

# EPIDEMIOLOGICAL PROFILE AND OUTCOMES IN POSTOPERATIVE NEUROMUSCULAR ESCOLIOSIS

PERFIL EPIDEMIOLÓGICO E DESFECHOS NO PÓS-OPERATÓRIO DE ESCOLIOSE NEUROMUSCULAR

PERFIL EPIDEMIOLÓGICO Y RESULTADOS EN EL POSTOPERATORIO DE ESCOLIOSIS NEUROMUSCULAR

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## ABSTRACT

**Objective:** To outline the epidemiological profile and identify the hospital outcomes of patients submitted to neuromuscular scoliosis correction surgery. **Methods:** This was a descriptive study that included 50 patients hospitalized following surgery for neuromuscular scoliosis in a tertiary-level hospital in São Paulo from January 2017 to July 2017. The variables were collected retrospectively from the patients' medical records: age, sex, main diagnosis, length of hospital stay, duration of surgery, hospital complications, and mobility. **Results:** Surgeries were performed in boys and girls in similar proportions, adolescents, many with cerebral palsy (42%), with mean hospital stay of 10.8 days. Fifty-two percent presented some complication, such as constipation. Infection of the surgical site was present in 12% of the sample. Forty-two percent had moderate to intense pain and only 2% did not achieve the proposed mobility goals. **Conclusion:** We observed that the epidemiological profile presented data consistent with the scarce literature available, while the definitions of complications, incidence, and hospital outcomes available in the literature were varied quite a bit from the findings in this study. **Level of evidence III; Retrospective study.**

**Keywords:** Scoliosis; Epidemiology; Postoperative care.

## RESUMO

**Objetivos:** Traçar o perfil epidemiológico e identificar os desfechos hospitalares de pacientes submetidos à correção cirúrgica de escoliose neuromuscular. **Métodos:** Trata-se de um estudo descritivo, em que foram incluídos 50 pacientes internados em pós-operatório de escoliose neuromuscular, em um hospital de nível terciário em São Paulo, no período de janeiro de 2017 a julho de 2017. As variáveis foram coletadas de forma retrospectiva, a partir dos prontuários dos pacientes: idade, sexo, diagnóstico principal, tempo de internação, tempo de duração da cirurgia, complicações hospitalares e mobilidade. **Resultados:** As cirurgias foram realizadas em meninos e meninas em proporção semelhante, adolescentes, em sua maioria com paralisia cerebral (42%), sendo que o tempo de internação médio foi de 10,8 dias e 52% apresentaram alguma complicação como a obstipação. A infecção de sítio cirúrgico esteve presente em 12% da amostra, 42% apresentaram dor moderada à intensa e só 2% não cumpriram as metas de mobilidade propostas. **Conclusões:** Observamos que o perfil epidemiológico apresentou dados consistentes com a escassa literatura disponível, enquanto a definição de complicação, incidência e desfechos hospitalares disponíveis na literatura foram bastante variáveis com os achados neste estudo. **Nível de Evidência III; Estudo Retrospectivo.**

**Descritores:** Escoliose; Epidemiologia; Cuidados pós-operatórios.

## RESUMEN

**Objetivos:** Trazar el perfil epidemiológico e identificar los resultados hospitalarios de pacientes sometidos a la corrección quirúrgica de escoliosis neuromuscular. **Métodos:** Se trata de un estudio descriptivo, en el que fueron incluidos 50 pacientes internados en postoperatorio de escoliosis neuromuscular, en un hospital de nivel terciario en São Paulo, en el período de enero de 2017 a julio de 2017. Las variables fueron colectadas de forma retrospectiva, a partir de los prontuarios de los pacientes: edad, sexo, diagnóstico principal, tiempo de internación, tiempo de duración de la cirugía, complicaciones hospitalarias y movilidad. **Resultados:** Las cirugías fueron realizadas en niños y niñas en proporción semejante, adolescentes, en su mayoría con parálisis cerebral (42%), siendo que el tiempo de internación promedio fue de 10,8 días y 52% presentaron alguna complicación como el estreñimiento. La infección de sitio quirúrgico estuvo presente en 12% de la muestra, 42% presentaron dolor moderado a intenso y sólo 2% no cumplieron las metas de movilidad propuestas. **Conclusiones:** Observamos que el perfil epidemiológico presentó datos consistentes con la escasa literatura disponible, mientras que la definición de complicación, incidencia y resultados hospitalarios disponibles en la literatura fueron bastante variables con los hallazgos en este estudio. **Nivel de Evidencia III; Estudio Retrospectivo.**

