

# EVALUATION OF QUALITY OF LIFE IN PATIENTS WITH SCOLIOSIS SUBMITTED TO CONSERVATIVE TREATMENT

AVALIAÇÃO DA QUALIDADE DE VIDA EM PACIENTES PORTADORES DE ESCOLIOSE SUBMETIDOS AO TRATAMENTO CONSERVADOR

EVALUACIÓN DE LA CALIDAD DE VIDA EN PACIENTES PORTADORES DE ESCOLIOSIS SOMETIDOS AL TRATAMIENTO CONSERVADOR

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## ABSTRACT

**Objective:** To assess the level of quality of life (QOL) and the most affected dimensions in patients with scoliosis. **Methods:** Original article about a descriptive, quantitative study of 20 individuals diagnosed with scoliosis and undergoing conservative treatment. Data were collected during consultations using two questionnaires, one containing social and demographic data and the Revised Scoliosis Research Society-22 (Brazilian version). The analysis was carried out in the Statistical Package for the Social Sciences (version 25), using descriptive statistics and the nonparametric Mann-Whitney test. The research was submitted to and approved by the Institutional Review Board of the Faculdades Integradas de Patos. **Results:** The sample was composed mostly of female patients (70%), aged between 12 and 16 years (55%), whose most affected QOL domains were activity (10%) and mental health (55%). In addition, patients with moderate scoliosis had a lower quality of life when compared to those with mild scoliosis. **Conclusion:** Scoliosis is an alteration of the spine that affects more female adolescents, negatively impacting their quality of life, and mainly affecting the domains of activity, mental health and appearance. Given this reality, a closer look is needed, seeking to create and encourage strategies that can improve the overall well-being of these patients. **Level of Evidence II - Retrospective Study.**

**Keywords:** Scoliosis; Quality of life; Conservative treatment.

## RESUMO

**Objetivo:** Avaliar o nível da qualidade de vida (QV) em pacientes com escoliose e as dimensões mais afetadas. **Métodos:** Artigo original, com estudo descritivo, quantitativo, realizado com 20 indivíduos com diagnóstico de escoliose submetidos ao tratamento conservador. Os dados foram coletados durante as consultas, a partir de dois questionários, um contendo dados sociais e demográficos e o Revised Scoliosis Research Society-22 (versão brasileira). A análise foi efetivada no Statistical Package for the Social Sciences (versão 25), utilizando estatística descritiva e teste não paramétrico de Mann-Whitney. A pesquisa foi submetida e aprovada pelo Comitê de Ética e Pesquisa das Faculdades Integradas de Patos. **Resultados:** A amostra foi composta na maior parte por pacientes do sexo feminino (70%), com idade entre 12 e 16 anos (55%), que apresentaram como o domínio de QV mais afetado o de atividade (10%) e o de saúde mental (55%). Além disso, os pacientes portadores de escoliose moderada apresentam uma menor qualidade de vida, quando comparados com os de escoliose leve. **Conclusão:** A escoliose é uma alteração da coluna vertebral que acomete mais adolescentes do sexo feminino, trazendo para as mesmas impactos negativos na sua qualidade de vida, afetando principalmente os domínios de atividade, saúde mental e aparência. Diante dessa realidade, é necessário um olhar mais atento, buscando a criação e incentivo de estratégias que possam melhorar o bem-estar global desses pacientes. **Nível de Evidência II – Estudo Retrospectivo.**

