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THE INCREASE IN REPETITIVE STRAIN INJURIES (RSI) IN CHILDREN AND ADOLESCENTS

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Abstract: Repetitive Strain Injuries (RSI) in young people have increased noticeably in recent times, with a sharp rise following the COVID-19 pandemic. The synopsis of loneliness, virtual learning and increased use of electronic devices has aggravated periods of inappropriate postures and monotonous actions, increasing susceptibility to musculoskeletal damage among this demographic group. Notifications have also been made in regions of the country where an increase in cases due to child labor can still be considered. Early exposure to work, such as heavy lifting and inappropriate positions, can complicate the risk of permanent injuries to the spine and upper limbs. This article provides the main reasons, risk elements and results of the increase in the number of RSI cases among young people, emphasizing the effects of the pandemic as well as the need to highlight the problem and prevention tactics, including ergonomic changes, reducing screen exposure and maintaining a healthy lifestyle. The study was based on the analysis of secondary data from the Data SUS Notifiable Diseases Information System database. Therefore, the purpose was to describe how RSI notification occurs in children and adolescents aged 10 to 19 in the years 2018 to 2023.
Keywords: RSI, child labor, COVID 19, electronic devices, musculoskeletal damage.

INTRODUCTION

Musculoskeletal injuries (MSIs), often the subject of research in adult work environments, have emerged as a growing concern among children and adolescents in the last decade, driven by the evolution of habits and the expectations of modern society. The COVID-19 pandemic has increased the chance of self-harm, mainly due to distance learning and greater dependence on digital devices. During quarantine periods, young people and adolescents began to carry out academic and recreational activities as well as community affairs virtually, causing long periods in sub-optimal postures, muscle tension and an exacerbation of repetitive movements (Nunes; Diniz, 2008). Children and adolescents with long bones and muscles that are still growing are at greater risk of getting injured in the wrong ways, such as being too sedentary or overdoing sports. RSIs, which comprise painful and inflammation-related disorders resulting from repeated movements and sustained postures, can cause muscle discomfort, swelling and impaired functionality (Barbosa; Trezza 2007). Inadequate domestic settings, infrequent rest breaks and ignorance about the dangers of persistent screen use have increased the prevalence of this problem (Schwaickardt et al, 2021).

However, even with the contribution of the aforementioned factors, the results of this study show the high occurrence of musculoskeletal complications due to the remote classes caused by the pandemic, as well as highlighting regional factors where the increase could possibly be related to child labor. These situations suggest a significant increase compared to the years prior to the pandemic. This trend reinforces the need for preventive and educational interventions that can eliminate risk factors and promote the physical health of children and adolescents.

L.E.R. AND ITS IMPACT ON YOUNG PEOPLE

Repetitive strain injuries. Repetitive strain injuries, known as work-related musculoskeletal disorders (WMSDs), are diseases that affect muscles, tendons, nerves and joint structures due to repetitive movements, inappropriate posture and exacerbated physical effort, which may or may not compromise adjacent structures (Silva; Lessa, 2014). These conditions, originally associated with the workplace, have gained importance in the context of children and adolescents, especially due to the increasing use of technological devices and inadequate study and leisure conditions.

According to Guttman (1999), professional attitudes and habits have repercussions on the skeleton, organs and psyche of individuals. They can lead to physical deformities, vicious attitudes and even psychic and moral deviations of character. He also emphasizes that the diagnosis of RLS is essentially clinical and based on the occupational clinical history, a detailed physical examination, complementary tests, when justified, and an analysis of the working conditions responsible for the onset of the injury.

