Reliability of the evaluation of shoulder girdle retraction instrument in a neonatal intermediate unit care

Confiabilidade de instrumentos de avaliação de retração de cintura escapular em uma unidade de cuidados intermediários neonatal

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ABSTRACT | OBJECTIVE: To evaluate inter and intra-examiner reliability in the use of instruments to assess shoulder girdle retraction in children hospitalized in a neonatal intermediate care unit. METHODS: Quantitative, cross-sectional and observational study carried out with newborns and infants who required hospitalization in a neonatal intermediate care unit. Data collection took place from October 2019 to February 2020. To evaluate shoulder girdle retraction, a biomechanical inspection protocol developed by the researchers was used, which made it possible to measure (in centimeters) from the upper and lower medial edges, right and left, to the spine, with the head in rotation to the right and left, and the scarf sign. The evaluations were always carried out by the same evaluators. To estimate inter and intra-examiner reliability of the biomechanical inspection protocol and scarf signal, the Kappa Index was used and, for measurements of scapular positioning, the Intraclass Correlation Coefficient. RESULTS: The biomechanical inspection protocol for suggestive signs of scapular girdle retraction showed mild to moderate inter-examiner agreement and substantial to almost perfect intra-examiner agreement. The intra-examiner agreement obtained in the scarf sign was mild to moderate and almost perfect intra-examiner. The positioning of the scapulae showed good inter-examiner agreement and excellent intra-examiner agreement. CONCLUSION: The evaluation of suggestive signs of scapular girdle retraction in newborns and infants has low inter-examiner reliability and very high intra-examiner reliability.

KEYWORDS: Shoulder blade. Newborn. Infant. Observer Dependent Variations. Test Reproducibility.

RESUMO | OBJETIVO: Avaliar a confiabilidade inter e intraexaminador, na utilização de instrumentos de avaliação da retração de cintura escapular em crianças internadas em uma unidade de cuidados intermediários neonatal. MATERIAL E MÉTODOS: Estudo quantitativo, transversal e observacional, realizado com recém-nascidos e lactentes que necessitaram de internamento em uma unidade de cuidados intermediários neonatal. A coleta de dados ocorreu de outubro de 2019 a fevereiro de 2020. Para avaliação da retração da cintura escapular foi utilizado um protocolo de inspeção biomecânica elaborado pelas pesquisadoras, que possibilitou a realização de medidas (em centímetros) das bordas mediais superiores e inferiores, direita e esquerda, até a coluna vertebral, com a cabeça em rotação para a direita e para a esquerda, e o sinal do cachecol. As avaliações foram realizadas sempre pelos mesmos avaliadores. Para estimar a confiabilidade inter e intraexaminador do protocolo de inspeção biomecânica e sinal do cachecol, foi utilizado o Índice de Kappa e para as medidas do posicionamento das escápulas, o Coeficiente de Correlação Intraclasse. RESULTADOS: O protocolo de inspeção biomecânica dos sinais sugestivos de retração de cintura escapular demostrou concordância leve a moderada interexaminadores, e substancial a quase perfeita intraexaminador. A concordância interexaminadores obtida no sinal do cachecol foi leve a moderada, e quase perfeita intraexaminador. O posicionamento das escápulas apresentou concordância interexaminadores considerada como boa, e concordância excelente intraexaminador. CONCLUSÃO: A avaliação de sinais sugestivos de retração de cintura escapular, em recém-nascidos e lactentes, apresenta baixos índices confiabilidade interexaminadores e altíssima confiabilidade intraexaminador.

PALAVRAS-CHAVE: Escápula. Recém-nascido. Lactente. Variações Dependentes do Observador. Reprodutibilidade dos Testes.

Introduction

Advances in medicine have allowed an increase in the survival of newborns (NB) with lower gestational age (GA).[1-5] In this scenario, there is a concern about the growth prognosis and the morbidities found in these children as a result of complications that long periods of hospitalization can cause.[1-3,6] Neonatal intensive care units (NICU) are extremely stressful environments, as they offer a routine of handling, noise and excessive stimuli to the NB, making it difficult to adapt to extra uterine life.[1,2,4] Preterm newborns represent the population most vulnerable to developmental disorders, given the immaturity of their body systems at birth, making them less organized.

