Aegean	77 (8.7)
	Central Anatolia	121 (13.7)
	Black Sea	14 (1.6)
	Marmara	10 (1.1)
	Not specified/ missing	21 (2.3)
Heard of scoliosis before	No	62 (6.8)
	Yes	844 (93.2)
Close acquaintance diagnosed with scoliosis	No	548 (60.5)
	Yes	358 (39.5)
Self-reported scoliosis awareness level	I don't know	166 (18.3)
	Moderate	639 (70.5)
	Good	101 (11.1)
Gender perceived to be more affected by scoliosis	Male	206 (22.7)
	Female	443 (48.9)
	Both	257 (28.4)
Belief that scoliosis has treatment options	No	40 (4.4)
	Yes	673 (74.3)
	Undecided	193 (21.3)
Awareness of scoliosis symptoms	No	371 (40.9)
	Yes	535 (59.1)
Participation in scoliosis awareness campaigns	No participation	880 (97.1)
	Participated	19 (2.1)
	Participated, no perceived benefit	7 (0.8)
Perceived sufficiency of scoliosis awareness in region	No	596 (65.8)
	Yes	56 (6.2)
	Undecided	254 (28.0)
Support for organizing scoliosis awareness events	No	84 (9.3)
	Yes	822 (90.7)

who completed the questionnaire submitted their responses online, and the data were digitally recorded by the researchers. Data related to age, gender, academic year, and knowledge of scoliosis from participants who met the eligibility criteria were used in the analysis.

Description: This form, designed to assess participants' knowledge, experience, and awareness regarding scoliosis, consists of multiple-choice and open-ended questions. Some questions (5-14) are answered with options such as "yes, no, and undecided" while question 15 is open-ended, allowing participants to express their opinions.

Statistical Analysis

Statistical analysis of the study were performed using SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as frequencies (percentages). The chi-square test was used to determine relationships among variables obtained from the knowledge form. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Most of the participants were female (56.1%), and the majority were between 18 and 22 years of age. Most participants were first-year (28.5%) and fourth-year (25.6%) medical students. The majority of respondents resided in the Mediterranean Region (73.1%). Approximately 93.2% of the participants reported that they had heard the term scoliosis before, and 39.5% stated that a close acquaintance had been diagnosed with scoliosis. Most participants described their level of scoliosis awareness as moderate (70.5%), and 48.9% believed that scoliosis affects females more frequently. Belief in the availability of treatment options was high, with 74.3% considering scoliosis to be treatable. However, only 59.1% reported being aware of the symptoms of scoliosis. The vast majority of participants (97.1%) had not participated in any scoliosis awareness campaigns, and 65.8% believed that scoliosis awareness in their region was insufficient. Nevertheless, 90.7% supported the organization of awareness events in schools and public spaces (Table 2). Responses to the open-ended question most frequently emphasized the need for public education campaigns, school-based screening programs, and increased use of social media to raise scoliosis awareness.

Differences in self-reported scoliosis awareness levels were examined according to demographic variables. A statistically significant difference was observed in awareness levels across age groups (p=0.012). The proportion of participants aged ≥24 years who reported a "good" level of awareness (22.9%) was higher than that observed in other age groups. Awareness levels also differed significantly according to academic year (p<0.001). Notably, third- and sixth-year students demonstrated higher proportions of "good" awareness levels (17.6% and 33.3%, respectively). In contrast, the proportions of participants

reporting "I don't know" were higher among first- and second-year students (23.6% and 23.8%, respectively). No statistically significant difference in awareness levels was observed according to gender (p=0.417), with similar distributions between male and female participants (Table 3).

The study findings indicate that the knowledge of students and attitudes regarding scoliosis vary by their academic year. Differences were observed in the variables related to beliefs about which gender scoliosis affects more and knowledge of its symptoms (p<0.001). The higher level of symptom knowledge among upper-year students suggests that health-related awareness increases with educational level. No statistically significant differences were found between grade levels for the other variables (Table 4).

Table 3. Differences in self-reported scoliosis awareness levels according to demographic variables

Variable	Category	I don't know n (%)	Moderate n (%)	Good n (%)	p-value
Gender	Male	83 (21.0)	264 (66.8)	48 (12.2)	0.417
	Female	81 (16.0)	373 (73.9)	51 (10.1)	
Age range (years)	18-20	66 (21.6)	211 (69.0)	29 (9.5)	0.012*
	20-22	61 (17.5)	250 (71.8)	37 (10.6)	
	22-24	34 (15.7)	156 (71.9)	27 (12.4)	
	≥24	5 (14.3)	22 (62.9)	8 (22.9)	
Academic year	1st year	61 (23.6)	177 (68.6)	20 (7.8)	<0.001*
	2nd year	31 (23.8)	92 (70.8)	7 (5.4)	
	3rd year	22 (12.1)	128 (70.3)	32 (17.6)	
	4th year	37 (15.9)	176 (75.9)	19 (8.2)	
	5th year	12 (15.0)	53 (66.3)	15 (18.8)	
	6th year	3 (12.5)	13 (54.2)	8 (33.3)	