PHYSICAL DAMAGE AND MUSCULOSKELETAL INJURIES

Exposure of children and adolescents to activities that require physical effort or, conversely, repetitiveness, significantly affects the development of the musculoskeletal system, which is in the process of maturing. Also according to Vieira et al. (2015), in childhood, structures such as ligaments, tendons and intervertebral discs are still forming, making the body more susceptible to the appearance of deformities such as scoliosis, kyphosis and lordosis. Early exposure to work, such as heavy lifting and inappropriate positions, can complicate the risk of permanent injuries to the spine and upper limbs. Chielle's study (2016) revealed that 53% of the RSI/WMSD cases treated at CEREST/Vales were related to childhood work-related illness. Among the patients who began their activities between the ages of 6 and 11, the incidence was higher in regions such as the shoulders and spine, demonstrating the early interference of physical overload in adults on musculoskeletal health. Increased time spent by children and adolescents in static postures during the pandemic was a risk factor for RSI.

PSYCHOLOGICAL AND COGNITIVE IMPACTS

RSI/WMSDs also have significant psychological implications. According to Teixeira et al. (2013), chronic pain and physical limitation can lead to depression, a sense of disability and anxiety, especially in young people. In children and adolescents, its impact on normal functionality can be accompanied by disturbances in school performance, sports, recreation, social isolation and, in general, a deterioration in quality of life. By disregarding these psychosocial factors, the person affected by the syndrome can be doubly victimized. With regard to the interactive communication space, the author Fantin (2018) presents the thesis that, in these conditions, the use of mobile devices as a technologically advanced tool for work, education, leisure, exacerbated behaviors can cause technological dependence as a natural mechanism for aggravating the precariousness of emotional behavior. Thus, it is believed that these factors together multiply the negative effect of RSIs.

RISKS RELATED TO CHILD LABOR

RSI is widely documented as being associated with early work. Assunção and Dias (2002) describe that children forced into heavy physical labor are more prone to fractures, fatigue and motor difficulties due to an insufficiently developed muscle growth spurt and coordination. In addition, a study carried out by Mendes and Cantanhede (2016) reports that in 2011, there were 258,000 children and adolescents (between 5 and 17 years old) in a situation of domestic child labor who provided services for other families, 102,668 (39.8%) were in the Northeast; 66,663 people (25.9%) in the Southeast; 35,590 (13.8%) in the North; 34,755 (13.5%) in the South; and 18,015 (7%), in the Midwest. In the same period, the states of Minas Gerais (31,316), Bahia (26,564), São Paulo (20,381) and Pará (19,309) had the hi-

ghest numbers of children and adolescents in domestic work, which often results in chronic problems associated with adulthood. In addition to physical limitations, Chielle's work (2016) reveals the economic and social difficulties faced by workers with child labor experience, as well as low schooling and a lack of opportunities in the labor market. This subsystem increases the conditions of poverty, social exclusion and growing dependence on public health services and social security benefits.

METHODOLOGY

This was a quantitative, descriptive and retrospective study. The study was based on the analysis of secondary data collected from the Data SUS Notifiable Diseases Information System database. Therefore, the purpose was to describe how RSI notification occurs in children and adolescents aged 10 to 19 in the years 2018 to 2023. This data was obtained directly from the DataSUS system, where the information available on the health platform is open to the public. Finally, this investigation is based on those registered as RSI/WMSD, who are diagnosed with RSI/WMSD codes, a general term that includes various pathologies and has records identified by ICD-10, reaching the categories M65 Synovitis and tenosynovitis, M75 Shoulder disorders, M77 enthesopathic diseases, among other musculoskeletal and tendon diseases. The definition fitted perfectly with the group that brought together all these variables. The study variable was the age group, which was delimited to notified cases of people aged 10 to 19 registered in the system. The indicators were also:

- Year of notification in the system;
- Sex of notified individuals, and
- Location of cases (states in Brazil).

The material collected was organized in electronic spreadsheets for descriptive analysis. The unit of analysis was the notification. The analytical procedures were the distribution of the absolute frequency of notifications by year, age group, gender and location. To assess trends in the number of notifications over time, an analysis was carried out which compared the percentage of this number between the years analyzed. The results were presented in the form of tables and graphs, which made it possible to illustrate the variations and patterns identified more clearly.

