

EPIDEMIOLOGY OF PEDIATRIC SCOLIOSIS IN A TERTIARY HOSPITAL IN RECIFE-PE

EPIDEMIOLOGIA DA ESCOLIOSE PEDIÁTRICA EM HOSPITAL TERCIÁRIO EM RECIFE-PE

EPIDEMIOLOGÍA DE LA ESCOLIOSIS PEDIÁTRICA EN HOSPITAL TERCIARIO EN RECIFE-PE

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ABSTRACT

Objective: The present study aims to outline the epidemiological parameters of patients with scoliosis between the ages of 0 and 18 years old, who were evaluated at the Getúlio Vargas Hospital in Recife-PE. **Methods:** The participants completed a demographic questionnaire, followed by clinical evaluation, including Cobb angle measurement, clinical photographic registration and quality of life questionnaires. **Results:** The sample consisted of 103 patients, mostly females, with a mean age of 13.86 years, from the interior of the state, diagnosed with adolescent idiopathic scoliosis classified as Lenke 1. Neuromuscular and congenital scoliosis were less common. The quality-of-life questionnaire showed a significant difference in self-image perception among patients with idiopathic scoliosis, those who had a curve measuring under 50 degrees had better scores than those who had greater angles. Patients with larger curves scored lower on all questionnaire items, but there was no significant difference when compared to the other group. **Conclusion:** It was shown that the main epidemiological parameters in the pediatric population with scoliosis are girls, mean age 13 years, coming from the interior of the state being idiopathic scoliosis, the most common, classified as Lenke 1. Neuromuscular scoliosis was the main type of deformity following the idiopathic; cerebral palsy being the most common etiology. **Level of evidence IV; Prognostic Studies Investigating the effect of a Patient characteristic on the outcome of Disease.**

Keywords: Spine; Scoliosis; Radiography; Health-Related Quality of Life.

RESUMO

Objetivo: Traçar o perfil epidemiológico dos pacientes portadores de escoliose entre as idades de 0 até 18 anos no Hospital Getúlio Vargas em Recife-PE. **Métodos:** Estudo transversal em que os participantes foram submetidos a um questionário demográfico, em seguida tiveram seu perfil clínico avaliado com a medição do ângulo de Cobb, realização de fotografias clínicas e aplicação de questionários de qualidade de vida. **Resultados:** A amostra foi construída com 103 pacientes, em sua maioria do gênero feminino, com idade média de 13,68 anos, provenientes do interior do estado, com diagnóstico de escoliose idiopática do adolescente classificadas como Lenke 1. Escoliose neuromuscular e congênita estiveram presentes em menor número. O questionário de qualidade de vida aplicado mostrou que houve diferença significativa na percepção da autoimagem de pacientes com escoliose idiopática que tinham curvas menores que 50 graus em relação aos que tinham maior deformidade. Aqueles com curvas de maior valor angular apresentavam menor pontuação em todos os quesitos do questionário, sugerindo pior qualidade de vida, mas não houve diferença significativa. **Conclusão:** Conclui-se que, o perfil epidemiológico dos pacientes portadores de escoliose pediátrica é formado por meninas com escoliose idiopática, com média de idade de 13 anos, provenientes do interior do estado, tendo diagnóstico de escoliose idiopática classificada como Lenke 1. Dos demais tipos de escoliose, o mais prevalente foi a escoliose neuromuscular secundária à paralisia cerebral. **Nível de Evidência IV; Estudos prognósticos – Investigação do efeito de característica de um paciente sobre o desfecho da doença.**

Descritores: Coluna Vertebral; Escoliose; Radiografia; Qualidade de Vida Relacionada à Saúde.