**Descritores:** Escoliose; Qualidade de vida; Tratamento conservador.

## RESUMEN

**Objetivo:** Evaluar el nivel de calidad de vida (CV) en pacientes con escoliosis y las dimensiones más afectadas. **Métodos:** Artículo original con estudio descriptivo, cuantitativo, realizado con 20 individuos con diagnóstico de escoliosis sometidos al tratamiento conservador. Los datos fueron recolectados, durante las consultas, a partir de dos cuestionarios, uno conteniendo datos sociales y demográficos y el Revised Scoliosis Research Society-22 (versión brasileña). El análisis fue efectuado en el Statistical Package for the Social Sciences (versión 25), utilizando estadística descriptiva y test no paramétrico de Mann-Whitney. La investigación fue enviada y aprobada por el Comité de Ética e Investigación de las Faculdades Integradas de Patos. **Resultados:** La muestra fue compuesta en la mayor parte por pacientes del sexo femenino (70%), con edad entre 12 y 16 años (55%) que presentaron como el dominio de CV más afectado el de actividad (10%) y el de salud mental (55%). Además, los pacientes portadores de escoliosis moderada presentan una menor calidad de vida, cuando comparados con los de escoliosis leve. **Conclusión:** La escoliosis es una alteración de la columna vertebral que acomete más a adolescentes femeninas, trayendo para éstas impactos negativos en su calidad de vida, afectando principalmente los dominios de actividad, salud mental y apariencia. Ante esta realidad, es necesario una mirada más atenta, buscando la creación e incentivo de estrategias que puedan mejorar el bienestar global de esos pacientes. **Nivel de evidencia II - Estudio retrospectivo.**

**Descriptor:** Escoliosis; Calidad de vida; Tratamiento conservador.

Study conducted at the Faculdades Integradas de Patos, Patos, PB, Brazil.

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## INTRODUCTION

Scoliosis is defined as a complex three-dimensional spinal deformity characterized by rotation of the vertebral bodies, lateral deviation in the frontal plane, and the appearance of thoracic lordosis. These alterations result in distortion of chest symmetry, characterized by a posterior elevation that coincides with the convex side of the curve of the deviation and a depression that appears on the concave side. This alteration of the spine can be classified according to its etiology as neuromuscular, congenital, or idiopathic.<sup>1</sup>

Intervention to treat this disease is defined after measuring the Cobb angle and either conservative or surgical measures may be indicated. The first is recommended for mild and moderate degrees and consists of monitoring the progression of scoliosis, physical therapy, and wearing orthopedic vests, while the second type of treatment is performed in patients with more severe conditions by surgically stabilizing the spine.<sup>2</sup>

As a result of the progression of their deformities, carriers may present a series of signs and symptoms, from physical to psychosocial, such as musculoskeletal pain, decreased mobility, cardiac and respiratory failure, as well as decreased self-esteem, self-deprecation, and relationship difficulties. However, even when the prognosis of scoliosis is favorable, the deformity may compromise the performance of daily activities, having significant impact on the quality of life (QOL) of these patients.<sup>3</sup>

The number of studies about quality of life assessment has been increasing on the scientific research scene in recent years due to a greater concern about the patient's perception of their condition. This is considered an important tool during choice of treatment to be recommended for the individual, as it ensures greater adherence to and satisfaction with the established therapy.<sup>4,5</sup>

Reflecting on this reality, the following questions arise: What is the level of quality of life of scoliosis patients? Is there a relationship between the degree of their deformity and QOL? It is appropriate to analyze these problems, given that the diagnosis of scoliosis occurs mainly during adolescence, a period when there is greater concern about physical appearance, enabling greater psychological fragility. Moreover, publications in both national and international databases about the influence of scoliosis on the quality of life of its carriers are still scarce.

The objective of this study is to evaluate the level of the quality of life in patients with scoliosis and the most affected dimensions.

## METHODS

This is an original article about a descriptive study from a quantitative approach conducted with 20 patients diagnosed with scoliosis, who underwent conservative treatment and follow-up at the Clínica Médica das Faculdades Integradas de Patos (CLIN-FIP) and the Clínica Escola de Fisioterapia da Instituição de Ensino Superior (IES), both located in the municipality of Patos, in the interior of the State of Paraíba.

The inclusion criteria were individuals with anteroposterior chest X-rays, a Cobb angle equal to or greater than 11°, and who were under conservative treatment using orthotics and/or physical therapy.

Patients previously submitted to surgical treatment for scoliosis and those unable to interpret the questionnaire either due to cognitive disability or illiteracy were excluded.

The study was conducted using two questionnaires, one containing social and demographic data authored by the team and the other, the Brazilian version of the Revised Scoliosis Research Society-22 (Br-SRS-22r), which is a tool especially designed for researching the quality of life directed towards the public of this study.

The SRS-22 questionnaire was translated to Portuguese and validated in 2010<sup>4</sup> and consists of 22 questions divided into five domains: function/activity, self-image/appearance, pain, mental health, and satisfaction with the treatment, each of which had a score, organized such that the higher the score, the lower the satisfaction with the quality of life in those domains.