The inclusion criteria for the study were cases notified in the Notifiable Diseases Information System between 2018 and 2023, with a diagnosis related to RSI/WMSD, in the 10-19 age group. Incomplete, duplicate and unspecified notifications were excluded from the study.

After filtering the data, it was then processed using Excel statistical analysis software to generate graphs and tables detailing the pattern of trips over the years and between regions and demographics. As this was an analysis of secondary data obtained from a public, open-access database, the use of an informed consent form was considered unnecessary. The study was conducted in accordance with Resolution 466/2012 of the National Health Council and its ethical complements.

STUDY LIMITATIONS

- variability in the quality and completeness of notifications which, because they are recorded manually, depend on the autonomy and technical capacity of the health professional;
- the possibility of underreporting cases of RSI/WMSD, especially in the school or home environment, since minor and secondary injuries are often overlooked in reports.

Through this methodology, it was possible to identify and understand the greater notification of RSI among children and adolescents in the age group of the study at a national level, providing support for the discussion on prevention and policies for this vulnerable age group.

RESULTS AND DISCUSSION

Based on the data collected from the Notifiable Diseases Information System (SINAN), there has been an increase in the number of RSI cases reported among children and adolescents aged between 10 and 19, between 2018 and the projection to 2023. The situation is worrying with a significant increase in the number of notifications, from 61 in 2018 to 168 in 2023, totaling 402 cases in the series.

Table 1 shows the notifications per year according to the ICD RSI/WMSD.

The most prevalent categories were muscle and nerve root disorders M50-M54, with 150 out of 402 cases, 37.3%, and syndromes and tendon disorders M65-M68, with 30 notifications, 7.4%.

Table 2, on the other hand, details notifications by state within the federative union, showing heterogeneity in the distribution of cases. Minas Gerais was the state with the highest number of case notifications, with 83 notifications, followed by Rio Grande do Sul with 59 notifications. This geographical distribution reflects possible regional inequalities in exposure to risk factors, as well as diagnostic and recording capacity. Due to the aforementioned segmentation by gender, the count of those affected is even higher among men, with 236 cases compared to just 166 women. It may also be related to differences in work and social activities and greater exposure to biomechanical factors, as highlighted by Mendes and Cantanhede (2016) with regard to the impact of work in childhood. Based on the findings presented, there has been a statistically significant increase in RSI notifications among adolescents over the years studied. This increase can be attributed to several factors, including additional awareness of RSI/WMSD, increased use of digital devices and changes in the conditions of education and social life, as the Covid-19 situation has also led to the additional use of technology in education (Fantin 2018).

NOTIFICATIONS BY YEAR OF NOTIFICATION ACCORDING TO ICD RSI/WMSD

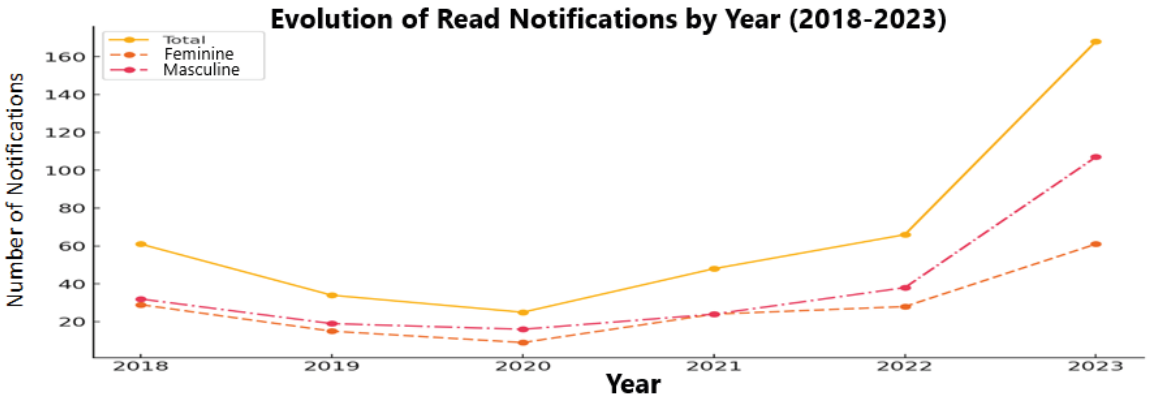
The breakdown of data by ICD in Table 1 shows that the majority associated with these events are muscle and nerve root disorders M50-M54 suggesting that it is appropriate to make a correlation between the repeated and inappropriate use of digital devices such as cell phones and computers.