RESUMEN

Objetivos: Describir el perfil epidemiológico de los pacientes diagnosticados con escoliosis de 0 a 18 años que son evaluados en el Hospital Getúlio Vargas en Recife-PE. **Métodos:** Los participantes fueron sometidos a una encuesta demográfica y luego a una evaluación clínica que incluyó la toma de fotos, la medición de ángulo de Cobb y un cuestionario de calidad de vida. **Resultados:** La muestra fue constituida por 103 individuos, la mayoría de género femenino, con edad media de 13,68 años, que provenían del interior del estado y que fueron diagnosticadas con escoliosis idiopática del adolescente, clasificada en Lenke 1. La escoliosis neuromuscular y congénita estuvieron presentes en un número más pequeño. El cuestionario de calidad de vida mostró que hubo una diferencia significativa en la percepción de autoimagen de los pacientes con escoliosis idiopática con curvas menores a 50 grados cuando se compararon con los que tenían curvas más grandes. Los pacientes con curvas mayores tenían menos puntos en todas las preguntas del cuestionario, pero sin diferencia significativa. **Conclusión:** Se concluyó que el perfil epidemiológico de los pacientes con escoliosis pediátrica era formado por niñas con

Study conducted by the Getúlio Vargas Hospital, Spinal Surgery Group, Recife, PE, Brazil.

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escoliosis idiopática, con edad media de 13 años, que provenían del interior del estado, clasificadas como Lenke 1. De los demás tipos de escoliosis, la neuromuscular secundaria a parálisis cerebral fue la más común. **Nivel de evidencia IV; Estudios pronósticos – Investigación del efecto de características de un paciente sobre el desenlace de la enfermedad.**

Descriptor: Columna Vertebral; Escoliosis; Radiografía; Calidad de Vida en Relación con la Salud.

INTRODUCTION

Scoliosis is defined by the *Scoliosis Research Society* (SRS) as a lateral curvature of the spine that exceeds 10°. It can have various etiologies, which are divided into idiopathic, congenital, neuromuscular, and syndromic.²

Idiopathic scoliosis is categorized as infantile, juvenile, and adolescent; adolescent scoliosis occurs after age 10 to 18.^{3,4} Its etiology remains unknown, but some hypotheses have been put forward, including hormonal, biomechanical, or genetic involvement.⁴ The prevalence of this condition is between 2-3%, falling to 0.1-0.3% when the curve exceeds 30°; it is more prevalent in females.³

Congenital scoliosis is defined as scoliosis caused by malformation of the spine.⁵ It can be divided into malformation or segmentation and is usually associated with other congenital malformations. It corresponds to 0.5-1 per 1000 live births and has a variable prognosis. Its evolution depends on the age at presentation, the location of the curve, and the type of deformity.⁶

Neuromuscular scoliosis is secondary to neuro- or myopathies.⁵ A common cause of this type of deformity is cerebral palsy; spasticity, muscle weakness, and failure of muscle control contribute to the trunk's imbalance and the curve's appearance.⁷ The goals of treating this type of patient include stabilizing the curve and improving the patient's quality of life since better trunk alignment makes it easier to transfer the patient.⁸

Some systemic diseases can be responsible for the appearance of vertebral deformities. Examples of pathologies that cause syndromic scoliosis include Marfan syndrome, achondroplasia, and Prader-Willi syndrome.⁵

The progression of the curve will depend on its main etiology, the patient's age at diagnosis, the location of the curve, and associated factors, such as secondary scoliosis. In pathologies with severe muscular deficiency, such as cerebral palsy, the progression of deformity is usually the rule since the neurological insult is unique, but the osteomuscular worsening is progressive.⁹ With regard to idiopathic scoliosis, some factors may contribute to its evolution, such as skeletal immaturity, the presence of right thoracic curves and the female sex.³

The main objective of this study was to outline the epidemiological profile of patients aged 0-18 with scoliosis in a high-complexity hospital in the city of Recife, Pernambuco.

METHODOLOGY

This is a descriptive cross-sectional study to evaluate the epidemiology of scoliosis in patients aged 0-18 at the Getúlio Vargas Hospital in the city of Recife, Pernambuco, Brazil. It was authorized by the Research Ethics Committee under number 35250220.2.1001.5479.