Shoulder girdle retraction is one of the possible alterations identified in NB submitted to long periods of hospitalization.[1,2,7,8] Lessa[1] cites three profiles that can be considered at risk for development of shoulder girdle retraction. The first one is the babies with the most severe clinical picture, such as those on mechanical ventilation for long periods. Another profile is that of irritable and hypertonic babies, due to the low tolerance to handling, which can cause hyperstimulation and disorganization of movements, leading to increased extensor tone. Finally, a third profile would be that of lethargic and hypotonic babies because, due to their low tone, these NBs seek stability by exerting a forced extension against the mattress surface. These characteristics, associated with the long period of hospitalization, immobility and, sometimes, poor positioning, can lead to postural changes such as shoulders retraction and shoulder blades approximation, shoulders elevation, hyperextended neck and hyperextended upper body.[6-8] As a result, there is a limitation in the development of important skills such as midline orientation, manipulation of objects, crawling, and sitting without support, leading to delay in motor development.[1]

The neonatal evaluation must be able to identify postural patterns and abnormal movements that signal delays in motor development, using standardized, validated and effective evaluation methods in the measurement of postural abnormalities.[9] The identification must occur as early as possible, allowing a timely and effective intervention and better prognosis for these children.[1,3,6] A recent study[10] used neonatal assessment instruments to identify shoulder girdle retraction in children hospitalized in an Intermediate Neonatal Care Unit (NICU). However, in the absence of consolidated methods in the literature, this identification still is made subjectively by visual inspection of the child, depending directly on the professional's experience to identify the change.

Given the lack of validated and proven effective methods for measuring shoulder girdle retraction, it is necessary to expand research on this topic, focusing on the diagnosis of this alteration that is commonly observed in NICUs. Thus, the present study aims to assess the inter and intra-examiner reliability in the use of instruments to assess shoulder girdle retraction in children hospitalized in an Intermediate Neonatal Care Unit (NICU).

Material and methods

This is a quantitative, cross-sectional and observational study. The study population consisted of newborns and infants who required admission to the Intermediate Care Unit of the General Hospital Roberto Santos, Salvador – BA. Based on convenience sampling, children admitted to a NICU who met the study's inclusion criteria were evaluated. The inclusion criteria used were: gestational age (GA) > 33 weeks, not being in a minimal handling protocol, not having suspected or diagnosed genetic syndromes, not being tracheostomized and not having been previously submitted to abdominal surgeries. As exclusion criteria, the following were adopted: high irritability during handling for the evaluation.

To conduct this study, data were collected on the sociodemographic and clinical characteristics of the children. At the time of the evaluation, the Brazelton[11] behavioral scale was used to identify the behavioral state of the children, prioritizing the evaluation during the calm alert state due to the interference that excessively irritable or sleepy behavioral state reflect on the child's tone, which would compromise the evaluation. To assess postural biomechanics, the biomechanical inspection protocol developed by the researchers was used based on the variables of the study by Georgieff and Bernbaum[12] and the variables of the study by Oliveira, Melo and Pimentel Sá.[8] The variables of this protocol include the evaluation of the following clinical signs: cervical hyperextension, shoulder elevation, external rotation of the

shoulders, upper body hyperextension, abduction of the shoulders and upper limbs, arm elevation accompanied by elbow flexion, hands to midline, and shoulder blades adduction. The positioning of the shoulder blades were evaluated using the measurement in centimeters of the upper right and left medial edges and from the right and left lower medial edges to the spine, initially with the head rotation to the right and, later, to the left.[10] Finally, to check the quality of the tone of the shoulder and shoulder blades muscles, the scarf sign was used[13], observing the location of the olecranon in relation to the midline of the child's upper body. The evaluation of the scarf sign was classified as: elbow does not reach the midline of the upper body; elbow remains in the midline of the upper body; broad movement, elbow extends beyond the midline of the upper body. More information regarding the methods and instruments used for the shoulder blades assessment is available in the article by Gomes et al.[10] and can be consulted.

Data collection took place from October 2019 to February 2020. To analyze the inter-examiner agreement, the assessment of the children was always carried out by the same researchers, a physical therapist and a 7th-semester Physiotherapy undergraduate student. Assessors with different levels of professional experience were selected in order to assess whether this has an impact on the assessment of shoulder girdle retraction through the use of standardized instruments. The procedures were performed sequentially by both, without them having access to each other's results. To assess intra-examiner agreement, the most experienced researcher repeated the assessment after 24 hours. The reassessment by the most experienced professional aimed to analyze the authenticity of the professional's evaluation by comparing the assessments. The choice of time between assessments aimed to minimize memory bias, however it was concluded that an interval longer than 24 hours could compromise assessment due to biomechanical changes inherent to the length of hospital stay.