**Descritores:** Escoliosis; Epidemiología; Cuidados posoperatorios.

Study conducted at the Hospital AACD, São Paulo, SP, Brazil.

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**INTRODUCTION**

Scoliosis is defined as a lateral deviation of the spine, more commonly observed in the thoracic and lumbar segments and considered pathological when the curvature is greater than 10°.1,2

Among the different etiologies, neuromuscular scoliosis develops secondarily to an imbalance between muscular forces in the axial plane resulting from the underlying disease and the rhythm of its progression is conditioned on the growth of the child and can evolve even after bone maturity.3

To evaluate and monitor the evolution of scoliosis, the gold standard is to use the Cobb method, which measures the angle of the curvature. Curves less than 10° are not considered scoliosis and curves greater than 40° usually require surgical treatment.4,5

The surgical indication occurs in high-degree, progressive scoliosis with marked pelvic obliquity (greater than 20°) and the goal of surgical treatment in neuromuscular scoliosis is to prevent progression of this condition, restore or maintain the balance in the sagittal and coronal planes, and to improve sitting alignment.2,6

The rates of surgical complications have decreased in recent years due to better approach by the surgical team, advances in surgical techniques, and accompaniment by multidisciplinary teams.3 The approach to the patient during the intra-hospital period requires care, given that the condition of these patients has a high potential for complications, such as infection and complications secondary to reduced mobility, that range from tegumentary lesions to loss of physical conditioning, bone and muscle mass to major cardiorespiratory functional impairment resulting from the high angle value of the vertebral deformity.7,8

Knowledge of the characteristics of this population and of their outcomes allows for more careful surgical planning, specialized staff training, and a focus on better patient care quality and safety.9

Physical therapy is important both in postoperative care to prevent the complications mentioned above and within the context of healthcare protocols. The goals set by the protocols must be met for patient results and outcomes to be monitored and indicators can be established to signal potential areas where there are opportunities for improvement.10

Thus, the objective of this study was to outline the epidemiological profile and identify the main hospital outcomes of patients with neuromuscular scoliosis who underwent treatment at the Associação de Apoio à Criança Deficiente (AACD) [Association for the Support of Disabled Children] in order to foster discussion about the postoperative approach to these patients in the future.

**METHODS**

This is an observational, descriptive study, approved by the AACD Institutional Review Board, São Paulo – Brazil, opinion 2.792.771.

The patient data included in the study were obtained by consulting the Hospital AACD electronic medical records contained in the Tasy® system. Data from the medical records of all patients diagnosed with neuromuscular scoliosis who underwent corrective surgery for scoliosis at the Hospital AACD during the period from January to June 2017 were included. Data from patients who had undergone previous spinal surgery and those who had undergone emergency surgery were excluded from the study.

The variables analyzed were sex, age, weight, underlying diagnosis, surgical time, days in the Intensive Care Unit (ICU), days in the hospital, and mobility (considering the achievement of the expected therapeutic goals for each postoperative day).

- Immediate postoperative: mobilization in bed
- 1st Postoperative: Elevation of the upper body in bed to 60°
- 2nd Postoperative: Sitting in chair or walking
- 3rd Postoperative: Assisted transfers or gait training and discharge orientations.

Data about pain and early complications such as pulmonary infection, infection of the surgical site, acute pulmonary respiratory failure, and unplanned intubation were also collected.

The information was stored in a database and later analyzed descriptively using Excel 2010. The data were presented as percentages, means, and standard deviation.