The sample was constructed on a free-demand basis, and patients with scoliosis attending the spinal surgery outpatient clinic at the hospital mentioned were selected from June 2021 to January 2023. Those responsible for the participants signed an informed consent form and an image form.

A digital medical record tool (RedCap) stores demographic, clinical, and radiographic data. Photographic records of the patients' clinical and radiographic appearance were also taken. All the participants were interviewed by the same orthopedic doctor who was part of the team.

The demographic data collected included gender, age, race and place of residence. Clinical information included the presence or absence of menarche, type and classification of scoliosis, and indicated treatment, as well as quality of life questionnaires such as the SRS-30 and the CPChild.¹⁰ In the radiographic analysis, panoramic radiographs were cataloged with the recording of Cobb's angle

and Risser's classification, as well as radiographs of the hand and wrist for Sanders' classification.¹¹

The X-rays were photographed with the patients in orthostasis or sitting/lying down, depending on their clinical condition, in posterior and lateral view, as well as posterior view with anterior trunk flexion, in the Adams test position.

SPSS 25.0 (*Statistical Package for the Social Sciences*) for Windows and Excel 365 were used for statistical analysis. All tests were applied with 95% confidence. The results were calculated considering valid answers, i.e., ignored answers were not considered; they are presented in table form with their respective absolute and relative frequencies. Measures of central tendency and measures of dispersion represent numerical variables. The Kolmogorov-Smirnov Normality test was used for quantitative variables, and the Mann-Whitney test (Non-Normal) was used to compare the two groups.

RESULTS

One hundred and six patients with scoliosis were interviewed, 103 of whom agreed to participate in the study. Of these, 81 were female (78.6%), and 59 (57.3%) identified themselves as brown; none of the participants identified themselves as indigenous or oriental. The average age was 13.68 years. Of the girls, 70 (86.4%) had already menarche. Regarding location, 64 patients came from the interior of the state of Pernambuco, 25 from the metropolitan region, 10 from the capital, and 4 from other states (Rondônia, Bahia, and Rio Grande do Norte). (Figure 1)

When asked how they were referred to the specialized center, 34 patients had a doctor's referral and were able to get an appointment, 30 were able to get an appointment on their own (without a referral), 14 had their appointment made by the place where they first received care, 7 were referred from another referral center, 4 sought cares without a referral and 10 were referred from another sector of the Getúlio Vargas Hospital.

The team considered that there was a delay in patient care in 86 cases (83.5%); the main reasons were delays in entering the referral center, 21 cases, and difficulties in scheduling surgery, 60 cases. The patient's difficulty in cooperating, the lack of ICUs, difficulty in getting the vest made and the patient's need for clinical compensation were blamed to a lesser extent.

Clinical Data

Of the 103 patients evaluated, 81 were classified as idiopathic scoliosis, followed by neuromuscular scoliosis (10), congenital scoliosis (6), syndromic scoliosis (5) and postural kyphosis (1). (Figure 2)

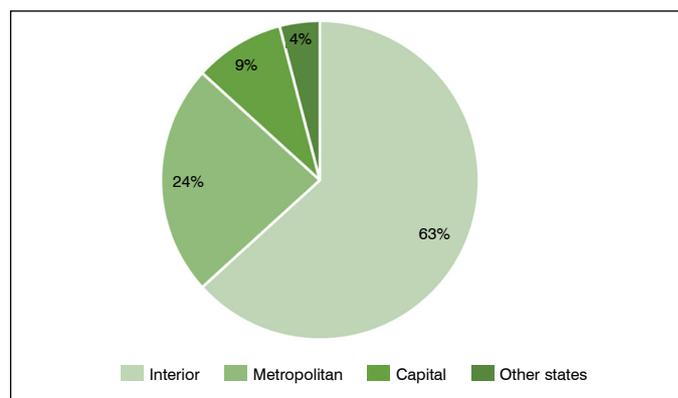


Figure 1. Location of patients.