All the participants included in the research were previously

informed about the study and signed the Informed Consent Form for participation in the research and, in cases under the age of 18, those legally responsible signed the Informed Consent Form. After this process, the questionnaire was presented to the volunteer, who answered all the questions of the tool without the help of the companions or third parties.

The data were analyzed in the Statistical Package for the Social Sciences (SPSS, version 25). In addition to descriptive relative and absolute frequency statistics, we also used the Mann-Whitney parametric test, given the small sample size. We adopted a statistical significance criterion of less than or equal to 5%, that is,  $p \leq 0.05$ .

The study was subject to the norms of Resolution no. 5010/2016 of the National Health Council, submitted to the Institutional Review Board of the Faculdades Integradas de Patos and approved as opinion number 2.394.623/2017.

## RESULTS

Table 1 shows that the sample was composed of more females than males, with most patients from 12 to 16 years of age, single, self-defined as White, and with income between one (01) and two (02) minimum salaries. In addition, there was a predominance of right-handed people and an equal distribution between cases with and without a family history, with or without physical activity, and with mild or moderate scoliotic angles (degrees).

**Table 1.** Descriptive analysis of sample data.

Variables	Absolute frequency (F)	Relative frequency (%)
<b>Sex</b>		
Female	14	70.0
Male	6	30.0
<b>Age</b>		
Between 12 and 16 years	11	55.0
Between 17 and 21 years	5	25.0
Between 22 and 25 years	4	20.0
<b>Marital status</b>		
Single	19	95.0
Married	1	5.0
<b>Education</b>		
Elementary school incomplete	6	30.0
High school incomplete	6	30.0
High school complete	1	5.0
University incomplete	7	35.0
<b>Race</b>		
White	15	75.0
Brown	4	20.0
Yellow	1	5.0
<b>Income</b>		
Less than one minimum salary	4	20.0
1-2 minimum salaries	7	35.0
3-4 minimum salaries	3	15.0
5-6 minimum salaries	2	10.0
More than 6 minimum salaries	4	20.0
<b>Dominant hand</b>		
Right	19	95.0
Left	1	5.0
<b>Family history</b>		
Yes	10	50.0
No	10	50.0
<b>Physical activity</b>		
Yes	9	45.0
No	11	55.0
<b>Angle (degree)</b>		
Mild scoliosis	11	55.0
Moderate scoliosis	9	45.0

Table 2 shows that the most affected quality of life domain was activity with 10% of scores between 4 and 4.9. The mental health domain had the most people in the 3 to 3.9 score range.

As shown in Table 3, no statistically significant results were observed in the comparison of the quality of life domains by sex. The greatest difference was in the domain related to appearance, where a lower median score for the males indicates less impairment to quality of life related to appearance.

Table 4 shows that those who do not practice physical activity had a higher median mental health score, that is, a lower mental quality of life. This result was statistically significant.

Table 5 shows that the people with moderate scoliosis had higher median quality of life scores in the activity and pain domains, that is, they were more compromised in these domains. These results were statistically significant.

**Table 2.** Description of the quality of life domains.

Domains	1 - 1.9	2 - 2.9	3 - 3.9	4 - 4.9	5
Appearance	3 (15.0)	10 (50.0)	6 (30.0)	1 (5.0)	0 (0.0)
Activity	2 (10.0)	10 (50.0)	6 (30.0)	2 (10.0)	0 (0.0)
Mental health	0 (0.0)	8 (40.0)	11 (55.0)	1 (5.0)	0 (0.0)
Pain	5 (25.0)	8 (40.0)	7 (35.0)	0 (0.0)	0 (0.0)
Satisfaction	8 (40.0)	9 (45.0)	3 (15.0)	0 (0.0)	0 (0.0)

**Table 3.** Comparison of the quality of life domains by sex.

Sex	Appearance	Activity	Mental health	Pain	Satisfaction
<b>Female</b>					
Mean	2.78	2.60	3.12	2.48	1.96
Standard deviation	0.77	0.78	0.55	0.46	0.79
Median	2.62	2.50	3.12	2.50	2.00
<b>Male</b>					
Mean	2.20	2.66	2.83	2.50	1.91
Standard deviation	0.74	0.68	0.58	0.79	0.86
Median	2.12	2.50	3.00	2.62	1.75
p-value	0.15	0.77	0.31	0.94	0.90