NOTIFICATIONS BY YEAR OF NOTIFICATION ACCORDING TO UF OF NOTIFICATION

The regional analysis, shown in **Table 2,** highlights the inequalities in the notification of cases. The state of Minas Gerais has the highest number of notifications, with 83 cases, which may be associated with better notification and diagnosis capacity. Among the lower group, Rondônia, with two cases, suggests the invisibility of NTE by the epidemiological surveillance system, consistent with the fragility of access to higher quality services and gaps in workers' health training.

NOTIFICATIONS BY YEAR OF NOTIFICATION ACCORDING TO UF OF NOTIFICATION

Males had a higher number of notifications, with a significant increase in 2023 (107 cases). This pattern can be explained by the greater involvement of boys in activities that require repetitive physical effort and the predominance of cultural factors that naturalize pain or discomfort until it is incapacitating (Assunção and Dias, 2002).



Graph 1 shows the development of total notifications and notifications by sex from 2018 to 2023. There is a peak in 2023, which reflects a huge problem for both sexes. This pattern corresponds to the statements made by Chielle in 2016, who pointed out how overloading the locomotor system at an early age affects the origin of musculoskeletal disorders.

Source: Author

RSI/WMSD ICD	2018	2019	2020	2021	2022	2023	Total
TOTAL	61	34	25	48	66	168	402
Other ICDs not listed	9	7	6	6	18	40	86
CID not filled in	12	10	5	4		3	34
Trans of nerves, roots and nerve plexus (G50-G59)	1	2	1	2	2	8	16
Infectious arthropathies (M00-M03)					1		1
Arthrosis (M15-M19)				1			1
Other joint disorders (M20-M25)	1		1	3	2	5	12
Deforming dorsopathies (M40-M43)				1	2		3
Spondylopathies (M45-M49)				1			1
Other dorsopathies (M50-M54)	14	4	6	23	25	78	150
Muscle disorders (M60-M63)	1					2	3
Disorders of the synovium and tendons (M65-M68)	15	2	2	2	4	5	30
Other soft tissue disorders (M70-M79)	8	9	4	5	13	25	64
Chondropathies (M91-M94)				1			1

Age group (13): 10 to 14 years, 15 to 19 years - period: 2018 - 2023.

Source: Ministry of Health/SVSA - Notifiable Diseases Information System - Sinan

UF of Notification	2018	2019	2020	2021	2022	2023	Total
TOTAL	61	34	25	48	66	168	402
Rondônia					1	1	2
Amazonas					2		2
Tocantins					1	13	14
Maranhão				1			1
Ceará		1	1	1	3	29	35
Rio Grande do Norte	1						1
Paraíba		1	1	1		2	5
Pernambuco	1	1	1	1	5	28	37
Sergipe		1		1			2
Bahia	2	1		1	4	12	20
Minas Gerais	21	14	9	11	16	12	83
Rio de Janeiro	23	4	2	3	3	7	42
São Paulo	5	5	3	4	3	15	35
Paraná	2		5	9	7	10	33
Santa Catarina	1	2		3		2	8
Rio Grande do Sul	2	4	3	12	15	23	59
Mato Grosso do Sul	3				2		5
Mato Grosso						1	1
Goiás					2	1	3
Federal District					2	12	14

Age group (13): 10 to 14 years, 15 to 19 years - period: 2018-2023

Source: Ministry of Health/SVSA - Notifiable Diseases Information System - Sinan Net