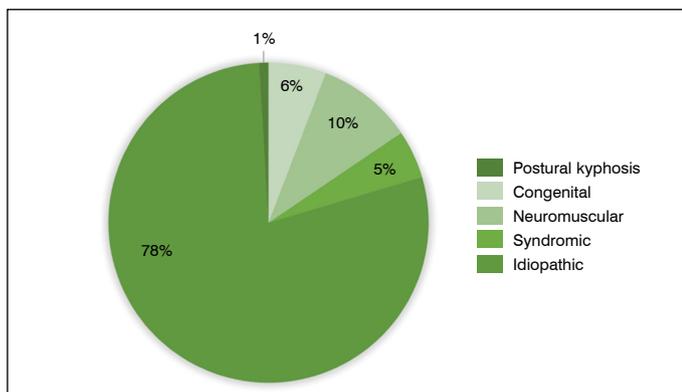


Figure 2. Etiological distribution of scoliosis.

When analyzing skeletal maturity using the Sanders classification, 32 patients were categorized as Sanders 7 and 17 individuals as Sanders 8, showing that 47.5% of patients had already reached some stage of skeletal maturity.¹¹ Twenty-two patients did not have this data computed.

Of the neuromuscular scoliosis, 8 cases (80%) were secondary to cerebral palsy, of which 62.5% (5) were classified as grade V on the gross motor function scale (GMFCS). There was one case of scoliosis due to myelomeningocele and one case with no defined etiology.

When stratifying idiopathic scoliosis, it was possible to record 65 cases with onset after 10 years of age (adolescent scoliosis), 15 cases with onset between 3 and 10 years of age (juvenile scoliosis) and 1 case of scoliosis with onset up to 3 years of age (infantile scoliosis).

Of the 81 individuals with EIA, two could not be classified according to Lenke. Forty-three were classified as type 1, 13 as type 5 and 10 as type 6 (Table 1). When assessing the lumbar modifier, 35 patients were type A and 37 were type C. When the study turned to the sagittal modifier, 63 individuals had kyphosis measured between 10-40°.

Before being assessed at the referral center, 20 patients had been recommended to use orthoses, but only 9 arrived at the clinic wearing a brace. Thirty-nine had had surgery indicated, 18 observation and 26 no initial indication. After evaluation, 74 were placed in the surgery queue, 21 were referred for observation and 8 were prescribed treatment with orthoses. A plaster cast was not recommended.

Quality of life assessment

To assess the quality of life of the patients studied, the *Scoliosis Research Society* (SRS) questionnaire was used in its 30-question version (SRS-30) for individuals with idiopathic scoliosis. Patients with secondary scoliosis were assessed using the CPCHILD questionnaire, which was answered by the patient’s main caregiver.

The SRS questionnaire divides the evaluation into 5 categories: appearance, functionality, pain, mental health and satisfaction. Each question can score from 1 to 5 points, with the lowest score corresponding to the worst score. An average is made of each category and all of them, following the same rule: lower score, worse quality of life.

Of the individuals studied, all those with idiopathic scoliosis answered the SRS questionnaire. The overall average score was 63.6 out of a possible 115 points, the other questions are shown in the table below. (Table 2)

By evaluating the Lenke classification and comparing it with the quality-of-life indices, it could be seen that patients with main thoracic and proximal thoracic curves (Lenke 2) had the highest quality of life score (96/115), while those classified as Lenke 3 had the lowest score (69/115), but this difference was not significant (p 0.070). When stratifying the pain score, this group also had the lowest score, which was statistically significant (p 0.007).

When the SRS questionnaire scores were compared between genders, boys had a lower average score (51.30) than girls (67.27), but this difference was also not significant (p 0.621).

Patients who had a Cobb of less than 50° in their main curve had better scores with an overall average of 68.10 points (SD ± 36.63), while patients with a Cobb of 50° or more had an average of 60.95 (SD ± 34.85); despite the disparity, the p-value was 0.10. In the “appearance” category, the group with the lowest angulation scored an average of 16.91 (SD ± 9.56) and the second group 13.96 (SD ± 8.33); this comparison showed a significant difference (p 0.02). (Table 3)

DISCUSSION

Scoliosis is the main cause of spinal deformity in the pediatric population, with idiopathic scoliosis accounting for 80% of all scoliosis.¹² This study was able to corroborate this information, with the majority of its subjects having idiopathic scoliosis, mainly girls (78.6%), in line with the rest of the literature, which states that scoliosis is more common in females.