**Table 4.** Comparison of the quality of life domains by physical activity.

Physical Activity	Appearance	Activity	Mental health	Pain	Satisfaction
<b>Yes</b>					
Mean	2.36	2.50	2.77	2.41	2.00
Standard deviation	0.69	0.79	0.47	0.59	0.93
Median	2.25	2.00	2.75	2.50	2.00
<b>No</b>					
Mean	2.81	2.72	3.25	2.54	1.90
Standard deviation	0.83	0.71	0.55	0.54	0.70
Median	2.50	2.50	3.25	2.50	2.00
p-value	0.21	0.51	0.05	0.62	0.80

**Table 5.** Comparison of the quality of life domains by severity of scoliosis.

Scoliosis	Appearance	Activity	Mental health	Pain	Satisfaction
<b>Mild</b>					
Mean	2.56	2.27	3.09	2.15	1.95
Standard deviation	0.99	0.60	0.57	0.47	0.82
Median	2.50	2.00	3.00	2.25	2.00
<b>Moderate</b>					
Mean	2.66	3.05	2.97	2.88	1.94
Standard deviation	0.50	0.68	0.57	0.35	0.80
Median	2.50	3.00	3.00	3.00	2.00
p-value	0.79	0.01	0.65	<0.01	0.98

## DISCUSSION

Scoliosis is a spinal deformity that can occur in varying degrees, bringing consequences and impacts to the lives of those affected and, thus, interfering in the quality of life of these individuals.<sup>6</sup>

From the results obtained in this study, we observed agreement with scientific publications regarding the epidemiological data for scoliosis, since there was a higher prevalence of the disease in females, as well as greater involvement in the adolescent age group. These findings are justified by the fact that adolescent idiopathic scoliosis (AIS) is the most common type, accounting for up to 85% of cases, with onset usually after 10 years of age, and its predilection for females is explained by the fact that bone development occurs earlier among girls.<sup>6</sup>

Regarding the previous assertion, one study sought to explain this early bone development by correlating AIS with growth hormone level and showed that girls with this diagnosis had higher hormone levels. It also observed that children with precocious growth hormone activity or those who undergo treatment based on this hormone may begin to develop AIS.<sup>7</sup> It is important to implement conservative interventions early in order to prevent the growth of the scoliotic curve while the maturation of the bone structure is not consolidated.<sup>8</sup>

Regarding race, there was a predominance of scoliosis among the individuals who defined themselves as White, corroborating the prevalence reported in a study that analyzed the clinical and epidemiological profile of scoliosis patients undergoing physical therapy in the state of Goiás.<sup>9</sup>

When the occurrence of scoliosis was compared with family income, there was greater involvement among the individuals who reported income between one and two minimum salaries, a result similar to that reported in a study conducted in 2011, in which 64,3% of the sample had a family income equal to or less than two minimum salaries.<sup>10</sup> In Brazil, these values can be explained by the economic reality of the country, where there is inequality in income distribution.<sup>11</sup>

In this investigation there were no individuals diagnosed with severe scoliosis, but only with mild and moderate cases, with a discreetly higher percentage of the former. It is noteworthy that scoliosis can be classified according to its severity based on the calculation of the Cobb angle. Measurement of this angle is extremely important, as it is from this that decisions about treatment of the disease are made.<sup>8</sup>

Similarly, in a study conducted in Korea<sup>2</sup> that also evaluated the quality of life in conservatively treated patients, there was a predominance of mild to moderate severity scoliosis. This predominance is due to the fact the conservative scoliosis treatment is used in cases at these severity levels, while individuals with severe scoliotic curves are treated surgically via spinal arthrodesis.

Among the complications described for this disease, progression of the AIS curve may cause cardiorespiratory impairment and frequent low back pain, conditions that contribute to the limitation of activities performed by the carrier. In addition, complaints about appearance and behavioral and psychological changes are observed in all individuals with scoliosis.<sup>6</sup>

In our study, the most affected quality of life domain was that of activity, followed by mental health. Regarding function, it is important to infer that the physical problem, the pain, and, in more advanced cases, the impairment of pulmonary and cardiac activity are relevant factors that hinder the participation of these individuals in social and physical activities, limiting their daily activities.<sup>2</sup> On the other hand, another study<sup>4</sup> with a similar objective, reported that there was no significant change in relation to the activity/function domain, observing that the study population had a good perception of their activities.