**RESULTS**

Regarding the sample characteristics, we observed a certain homogeneity in relation to the sex of the patients, 22 of whom were female and 28 of whom were male. The mean age of the patients was 13.9 years and cerebral palsy (CP) was the most common underlying diagnosis among the study participants (42%). Regarding mobility, 76% of the patients used wheelchairs and 18% had had previous respiratory disease (Table 1).

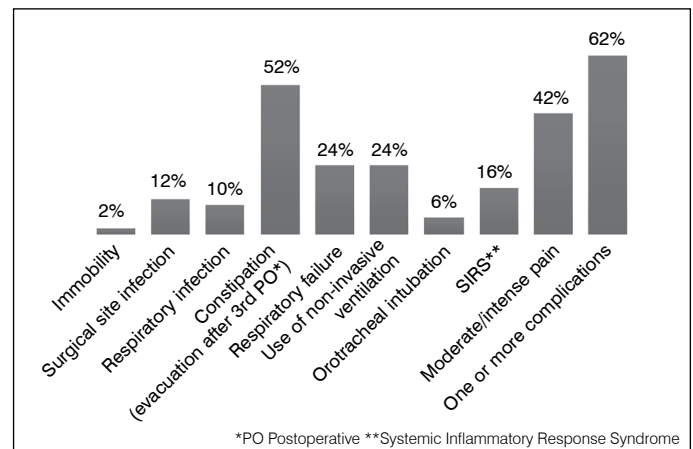
Early complications are defined as those occurring from 24 hours following surgery to the moment of hospital discharge and in this context we observed that 94% of the patients presented some type of complication, from those of lowest risk, such as constipation (52%), to those that require greater attention, such as infection of the surgical site (12%), respiratory failure (24%), Systemic Inflammatory Response Syndrome (16%), and moderate to intense pain (42%) (Figure 1).

As for mobility, we measured how well the patients reached the mobility goals proposed by the team for the postoperative days. The data found were: 82% reached the immediate postoperative goal, 24% reached the first postoperative day goal, 56% met the second postoperative day goal, and by the third postoperative day, 98% had achieved all the mobility goals and were oriented by the physical therapy team about exercise, decubitus changes, transfers, and home care (Table 2).

The mean surgical time was 240 minutes and the mean hospitalization time was 10.8 days, more than the 6 days provided by the institution for this procedure (Table 3).

**Table 1.** Patient characteristics.

Sample Characteristics	Sex		N°	Mean	Standard deviation (SD)
	Male	Female			
Total sample	28	22	50	-	-
Age				13.9	5.6
Weight				35.1	-
<b>Underlying disease</b>					
Myelomeningocele			10	20%	-
Cerebral Palsy			21	42%	-
Neuromuscular disease			9	18%	-
Other			10	20%	-
<b>Mobility</b>			<b>N°</b>	<b>%</b>	<b>-</b>
Able to walk			12	24%	-
Uses wheelchair			38	76%	-
<b>Previous respiratory disease</b>			<b>N°</b>	<b>%</b>	<b>-</b>
Yes			9	18%	-
No			41	82%	-



**Figure 1.** Early complications.

**Table 2.** Mobility goals achieved in the Postoperative period.

Postoperative Mobility Goals		
Immediate PO	N <sup>o</sup>	%
Early mobilization	41	82%
Elevation of the upper body to 30° in bed	37	74%
Decubitus changes	36	72%
1 <sup>st</sup> PO	N <sup>o</sup>	%
Elevation of the upper body to 60° in bed	12	24%
2 <sup>nd</sup> PO	N <sup>o</sup>	%
Sit up outside of bed (or gait training)	28	56%
3 <sup>rd</sup> PO	N <sup>o</sup>	%
Transfer training with family members	12	24%
Discharge orientation	49	98%

\*PO = Postoperative.