In addition to impairing the development of organs and systems, as in the case of early onset scoliosis, in which the cardiopulmonary system can be compromised, coronal deformity has a significant impact on the patient’s quality of life, a fact that can be seen in the SRS questionnaire score, which was lower than 60% in both the group with curves below 50° and the group with greater curves.

Of all the items in the quality-of-life assessment, the one with the lowest score for patients was mental health. A literature review published in 2022 by Mitsiaki et al¹³ identified idiopathic scoliosis as a risk factor for psychiatric disorders, especially depression and anxiety.

Another characteristic cited is the higher prevalence of back pain in patients with scoliosis.¹⁴ Some authors advocate that pain in the back region increases after the age of 13, and this is attributed to pubertal spurt and increased paravertebral muscle tension due to more time at school.¹⁵ In the present study, patients with curves of less than 50° had a higher score in the pain category of the SRS, reflecting lower pain intensity in this group; however, the difference in relation to the group with the highest angular value was not significant (p 0.16).

The progression of scoliosis is an important factor in the

Table 1. Lenke’s classification.

Lenke classification	Number of patients
1	43
2	3
3	7
4	3
5	13
6	10
Not classified	2
Total	81

Table 2. Score by category in the SRS-30 questionnaire.

Category	Average score	Maximum possible score
Appearance	15.06 (SD ± 8.87)	30
Function	14.37 (SD ± 8.10)	25
Pain	15.08 (SD ± 8.93)	25
Mental health	13.36 (SD ± 8.20)	25
Satisfaction	5.73 (SD ± 3.29)	10
Geral Score	63.6 (SD ± 35.53)	115

Table 3. Comparison of SRS-30 questionnaire categories by curve size.

Variables	Cobb Principal		p-value*
	< 50	≥ 50	
	Median (P ₂₅ ; P ₇₅)	Median (P ₂₅ ; P ₇₅)	
Appearance points	21.00 (12.50; 24.00)	17.00 (10.00; 20.00)	0.022
Pain points	19.00 (10.50; 25.00)	17.00 (10.00; 20.00)	0.166
SRS points	85.00 (57.00; 95.50)	74.00 (54.00; 87.00)	0.102

(*) Mann-Whitney test. Age did not affect the sum of the criteria that assess quality of life.

therapeutic decision. The age at diagnosis, etiology and type of curve are important factors.³ For 83% of patients, there was a delay in care, most of whom had difficulty scheduling the surgical procedure. Seventy-four of the 103 patients had surgery indicated. Suggesting that early detection and closer monitoring could change this scenario; making it possible to perform the surgical procedure at less advanced stages or even restrict the deformity through the use of orthoses.

CONCLUSION

The present study identified that the profile of pediatric patients

with scoliosis in the state of Pernambuco is made up mainly of idiopathic scoliosis, in girls, with an average age of 13 years, from the interior of the state, with a diagnosis of idiopathic scoliosis classified as Lenke 1.

Of the other types of scoliosis, the most prevalent was neuromuscular scoliosis secondary to cerebral palsy.

All authors declare no potential conflict of interest related to this article.

CONTRIBUTIONS OF THE AUTHORS: The article was developed through the collaborative efforts of several authors who made significant contributions. GCCB played a major role in writing the manuscript, performing data collection and analysis, and conducting bibliographic research. Meanwhile, TAMR focused on patient follow-up, review, data analysis, and intellectual concept. AFFP also participated in patient follow-up, review, and data analysis, as well as providing intellectual input and final approval of the study. MACF contributed to patient follow-up, review, data analysis, intellectual concept, and final approval of the work. Finally, RCM and LTBC provided valuable input on data analysis and intellectual concept, and reviewed and approved the final work.

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