ORIGINAL ARTICLE / ORJİNAL MAKALE

# PREVALENCE OF IDIOPATHIC SCOLIOSIS AND ITS CORRELATION WITH BACK PAIN

## *ERİŞKİN YAŞ GRUBU HASTALARDA İDİOPATİK SKOLYOZ PREVALANSI VE SIRT AĞRISI İLE KORELASYONU*

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## SUMMARY:

Idiopathic scoliosis is still not a well-known disease, despite a great deal of research into its incidence rate. These studies have generally consisted of research into its prevalence, and are based on screening tests in schools and radiological evaluations. Recently, the opinion that screening of school students is not cost-effective has been established. Prevalence studies on idiopathic scoliosis in our country are also limited. Therefore, the aim of this study is to research the prevalence of idiopathic scoliosis by radiological screening, and also its connection with back pain.

With that purpose, 27,846 chest X-rays obtained between 2006 and 2011 were evaluated. The mean age was 31.4±9.9, and the gender distribution was 16,659 males (59.8%) and 11,187 females (40.2%). The patient records were obtained from the Patient Records System (PRS), the MRI records were obtained from the Radiological Images Records System (RIS), and these were evaluated retrospectively. In the second part of the study, X-rays of 549 patients with complaints of back pain were taken from their records, and their thoracic and dorso–lumbar X-rays were evaluated, considering the number of patients who had a scoliosis curvature of 10° or more, their gender, age, and the Cobb angle of the major curvatures. For the latter group, all highlighted individual prevalence values (total and gender-based) were calculated, considering the degree of scoliosis (10–30° or greater than 30°) between 20–40 years of age. Pain scores of the patients (Canadian Scale) were also evaluated, and it was determined if there was any correlation with the degree/portion of curvature of scoliosis.

This study shows that the prevalence of 10° of scoliosis in patients between the ages of 20 and 40 was 4.64%, and this prevalence was 1.5 times higher in women than in men. Overall, the prevalence of scoliosis was 24.2% in the entire 549 patients who applied to the hospital with back pain during the five-year study period and who had thoracic and thoracolumbar X-rays taken. There was a statistically significant correlation between the intensity of the curvature and the pain score (p<0.05).

As a result, this study contributes to the literature on scoliosis prevalence studies, of which there are very few in Turkey. Additionally, this study is the first study of the prevalence of scoliosis that has been performed in young adults (20–40 years old) in the entire literature. The prevalence (4.6%) of a scoliosis curvature of greater than 10° in our patients is in accordance with other studies in the literature. This study also suggests that scoliosis is correlated with significantly higher rates of adult back pain and fibromyositis.

**Key words:** Idiopathic scoliosis, adult scoliosis, prevalence, screening, back pain

**Level of evidence:** Retrospective clinical study, Level III

## ÖZET:

İdiopatik skolyozun insidansı, geniş çalışmalara rağmen tam olarak bilinmemektedir. Çalışmaların çoğu prevalans çalışmaları olup, bu çalışmalarda okul taramaları ve radyolojik taramalara dayanmaktadır. Son yıllarda okul taramalarının maliyet etkin çalışmalar olmadığı konusunda ortak bir kanı oluşmuştur. Ülkemizde idiopatik skolyoz prevalans çalışmaları da sınırlı sayıdadır. Bu nedenle bu çalışmada radyolojik tarama ile idiopatik skolyoz prevalansı ayrıca sırt ağrısı ile ilişkisinin araştırılması amaçlanmıştır.