Referring to the results in the mental health domain, we observed conformity with most of the articles published about the quality of life in patients with scoliosis, there being great concern in this area, since they present feelings that range from unhealthy thoughts to more severe symptoms, such as suicidal thinking.<sup>2,4</sup> However, it is noted that the regular practice of physical activity is a factor for a better state of mental health, resulting in a better quality of life.<sup>12</sup>

In addition to improving physical and mental well-being, physical exercises improve the mobility, flexibility, strength, and balance of

these patients, and may reduce the angle of the scoliotic curve, as they improve spinal stability and decreases the risk of disease progression. An alternative is physical therapy, as its exercises prevent the aggravation of mild scoliosis and seek to neutralize the effects of moderate scoliosis by trying to increase spinal coordination and proprioception, as well as the control of movements.<sup>8</sup>

Similarly to what has been stated previously, an investigation with adolescents diagnosed with scoliosis and undergoing activities that included self-correction exercises found this practice useful in reducing the Cobb angle, as well as in improving the quality of life of the volunteers. In addition to the clinical benefits achieved, exercise also benefits self-esteem and reduces pain and other symptoms that interfere with the individual's well-being.<sup>13</sup>

Also, in our study, we observed no difference in the quality of life scores by sex. A study to investigate quality of life as related to health and issues with body image in a total of 137 adolescent patients with untreated early onset idiopathic scoliosis in a developed country found no significant differences in relation to sex.<sup>14</sup>

However, regarding the domain of appearance, there was greater impairment among females, analogous to the results obtained in other investigations.<sup>2,14</sup> A study in Cairo, Egypt, affirmed that the quality of life and body image in adolescents were severely compromised.<sup>14</sup>

These data are relevant, since the idea that the spinal deformity can negatively affect body perception and the appearance of scoliosis patients generates distress. Most patients are diagnosed during adolescence, a period when bodily knowledge begins, favoring a greater likelihood of the group experiencing psychological suffering.<sup>4</sup>

Correlating the severity of scoliosis with the quality of life domains, we observed that patients with moderate scoliosis had greater impairment in the activity and pain domains, indicating that the greater the scoliotic curvature, the greater the compromise to quality of life. A relationship between the pain domain and both the use of orthotics and the sex of the patients has been described, with a higher prevalence reported among females.<sup>15,16</sup>

Therefore, satisfaction with the treatment instituted is one of the

domains assessed in the questionnaire used to research the quality of life and is an important factor for the continuity of the treatment to which the individual is submitted, because the higher the degree of satisfaction with the treatment, the greater the adherence to the treatment. In this study, there was a good percentage of satisfaction with the therapy and this can be explained by the study sample size.<sup>4,5</sup>

Finally, among the limitations encountered in conducting this study, we note the small size of the sample and the fact that the patients selected were all being treated conservatively. As such, it was not possible to compare the quality of life with patients who underwent surgical treatment. Another study reported that in the group of patients with scoliosis, those without treatment or in non-surgical therapy had worse quality of life scores than those who had already undergone surgery.<sup>14</sup>

## CONCLUSIONS

Scoliosis is a spinal alteration that affects more female adolescents and negatively impacts their quality of life. According to the results obtained in our study, the most affected quality of life domains are activity and mental health. When looking at the appearance domain, we observed that there is greater impairment among females as compared to males.

Thus, it is evident that more attention to these patients is necessary, seeking to create and encourage strategies that can improve the quality of life of patients with scoliosis, such as the practice of physical activity. Also, further research on this subject with more consolidated methodological designs and including patients with scoliosis undergoing surgical treatment is appropriate in order to compare the severity of scoliosis and the therapeutic methods.

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

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**CONTRIBUTION OF THE AUTHORS:** Each author made significant individual contributions to this manuscript. EGM and MNAS were responsible for the idea and concept of the project. EGM performed the data collection and analysis. MNAS evaluated the statistical analysis. EGM and MNAS conducted the bibliographical research and manuscript review. RBTS and ALDB contributed to the discussion and general text review.