The collected data were compiled in a database created in Excel for Windows and analyzed in Stata software, version.15.0. Statistical analysis involved the calculation of absolute and relative frequency measures of categorical variables. To estimate the inter and intra-evaluator reliability of the categorical variables of the biomechanical inspection protocol and scarf sign, the Kappa Index (Kp) was used, according to the following classification: >0.80 characterized almost perfect agreement, between 0.60 and 0.79 indicated substantive agreement, between 0.40 and 0.59 indicated moderate agreement, between 0.20 and 0.39 mild agreement, between 0 and 0.19 poor agreement, and <0 represented no agreement.[14] A reliability of measurements of scapular positioning was obtained from the Intraclass Correlation Coefficient (ICC), being classified as: <0.5 = poor reliability, from 0.5 to 0.75 = moderate reliability; from 0.75 to 0.90 = good reliability; >0.90 = excellent reliability.15 In both analyses, a statistical significance level of 95% (p-value<0.05) was considered.

The present study was approved by the Research Ethics Committee of Hospital Geral Roberto Santos, under opinion number 3,283,201 (CAAE 11638119.0.0000.5028), respecting the ethical precepts following the regulations of Resolution 466/2012 of the National Council of Health. We emphasize that for all study participants, parents or guardians were advised regarding the research and signed a Free and Informed Consent Term (FICT).

Results

Twenty-one children were included, of which 14 (66.7%) were newborns, and 12 (57.1%) were male. As for gestational age, 18 (85.7%) were preterm. Regarding birth weight, only three (14.3%) were born with adequate weight. As for clinical diagnoses, 13 (61.9%) had a diagnosis of respiratory distress, 6 (28.6%) had a history of apnea, and 11 (52.4%) had a diagnosis of jaundice. Regarding the need to use mechanical ventilation, four (19.1%) used invasive mechanical ventilation (IMV), and 14 (66.7%) used non-invasive mechanical ventilation (NIV). (Table 1)

The inter-examiner reliability analysis of the biomechanical inspection protocol for suggestive signs of scapular girdle retraction showed moderate agreement in cervical hyperextension (Kp=0.58, p-value=0.003) and shoulder blades adduction (Kp=0.53, p -value=0.007). The intra-evaluator reliability analysis of the same protocol showed almost perfect agreement for the evaluations of external rotation of shoulders (Kp=1.00, p-value<0.001), adduction of shoulders and upper limbs (Kp=1.00, p-value<0.001), and shoulder elevation (Kp=0.90, p-value<0.001) and cervical hyperextension (Kp=1.00,

p-value<0.001). The items shoulder blades adduction (Kp=0.67, p-value<0.001) and hands to the midline (Kp=0.74, p-value<0.001) obtained substantial agreement (Table 2).

Limitations were found when analyzing the reliability of some items of the protocol due to the little variation in the answers and the small sample size. Thus, in the evaluation of inter-examiner reliability, it was not possible to analyze the items external rotation of the shoulders, hyperextension of the upper body, adduction of shoulders and upper limbs, elevation of the arm accompanied by flexion of the elbow and hands to the midline. In the intra-examiner evaluation, it was not possible to analyze the agreement between upper body hyperextension and arm elevation accompanied by elbow flexion.

The inter-examiner reliability evaluated in the scarf sign obtained mild agreement for the right upper limb (Kp=0.42, p-value=0.004) and moderate agreement for the left upper limb (Kp=0.35, p-value= 0.015). The intra-examiner agreement of this same method was almost perfect for both upper limbs (right and left upper limb: Kp=0.84, p-value<0.001) (Table 3). The reliability analysis of the assessment of scapular positioning showed good inter-examiner agreement and excellent intra-examiner agreement, with a p-value <0.001 for all cases. More information is available in table 4.