Bu amaçla 2006 ile 2011 yılları arasında çekilen 27.846 PA akciğer grafi değerlendirilmiştir. Ortalama yaş 31.4 ± 9.9 olup hastalardan 16.659'u (% 59.8) erkek ve geri kalan 11.187 (% 40.2) kişi kadındır. Hasta kayıtları Hastane Bilgi Sistemi (HİS)'den MR kayıtları Radyoloji Bilgi Sistemi (RİS)'den elde edilmiş, geriye dönük olarak değerlendirilmiştir. Çalışmanın ikinci kısmında, yakınma kısmında sırt ağrısı yazılan ve torakal veya dorsolomber grafileri çekilen 549 hastanın grafileri gözden geçirilmiş, yine aynı şekilde 10° ve üzeri skolyotik eğriliğe sahip hasta sayısı, yaşı, cinsiyeti ve majör eğriliğin Cobb açısı belirlenmiştir. Bu grupta da 20-40 yaş arası toplam, sadece erkek ve kadınlarda, 10°-30° arası ve 30° üzeri skolyozu olanlar olmak üzere tüm başlıklar için ayrı ayrı prevalans değerleri hesaplanmıştır. Ayrıca HİS sisteminde bu hastaların ağrı skorları gözden geçirilmiş ve bu hastaların skolyotik eğrilik miktarı ile korelasyonu araştırılmıştır.

Çalışmaya dâhil edilen 20-40 yaş arası hastaların akciğer grafilerinde 10° skolyoz prevalansının % 4.64 olduğu, kadınlarda prevalansın erkeklere nazaran yaklaşık 1.5 kat fazla olduğu belirlenmiştir. 5 yıllık dönem içinde sırt ağrısı nedeniyle hastaneye başvuran 549 hastaya torakal ve torakolomber grafi çekildiği, bu grafilerin taranması sonrasında skolyoz prevalansının % 24.2 olduğu ve eğrilik şiddeti ile ağrı skorlarının istatistiki olarak anlamlı olacak şekilde korele olduğu belirlenmiştir (p<0.05).

Sonuç olarak bu çalışma Türkiye için az sayıda olan skolyoz prevalans çalışmalarına bir katkı sağlayacaktır. Üstelik 20-40 yaş arası genç erişkin grupta yapılan literatürdeki ilk prevalans çalışmasıdır. Bu çalışmada elde edilen 10° üzeri skolyotik eğrilik prevalansı (% 4.6) literatürdeki çalışmalarla uyumlu bulunmuştur. Bu çalışmada ayrıca erişkin yaş sırt ağrısı ve fibromiyozit olgularına skolyotik eğriliğin önemli bir oranda eşlik ettiği de saptanmıştır.

**Anahtar Kelimeler:** İdiopatik skolyoz, erişkin skolyoz, prevalans, tarama, sırt ağrısı

**Kanıt Düzeyi:** Retrospektif Klinik Çalışma, Düzey III

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## INTRODUCTION:

Scoliosis can be defined as curvature of the spine on the right side by 10° or more. In addition to lateral curvature, structural scoliosis shows lordosis in the sagittal plane of the scoliotic area and rotational deformity at the apical side of the curve[8]. The majority of structural scolioses consist of idiopathic scoliosis. The prevalence of idiopathic scoliosis is generally based on radiological or school screenings[19,20]. The prevalence of idiopathic scoliosis with a curvature greater than 10° varies between 1.5–3% when studied radiographically. It has been reported as 0.2–0.3% for curvatures greater than 30° [2,3,5-8,11,12,16,17,24,25].

There are limited numbers of studies regarding the prevalence of idiopathic scoliosis in Turkey. Only a single study has been published using radiological screening, using micrographs for tuberculosis[8,23]. In our study, the group was not heterogenous and contained only adult patients between the ages of 20 and 40. All lung X-rays taken during a five-year period in a group hospital were evaluated. Currently, there are no radiographic screening studies performed on young adults (20–40 years old) in the literature.

In this study, two-way spine X-rays for all patients aged 20–40 admitted for back and lower back pain were evaluated and the prevalence of scoliosis was assessed. Therefore, the aim of this study is to determine the prevalence of idiopathic scoliosis in a young adult age group.

## PATIENTS AND METHOD:

In this study, PA lung X-rays of 27,846 patients aged between 20 and 40 years old who were admitted to the Orthopedia and Traumatology Clinic of Hisar Intercontinental Hospital between 1 January 2007 and 1 January 2012 were screened.

The mean age was 31.4±9.9 and there were 16,659 males (59.8%) and 11,187 (40.2%) females. Patient records were obtained from the Patient Records System (PRS) and MRI records were obtained from the Radiological Images Records System (RIS), and these were evaluated retrospectively.