*: Statistically significant at p<0.05 (chi-square test)

Table 4. Distribution of scoliosis awareness and perceptual variables according to academic year

Variable	Response	1st year	2nd year	3rd year	4th year	5th year	6th year	p-value
Have you heard of scoliosis before?	No	24 (9.3)	7 (5.4)	15 (8.2)	11 (4.7)	3 (3.8)	2 (8.3)	0.075
	Yes	234 (90.7)	123 (94.6)	167 (91.8)	221 (95.3)	77 (96.3)	22 (91.7)	
Has a close acquaintance been diagnosed with scoliosis?	No	159 (61.6)	85 (65.4)	102 (56.0)	150 (64.7)	41 (51.3)	11 (45.8)	0.190
	Yes	99 (38.4)	45 (34.6)	80 (44.0)	82 (35.3)	39 (48.8)	13 (54.2)	
Which gender do you think is more affected by scoliosis?	Male	42 (16.3)	42 (32.3)	46 (25.3)	55 (23.7)	16 (20.0)	5 (20.8)	<0.001*
	Female	108 (41.9)	42 (32.3)	95 (52.2)	133 (57.3)	52 (65.0)	13 (54.2)	
	Both	108 (41.9)	46 (35.4)	41 (22.5)	44 (19.0)	12 (15.0)	6 (25.0)	
Do you believe that scoliosis patients have treatment options?	No	9 (3.5)	5 (3.8)	8 (4.4)	14 (6.0)	3 (3.8)	1 (4.2)	0.073
	Yes	189 (73.3)	95 (73.1)	133 (73.1)	170 (73.3)	69 (86.3)	17 (70.8)	
	Undecided	60 (23.3)	30 (23.1)	41 (22.5)	48 (20.7)	8 (10.0)	6 (25.0)	
Are you aware of the symptoms of scoliosis?	No	122 (47.3)	64 (49.2)	83 (45.6)	84 (36.2)	12 (15.0)	6 (25.0)	<0.001*
	Yes	136 (52.7)	66 (50.8)	99 (54.4)	148 (63.8)	68 (85.0)	18 (75.0)	

*: Statistically significant at p<0.05 (chi-square test)

Comparisons based on gender revealed notable differences in certain scoliosis awareness indicators. The rate of having a close acquaintance diagnosed with scoliosis was significantly higher among female participants compared to males (p=0.010). Additionally, the perception that scoliosis affects females more frequently was considerably more prevalent among female participants (p<0.001). No significant gender-based differences were found in the other variables. These findings indicate that female individuals have different experiences and perceptions regarding scoliosis compared to males (Table 5).

DISCUSSION

In this study, the knowledge levels, awareness, and attitudes of students from the Süleyman Demirel University Faculty of Medicine regarding scoliosis were evaluated. The findings indicate that a large proportion of students were familiar with the term scoliosis and believed that it is treatable. In addition, differences in awareness levels were observed across academic years and age groups, while participation in scoliosis awareness activities was found to be very limited.

A total of 93.2% of participants reported having heard the term scoliosis before. This rate is higher than the awareness levels reported in previous studies. For example, a study conducted among health sciences students in Indonesia found that 72.4% of participants were knowledgeable about scoliosis[7]. The higher familiarity observed in the present study may be explained by medical students' greater exposure to fundamental health-related concepts.

Regarding self-reported awareness levels, 70.5% of participants described their awareness as "moderate" while 11.1% reported a "good" level of awareness. Awareness levels differed significantly according to academic year, with higher proportions of "good" awareness observed among third- and sixth-year students (p<0.001). This finding is consistent with the transition to clinical training in the third year and increased exposure to both theoretical and practical knowledge during the final year of medical education. Similarly, a study by Cuschieri and Grech[8] involving 101 medical students reported that although 62.38% had heard of AIS, substantial gaps remained in knowledge related to risk factors, screening, and treatment thresholds. While students in clinical years demonstrated higher awareness levels, gaps in etiological understanding and conservative treatment approaches persisted. Doucet et al.[6] likewise emphasized that awareness and knowledge levels tend to increase throughout health sciences education.

The proportion of female students reporting close acquaintances diagnosed with scoliosis was significantly higher than that of male students (p=0.010). In addition, the perception that scoliosis affects females more frequently was more common among female participants (p<0.001). These findings are consistent with the literature indicating that AIS occurs more frequently in females and that curve progression risk is higher in this group[4,5]. However, no statistically significant difference was observed between genders in terms of awareness of scoliosis symptoms.