Table 1. Clinical and sociodemographic characteristics of newborns and infants admitted to an Intermediate Care Unit in Salvador-BA, 2019 – 2020

Variables	N	%
Sex		
Female	9	42,9
Male	12	57,1
Gestational age		
Pre-term	18	85,7
At term	3	14,3
Post-term	-	-
Days of life		
Newborn	14	66,7
Lactating	7	33,3
Birth Wight		
Suitable weight	3	14,3
Low Weight	9	42,8
Very low weight	8	38,1
Extreme low weight	1	4,8
Clinical diagnoses*		
Newborn discomfort syndrome	13	61,9
Apnea	6	28,6
Jaundice	11	52,4
Use of mechanical ventilation		
Did not use mechanical ventilation	3	14,2
Invasive mechanical ventilation	4	19,1
Non-invasive mechanical ventilation	14	66,7

*Data referring to the total of 21 children who were part of this study, considering that some children had more than one diagnosis

Table 2. Inter-evaluator and intra-evaluator reliability values according to the Biomechanical Inspection Protocol, applied to newborns and infants hospitalized in an Intermediate Care Unit in Salvador-BA, 2019 – 2020

Variables	Inter-evaluator reliability		Intra-evaluator reliability	
	Kappa	p-value	Kappa	p-value
Cervical hyperextension	0,58	0,003	1,00	<0,001
Shoulder elevation	0,24	0,139	0,90	<0,001
External rotation of the shoulders	-	-	1,00	<0,001
Hyperextension of the upper body	-	-	-	-
Shoulder and upper limb adduction	-	-	1,00	<0,001
Arm elevation accompanied by elbow flexion	-	-	-	-
Hands to the midline	-	-	0,74	<0,001
Shoulder blades adduction	0,53	0,007	0,67	<0,001

Kappa Index Values: <0 = No agreement; 0 to 0.19 = Poor agreement; 0.20 to 0.39 = Slight agreement; 0.40 to 0.59 = Moderate agreement; 0.60 to 0.79 = Substantive agreement; 0.80 to 1.00 = Almost perfect agreement.

Table 3. Inter-rater and intra-rater reliability values according to the Scarf Sign, applied to newborns and infants hospitalized in an Intermediate Care Unit in Salvador-BA, 2019 – 2020

Variables	Inter-evaluator reliability		Intra-evaluator reliability	
	Kappa	p-value	Kappa	p-value
Scarf sign: upper right limb	0,42	0,004	0,84	<0,001
Scarf sign: Upper left limb	0,35	0,015	0,84	<0,001

Kappa Index Values: <0 = No agreement; 0 to 0.19 = Poor agreement; 0.20 to 0.39 = Slight agreement; 0.40 to 0.59 = Moderate agreement; 0.60 to 0.79 = Substantive agreement; 0.80 to 1.00 = Almost perfect agreement.

Table 4. Inter-rater and intra-rater reliability values of the second measurement points on the scapulae, applied to newborns and infants hospitalized in an Intermediate Care Unit in Salvador-BA, 2019 – 2020

Variables	Inter-evaluator reliability		Intra-evaluator reliability	
	ICI	p-value	ICI	p-value
Head rotated to the right (cm)				
Upper left medial border	0,85	<0,001	0,98	<0,001
Upper right medial border	0,85	<0,001	0,97	<0,001
Lower left medial border	0,88	<0,001	0,98	<0,001
Lower right medial border	0,87	<0,001	0,97	<0,001
Head rotated to the left (cm)				
Upper left medial border	0,81	<0,001	0,98	<0,001
Upper right medial border	0,85	<0,001	0,98	<0,001
Lower left medial border	0,87	<0,001	0,97	<0,001
Lower right medial border	0,89	<0,001	0,95	<0,001

ICI = Intraclass Correlation Index.
ICI values: < 0.5 = Bad reliability; From 0.5 to 0.75 = Moderate reliability; From 0.75 to 0.90 = Good reliability; > 0.90 = Excellent reliability.[15]

Discussion

The results presented confirm that, in the population of newborns and infants, instruments for assessing shoulder girdle retraction have very high intra-examiner reliability. In the inter-examiner assessment, among the items that could be analyzed, agreement ranging from mild to moderate was observed, which may be due to the difference in experience between professionals. The protocol of scapular measurement points, in turn, proved to be a highly reliable tool in the evaluation of suggestive signs of shoulder blades girdle retraction, obtaining good inter-examiner reliability and excellent intra-examiner reliability.