The X-rays were examined by one radiology expert and two orthopedic experts, and the number of patients with a scoliotic curve greater than 10°, age, gender and the Cobb angle of the major curve were determined. In all screened lung X-rays, the prevalence of scoliosis was determined and all highlighted individual prevalence values (total and gender-based) were calculated based on the degree of scoliosis (either 10–30° or greater than 30°).

In the second part of the study, X-rays of 549 patients with complaints of back pain were taken from the records, and their thoracic and dorso–lumbar X-rays were evaluated, considering the number of the patients who had 10° or more of scoliotic curvature, their gender, age and the Cobb angle of major curvatures. Also for this group, all individual prevalence values (both total and gender-based) were calculated considering the degree of scoliosis (10–30° or greater than 30°) between the ages of 20 and 40. In addition, the pain scores of these patients were examined in PRS, and any correlation with the amount of scoliotic curve was investigated.

The Pearson correlation test was used for statistical evaluation, and a p-value less than 0.05 was considered significant.

## RESULTS

1,291 of the patients between 20 and 40 years old were diagnosed with a scoliotic curvature, and the prevalence was found to be 4.64%. The mean Cobb angle in this group was 18.9±11.1° (10–44°).

While 879 (68.1%) of the patients with scoliosis were female, 412 (31.9%) were male, and the prevalence was 1.5 times higher in women compared with men (Female/Male: 1.44/1) (Figure-1, 2).

While there were 974 (75.4%) patients with curvatures between 10° and 30°, there were 317 (24.6%) patients with a curvature greater than 30°. In the group with a curvature from 10–30°, the prevalence was 3.5%, and for the group with curvatures greater than 30° it was 1.1% (Figure-3).

Over the five-year period, the thoracic and thoracolumbar X-rays of 549 patients (300 female, 249 male) admitted due to back pain were taken, and a scoliotic curve was detected in 133 patients as a result of screening these X-rays, giving a prevalence of scoliosis of 24.2%.
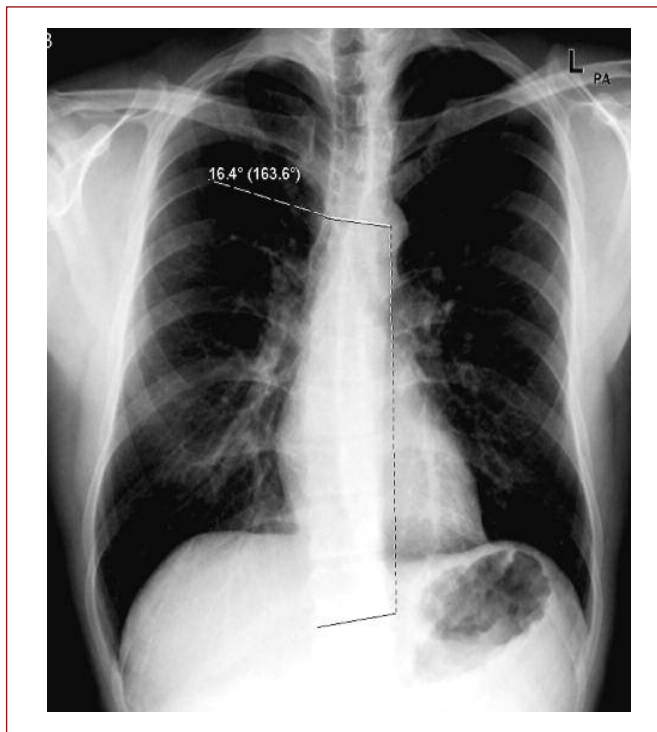