Overall, 59.1% of participants reported being aware of the symptoms of scoliosis. Despite widespread access to information, this finding suggests that symptom awareness remains insufficient. The significant increase in symptom awareness across academic years (p<0.001) highlights the importance of clinical exposure in recognizing scoliosis-related physical findings. Early identification of these signs has been shown to improve treatment outcomes[9]. Kuru Çolak et al.[10] evaluated 611 students from 60 universities, including 155 medical students, and reported that a substantial proportion of fourth-year students graduated without basic knowledge of scoliosis. In contrast, symptom awareness among fourth-year students was relatively higher in the present study. Most existing studies have focused on physiotherapy students and practitioners. For instance, Akgül et al.[11] reported that only 19.5% of physiotherapy students and 30.7% of physiotherapists correctly

Table 5. Comparison of scoliosis awareness, knowledge level, and perceptions according to gender

Variable	Response	Male n (%)	Female n (%)	p-value
Have you heard of scoliosis before?	No	31 (7.8)	29 (5.7)	0.209
	Yes	364 (92.2)	476 (94.3)	
Has a close acquaintance been diagnosed with scoliosis?	No	257 (65.1)	286 (56.6)	0.010*
	Yes	138 (34.9)	219 (43.4)	
Which gender do you think is more affected by scoliosis?	Male	130 (32.9)	75 (14.9)	<0.001*
	Female	153 (38.7)	288 (57.0)	
	Both	112 (28.4)	142 (28.1)	
Do you believe that scoliosis patients have treatment options?	No	18 (4.6)	21 (4.2)	0.588
	Yes	288 (72.9)	381 (75.4)	
	Undecided	89 (22.5)	103 (20.4)	
Are you aware of the symptoms of scoliosis?	No	175 (44.3)	192 (38.0)	0.057
	Yes	220 (55.7)	313 (62.0)	

*: Statistically significant at p<0.05 (chi-square test)

identified diagnostic criteria for scoliosis, while du Toit et al.[12] reported a rate of 56%among physiotherapists involved in orthopedic rehabilitation. Although medical students may have stronger theoretical backgrounds, these findings indicate persistent gaps in practical knowledge related to diagnosis and treatment algorithms.

Participation in scoliosis awareness campaigns was notably low, with only 2.1% of participants reporting previous attendance, while 97.1% had never participated in such events. This low participation suggests that scoliosis remains insufficiently visible as a public health issue. Public awareness initiatives conducted during scoliosis awareness month (June) have been shown to play a critical role in early diagnosis[13,14]. In comparison, a cross-sectional study conducted in Saudi Arabia reported a 12% participation rate in awareness campaigns[15]. In the present study, 90.7% of participants supported the organization of awareness activities in schools and public spaces, underscoring the need to expand such initiatives.

Study Limitations

Several limitations of this study should be acknowledged. Although the medical curriculum is predominantly theoretical, scoliosis education is primarily delivered during the fifth-year orthopedics and traumatology clerkship. The relatively low participation rate of fifth- and sixth-year students, who receive formal clinical training in scoliosis, represents an important limitation when interpreting educational outcomes. In addition, the absence of complete demographic data regarding the total population exposed to the survey limits the generalizability of the findings to all medical students in Türkiye.

CONCLUSION

This study evaluated the knowledge and awareness levels of students at Süleyman Demirel University Faculty of Medicine regarding scoliosis. Although awareness increased significantly with academic year and age, no significant difference was observed according to gender. Enhancing medical students' awareness of scoliosis, a condition that can be effectively managed with early diagnosis, is essential for both individual and public health. Delayed recognition may result in missed early intervention opportunities, leading to advanced-stage AIS and increased long-term healthcare burden. Therefore, in addition to clinical education, integrating scoliosis awareness into social responsibility initiatives and community-based education programs may enhance student engagement, promote active participation in public health efforts, and contribute to both societal benefit and the development of students' personal awareness.

Ethics

Ethics Committee Approval: This survey-based cross-sectional study was approved by the Süleyman Demirel University Scientific Research Publication Ethics Committee (approval no: 90/2, date: 29.01.2025).

Informed Consent: The informed consent form was provided online.

Footnotes

Authorship Contributions

Surgical and Medical Practices: Ü.Ü.S., R.D., Concept: A.T., Ü.Ü.S., R.D., Design: Ü.Ü.S., R.D., Data Collection or Processing: A.T., D.N.T., E.S.G., A.G., İ.S., Analysis or Interpretation: İ.S., Ü.Ü.S., Literature Search: A.T., D.N.T., E.S.G., A.G., Writing: A.T., D.N.T., E.S.G., A.G., İ.S.

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