**Table 3.** Surgical characteristics.

Surgical Characteristics				
	Total	Mean ± SD	Min-Max	%
Surgical time *	14,730 (min*)	240 ± 131	80-780	—
Postoperative in the ICU**	49			98%
Duration of ICU stay**		2.6 ± 2.7	1-15	—
Duration of Hospital stay**		10.8 ± 7.2	3- 38	—

\*minutes \*\* days.

## DISCUSSION

When opting for surgery for the correction of neuromuscular scoliosis, the risks inherent to the procedure should be known and considered,<sup>11</sup> as should be its objectives, given that this procedure is not premised on a single objective, but is guided by a set of goals to be achieved, with emphasis on spinal alignment.<sup>12</sup>

This study analyzed data from a sample of fifty patients diagnosed with neuromuscular scoliosis and we observed a certain homogeneity in distribution by sex, with a discreetly higher percentage of males. As in other studies, it was noted that the presence of curves with high angular values and the need for surgical intervention did not seem to be related to sex.<sup>13,14</sup>

Regarding the age of the individuals on the date of surgical intervention, we observed greater variability in the sample. The mean age found in our study was 13.9 years, similar to the data published in the study by Jaccard,<sup>13</sup> who reported a mean age of 11 years. In the study by Dahe,<sup>14</sup> the mean age of the operated population was 16.4 years. It is important to highlight that the mean ages at time of surgical intervention in the three studies cited correspond to the period of puberty, when there is progression of the curvature in scoliosis.<sup>15</sup>

Cerebral palsy was the predominant underlying diagnosis in this study (42%), followed by myelomeningocele (20%). The variability in the underlying diagnoses leading to surgical interventions for the correction of scoliosis prevalent in other studies seems to be due to selection of the sample chosen for each study.<sup>16,17</sup>

It is well-known that surgical complexity is related to surgical time and this, together with the length of the hospital stay, can be a predictor of complications and mortality. In this study, the Cobb

angle, which is an important factor when analyzing outcomes related to surgical time, for example, was not documented.<sup>13,18</sup>

Most studies only report complications related to the intraoperative period or the most serious postoperative ones, such as infection of the surgical site and respiratory infection. In this sense, the complication rate percentages found in the literature are lower than the values observed in our study. However, it is important to note that in our study we reported all complications, from the mildest, such as constipation (52%), to the most severe, such as surgical site infection (12%) and the presence of moderate to intense pain (42%). There were no cases of death during the collection period.

The incidence of surgical site infection seems to have some relationship with the underlying diagnosis of the patient. In our study, which had a diverse set of underlying diagnoses, the incidence of infection was 12%, while in the study by Jaccard et al.,<sup>13</sup> whose sample was comprised only of patients with myelomeningocele, surgical site infection was present in more than double the number of cases (25%) in our study. However, we cannot infer anything from this finding, since there are no studies that stratify outcomes by underlying diagnosis.<sup>13,18</sup>

Immobility, although with a small overall percentage (2%) in this study, was reported as a complication because it is a factor that can impact hospital outcomes.<sup>19,20</sup> The 1<sup>st</sup> postoperative was the day of least adherence to the proposed mobility goals (24%) and this should be a point of attention to be managed in the institutions, in conjunction with patient education and the active participation of the patient and family in postoperative planning, including information about daily goals.

In our study, on the day of discharge 98% of the patients had achieved all the mobility goals proposed for the hospital stay and were oriented and trained by the physical therapy team about mobility care and home transfers. The remaining 2% either refused care or had medical restrictions preventing them from performing the procedures. We did not observe any information about patient discharge guidelines in the literature on the subject, a matter of concern given that the guidelines aim to provide continuity of care and prevent late complications.

## CONCLUSION

The epidemiological profile provided anthropomorphic data consistent with that found in the scarce literature. Immobility, despite the low percentages observed in our study, still raises concern in this population. Although there were no deaths during the period studied, almost the entire sample had some type of early postoperative complication. However, the definitions of what is considered a complication and what the hospital outcomes are in this population are still quite variable in relation to the literature. For more consistent data around outcomes in this population, further study on the subject is needed, preferably with stratification by underlying diagnosis.

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