**Figure-1.** A 37-year-old male patient (A.D) with 16.4° of scoliotic curve in a PA Lung X-ray.
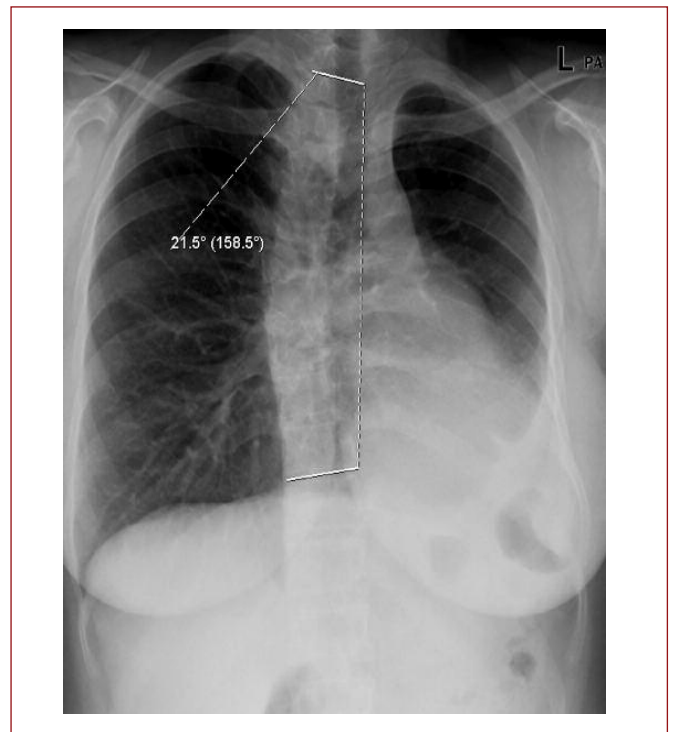


**Figure-2.** A 33-year-old female patient (T.G) with 21.5° of scoliotic curve in a lung X-ray.
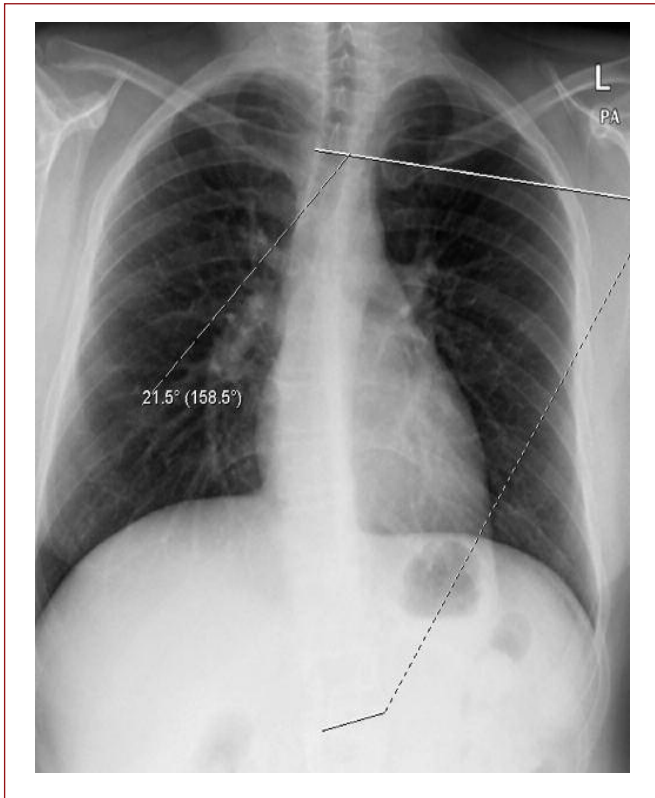
**Figure -3.** A 27-year-old male patient (M.D) with 21.5° of scoliotic curve in a PA–Lung X-ray.

The mean Cobb angle of the 133 patients was found to be 22.4±9.3° (10–50°). 74 (55.6%) of the patients were female, while 59 (44.4%) were male. The scoliotic prevalence was calculated to be 24.7% in females with back pain, and 23.7% in males. The female/male prevalence was found to be 1.04/1. While there were 89 (66.9%) patients with curvatures between 10° and 30°, there were 44 (33.1%) patients with curvatures greater than 30° (Figure-4.a, b).

While the prevalence of curvatures at angles between 10–30° was 16.2% in patients aged 20–40 years old with back pain, the prevalence was 8.0% for curvatures greater than 30°. Additionally, it was observed that the curve severity and pain scores were significantly correlated (p<0.05) (Figure-5.a,b).