UF of Notification	2018	2019	2020	2021	2022	2023	Total
TOTAL	32	19	16	24	38	107	236
Rondônia					1	1	2
Amazonas					1		1
Tocantins						10	10
Maranhão				1			1
Ceará				1	1	20	22
Rio Grande do Norte	1						1
Paraíba		1	1	1		2	5
Pernambuco			1		3	23	27
Sergipe		1					1
Bahia		1		1	3	6	11
Minas Gerais	15	10	7	7	9	4	52
Rio de Janeiro	9	3	2		2	4	20
São Paulo	4	2	1	4	2	8	21
Paraná			4	4	5	5	18
Santa Catarina	1						1
Rio Grande do Sul	1	1		5	8	13	28
Mato Grosso do Sul	1				1		2
Mato Grosso						1	1
Goiás					1		1
Federal District					1	10	11

Age group (13): 10 to 14 years, 15 to 19 years - Sex: Male - Period: 2018-2023

Source: Ministry of Health/SVSA - Notifiable Diseases Information System - Sinan

UF of Notification	2018	2019	2020	2021	2022	2023	Total
TOTAL	29	15	9	24	28	61	166
Amazonas					1		1
Tocantins					1	3	4
Ceará		1	1		2	9	13
Pernambuco	1	1		1	2	5	10
Sergipe				1			1
Bahia	2				1	6	9
Minas Gerais	6	4	2	4	7	8	31
Rio de Janeiro	14	1		3	1	3	22
São Paulo	1	3	2		1	7	14
Paraná	2		1	5	2	5	15
Santa Catarina		2		3		2	7
Rio Grande do Sul	1	3	3	7	7	10	31
Mato Grosso do Sul	2				1		3
Goiás					1	1	2
Federal District					1	2	3

Age group (13): 10 to 14 years, 15 to 19 years - Sex: Female - Period: 2018-2023

Source: Ministry of Health/SVSA - Notifiable Diseases Information System - Sinan Net

NOTIFICATIONS BY YEAR OF NOTIFICATION ACCORDING TO UF OF NOTIFICATION

With regard to the female public, as shown in the Female table, cases also increased, but more equally, especially between 2021 and 2023. The increase in these cases can be attributed to psychosocial and occupational factors, as warned by Sousa (2018): "schooling coupled with domestic responsibilities and lack of income may be among the aggravating factors". Finally, the review literature points out that prevention is the best way to deal with the increase in RSI/WMSDs in adolescents. The study by Nunes and Diniz in 2021 warns that: "education and ergonomics associated with raising awareness among children and adolescents about the importance of regular breaks and proper postures" and "educational social policies on adolescent worker health" are the best ways to reduce the impacts of technological overexposure and early work.

PREVENTION AND EDUCATION MEASURES

Raising awareness of ergonomics and developing preventive practices have been identified as the keys to mitigating the consequences of RSI in young people. By applying the serious game concept in schools, Nunes and Diniz argue that ergonomic awareness can be successfully raised and interactive learning can induce behavioral changes. Prevention activities also require public measures to eradicate child labor.

CONCLUSION

As emphasized by Guttman (1999) RSI is a very important public health problem, especially in the area of occupational health, its prevalence is very high but underdiagnosed, and it generates significant temporary disability and even permanent disability. The increase in notifications in children and adolescents must be taken into account, both with the inappropriate use of technology and early exposure to work. As evidenced by stu-

dies such as Chielle, (2016) and Teixeira et al. (2013), these types of injuries have a strong correlation in causing physical, psychological and social impact. Due to the fact that these diseases originate before adulthood, it must ultimately be the mind that addresses the cure or, better still, the effort to minimize the manifestation of serious cases of RSI/WMSD and preventive work. The path to be followed can only be pointed out thanks to critical thinking and systematic observation, idealized public policies aimed at reducing the impact of injuries on young people and the quality of life of future generations.

The conclusion to be drawn is that the objective approach to be followed is an interdisciplinary one, with the word ergonomics as its essence, pedagogical collaboration and the idea of international policies to approach child and adolescent development with care.

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