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## REFERENCES

- Bettany-Saltikov J, Weiss HR, Chockalingam N, Kandasamy G, Arnell T. A Comparison of Patient-Reported Outcome Measures Following Different Treatment Approaches for Adolescents with Severe Idiopathic Scoliosis: A Systematic Review. *Asian Spine J.* 2016;10(6):1170-94.
- Lee H, Choi J, Hwang JH, Park JH. Health-related quality of life of adolescents conservatively treated for idiopathic scoliosis in Korea: a cross-sectional study. *Scoliosis Spinal Disord.* 2016;11:11.
- Schlösser TP, Stadhouders A, Schimmel JJ, Lehr AM, Van der Heijden GJ, Castelein RM. Reliability and validity of the adapted Dutch version of the revised Scoliosis Research Society 22-item questionnaire. *Spine J.* 2014;14(8):1663-72.
- Rosanova GCL, Camarini PMF, Gabriel BS, Oliveira AS. Caracterização da qualidade de vida de adolescentes com escoliose idiopática. *Fisioter Mov.* 2013;26(1):63-70.
- Camarini PMF, Rosanova GCL, Gabriel BS, Gianini PES, Oliveira AS. The Brazilian version of the SRS-22r questionnaire for idiopathic scoliosis. *Braz J Phys Ther.* 2013;17(5):494-505.
- Pomar FM, Sousa DC, Gotfryd AO, Carneiro NJ. Evaluation of prognostic factors in quality of life of patients with adolescent idiopathic scoliosis undergoing spinal fusion by the posterior approach. *Coluna/Columna.* 2016;15(3): 175-80.
- Rocha LF, Vitorino N, Parente D. Escoliose e suas bases genéticas. *Saúde Foco.* 2014;1(1):82-92.
- Hisamatsu TM, Ladwig RP, Veronese TP, Ferreira DMA. Programa de reabilitação em grupo na escoliose idiopática: estudo de caso. *Coloq Vitae.* 2016;8(2):46-50.
- Mota MAG, Battisti L, Rodrigues WCC, Silva-Hamu TCD. Perfil clínico e do atendimento fisioterapêutico em portadores de escoliose. *Anais do Congresso de Ensino, Pesquisa e Extensão da UEG (CEPE).* 2015;2(1):1-2.
- Santo AE, Guimarães LV, Galera MF. Prevalência de escoliose idiopática e variáveis associadas em escolares do ensino fundamental de escolas municipais de Cuiabá, MT, 2002. *Rev Bras Epidemiol.* 2011;14(2): 347-56.
- Instituto Brasileiro de Geografia e Estatística (IBGE). Síntese de indicadores sociais: uma análise das condições de vida da população brasileira: Coordenação de População e Indicadores Sociais. 2016 [acesso em 2018 maio 22];1(1):82-96. Disponível em: <https://biblioteca.ibge.gov.br/visualizacao/livros/liv101629.pdf>
- Silva GC, Silva RAS, Cavalcante N, Jorge L. Saúde mental e níveis de atividade física em crianças: uma revisão sistemática. *Cad Bras Ter Ocup.* 2017;25(3):607-15.
- Monticone M, Cazzaniga EAD, Rocca B, Ferrante S. Active self-correction and task-oriented exercises reduce spinal deformity and improve quality of life in subjects with mild adolescent idiopathic scoliosis. Results of a randomised controlled trial. *Eur Spine J.* 2014;23(1):1204-14.
- Soliman HAG. Health-related Quality of Life and Body Image Disturbance of Adolescents With Severe Untreated Idiopathic Early Onset Scoliosis in a Developing Country. *Spine (Phila Pa 1976).* 2018;43(22):1566-71.
- McKean GM, Tsirikos AI. Quality of life in children and adolescents undergoing spinal deformity surgery. *J Back Musculoskelet Rehabil.* 2017;30(2):339-46.
- Doi T, Inoue H, Arai Y, Shirado O, Doi T, Yamazaki K, Uno K, et al. Reliability and validity of a novel quality of life questionnaire for female patients with adolescent idiopathic scoliosis: Scoliosis Japanese Questionnaire-27: a multicenter, cross-sectional study. *BMC Musculoskelet Disord.* 2018;19(1):99