## DISCUSSION:

Idiopathic scoliosis has been present throughout history. Scoliosis is mentioned in the Edwin Smith papyrus, the oldest medical document, dating from 1500 BC. Images that concern the treatment of scoliosis can be seen in drawings that were done by Hippocrates[8]. There have been many prevalence studies on scoliosis carried out according to age, gender, and geographic areas. Most of these studies are based on screening in schools and radiological screening. There is a general consensus that school screenings are not cost-effective. However, most radiological screenings are microfilm screenings that are performed for tuberculosis. The prevalence of idiopathic scoliosis with curvatures of more than 10° varies between 1.5–3%.

It has been reported as 0.2–0.3% for curvatures greater than 30°[2,3,5-8,11,12,16,17,24,25].

In a screening performed by Ochsmann et al. of medical records from the ICD-10 list in Germany in 2010, it was detected that back pain was present in 644,773 children and the prevalence of scoliosis varied between 0.01% and 12.5% [14]. In a screening of 4,000 Norwegian school children aged 12 that was performed in 2011, although the prevalence of body asymmetry was detected as 4%, the prevalence of scoliosis was 1.4% [1]. Two large studies were published in 2011. The first was a five-year epidemiological study that included 255,875 children, carried out by Ueno et al. The general prevalence in this study was detected as 0.87%[22]. The second study was performed in Korea by Suh et al. and contained 1,134,890 children.
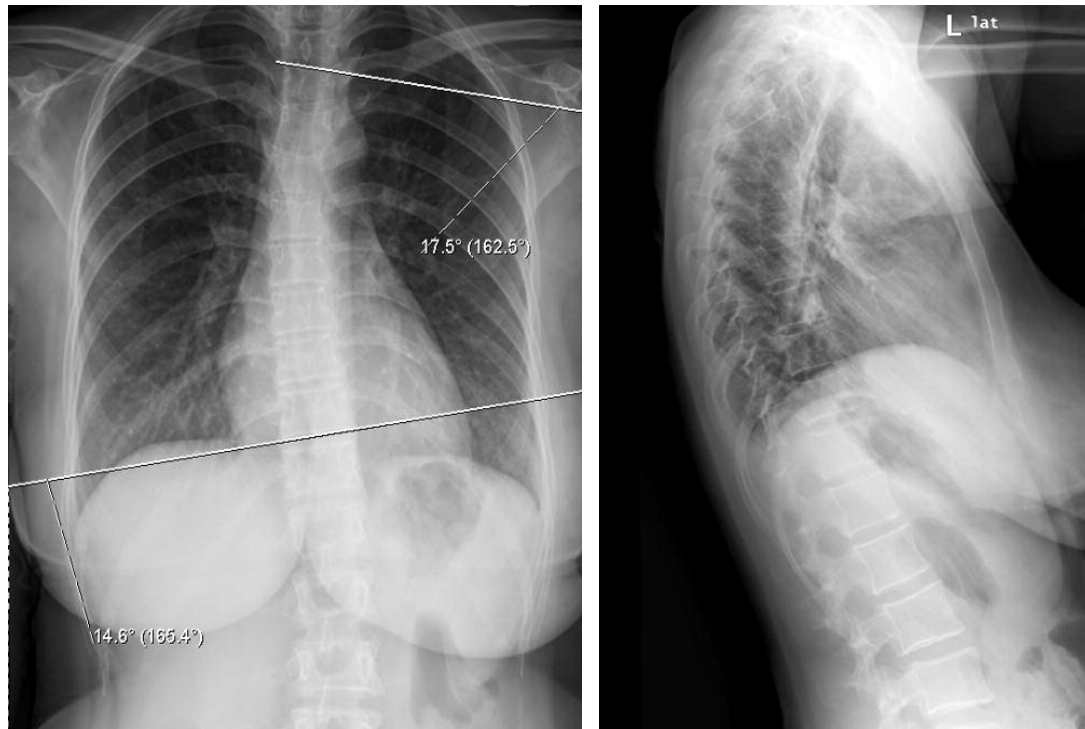
**Figure-4. a.** A 34-year-old female patient (B.Ç) admitted due to back pain; thoracic 17.5° and lumbar 14.5° scoliotic curves observed in PA X-ray. **b.** It seems that thoracic kyphosis decreases in a lateral X-ray.



**Figure-5. a.** A 28-year-old male patient (N.A) admitted due to back pain; thoracic 25.4° and lumbar 30.7° scoliotic curves observed in PA X-ray. **b.** It seems that thoracic kyphosis decreases in a lateral X-ray.

In this study, children aged 10–11 and 12–13 were screened and the scoliosis prevalence was found to be 3.26%, and the prevalence was 1.1 times higher in females than in males.

There was no difference in the prevalence between age groups[21]. Nery et al. screened 1,340 children in Rio Grande do Sul, Brazil, and they found a scoliosis prevalence of 1.4%[13]. In a study performed by Bunke-Persson et al. in 2012, they found the scoliotic curve prevalence to be 17% in 666 children aged 4–18 with cerebral palsy[15]. Bar-Dayan et al. reported that the scoliosis prevalence in 828,171 individuals aged 17 was 0.8%[4].

There are relatively small numbers of studies containing scoliosis screenings of adult patients. Our study is the first study in the literature that includes young adult patients aged 20–40. In a study including 1,347 elderly patients aged 60–94 by Hong et al. in 2010, the scoliosis prevalence was found to be 35.5%[9]. In lung X-rays of patients aged 20–40 that were included in this study, the prevalence of 10° of scoliosis was found to be 4.64, and this was 1.5 times higher in females than in males. For curvatures between 10° and 30° in this age group the prevalence was 3.5%, while it was 1.1% for curvatures greater than 30°. The general prevalence of scoliosis detected in this study was found to be higher than in the studies that include childhood screenings.

There have been limited numbers of studies on scoliosis prevalence in Turkey[8,23]. A portion of these are school screenings. The most comprehensive study includes 100,000 microfilm screenings carried out by Alıcı et al., which found the scoliosis prevalence to be 1.5%. In a study carried out by Uğraş et al. in 2010 in which 4,259 children were screened

in school, the prevalence was found to be 2.5% and the female/male ratio was detected to be 2.5 [23]. Our study differs from other studies performed on the scoliosis prevalence in Turkey, as it used direct lung X-ray evaluation to screen adults aged 20–40, and so this study makes an important contribution to this issue.

In various studies, it has been shown that the prevalence of back pain in idiopathic scoliosis patients was no different to a normal population[8]. In a multi-centered, prospective and randomized study carried out by Landman et al. and the Spine Deformity Study Group in 2011, 1,433 idiopathic scoliosis cases were evaluated. Back pain was found in 77.9% of the patients, and it was shown that the pain correlated with the body mass index and the amplitude and severity of the pain[10].

In a study performed by Sato et al. in Niigata, Japan in 2011, they stated that back pain was present in 27.5% of patients with scoliosis and in 11.4% of patients without scoliosis. Additionally, they reported that back pain was present in 58.8% of patients who had had scoliosis for their entire lifetime, and in 32.9% of patients without scoliosis[18]. These recent studies support the suggestion that back pain is seen more commonly in patients with scoliosis. Because of our similar observations, thoracic and thoracolumbar X-rays were taken from 549 patients aged 20–40 who were admitted due to back pain, and scoliotic curves were found in 133 patients. The scoliosis prevalence was detected to be 24.2%. A statistically significant correlation between curve severity and pain scores was found (p<0.05). This suggests that there is a significant association with scoliosis among patients admitted due to back pain, and

so scoliosis should be screened in patients with severe pain.

As a result, this study makes an important contribution to the limited prevalence studies in Turkey in the literature. It is also the first prevalence study performed with a young adult group aged 20–40. The prevalence of greater than 10° of scoliotic curve (4.6%) found in this study is compatible with studies in the literature. Additionally, this study suggests that scoliosis accompanies adult back pain and cases of fibromyositis at significantly higher rates.

## ACKNOWLEDGEMENT:

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