No studies were found in the literature evaluating the reliability of methods that identify suggestive signs of shoulder girdle retraction in newborns and infants. Studies related to this theme have prioritized describing this postural change and identifying the possible causes to avoid behaviors that contribute to the appearance of shoulder girdle retraction in children.[1,7,16]

Lessa[1] described a high-risk postural profile for shoulder blade girdle retraction, in which children with neck hyperextension, shoulder elevation, decreased arm movements in the midline, and upper body hyperextension, among others, evolved with blockage of mobility in the regions from the shoulders. Tecklin[16] highlighted that babies kept for long periods on mechanical ventilation may present these postural changes. This highlights the importance of observing these signs in the daily routine of NICUs, to identifying as early as possible the possible suggestive signs of retraction of the shoulder blades, enabling the timely treatment of these children. In the study by Gomes et al.[10], the evaluation of these signs during the period of hospitalization of newborns showed that children who showed suggestive signs of retraction of the shoulder girdle had adduction of the shoulder blades as a clinical sign.

In the present study, the observation of these clinical signs, through the biomechanical inspection protocol for suggestive signs of shoulder girdle retraction, proved to be evaluator-dependent. Intra-examiner reliability was considered substantive to almost perfect in the case of a more experienced professional. On the other hand, the inter-examiner reliability obtained mild to moderate reliability in cervical hyperextension and shoulder blades adduction, and, thus, it shows that the observation of these signs may vary according to the professional's experience, which, in this case, are an undergraduate student and a physical therapist.

The scarf sign obtained mild to moderate inter-examiner reliability and almost perfect intra-examiner reliability, also showing itself to be dependent on the evaluator's experience, given that the results found in the reevaluation of the most experienced professional were maintained. Gomes et al.[10] used this method to assess the frequency of suggestive signs of scapular girdle retraction in NBs admitted to an ICU and observed a relationship between the positive scarf sign and hypertonia in children identified with suggestive signs of shoulder blade girdle retraction.

Learning to assess a patient using any systematic method is a skill that requires practice over time.[9] The professional's experience performing the scarf sign maneuver can be an important factor in obtaining this data, given the need for handling the child during the procedure. In addition, in the case of a hospital environment, where children are exposed to stimulation and handling routine that can generate discomfort and stress, the change in the inter-examiner results can also be justified by the fact that the evaluations took place successively, increasing the time in which the child was being handled, a fact that did not occur in the second evaluation by the more experienced professional, repeated after 24 hours.

The assessment of shoulder blades measurement points in this study, proved to be a highly reliable tool, with good inter-examiner reliability and excellent intra-examiner reliability, meeting the reproducibility criteria both by an experienced evaluator, a physical therapist and by a less experienced evaluator, a graduation student. The study by Gomes et al.[10] used this method to detect suggestive signs of shoulder blades girdle retraction in newborns and observed a progressive reduction in measurements of the lower-left edge of the shoulder blades throughout the hospitalization period in children identified with this postural change.

Despite the high reliability found, it should be considered that, as this is a neonatal population, the values of the shoulder blades' measurement points naturally fall within a small metric scale. In this way, the high reliability can be attributed to the

minimum variation of the values, considering that the statistical method used to evaluate the reliability of the measurement points of the shoulder blades does not have a millimeter precision capable of efficiently identifying the small differences between the evaluations. The more specific the method used in the evaluation, the greater the potential to detect changes in the early stages, however, the training of professionals to apply the method must be more rigorous to obtain better reliability indexes.[17]

Resources such as software with digitized photography can be an alternative to increase the accuracy of the results regarding the measurement points of the shoulder blades in relation to the spine, standardizing the evaluation. Thus, this would not be performed exclusively from the evaluator's observation, making the method more reliable, in addition to allowing the recording image of the data.

We emphasize that convenience sampling and the small sample size, which made it impossible to analyze some variables present in the biomechanical inspection protocol, are important limitations in the study. For that reason, the results of the inferential analysis should be interpreted with caution. The scarcity of studies on this topic is also an important limitation, as there are no definitions of reference values that classify these postural changes.

Despite the limitations pointed out, the relevance of this research lies in promoting discussions about the identification and monitoring of suggestive signs of shoulder girdle retraction in children requiring hospitalization. It is expected that the results found can contribute to professionals working in neonatal units, helping to detect and evaluate postural changes that can be caused by prolonged hospitalization, and also encourage future research on the subject.

Although retraction of the shoulder girdle is a postural alteration quite observed in the clinical practice of the physical therapist in the follow-up of children submitted to hospital admission, is still a rarely addressed topic in the literature. Therefore, future research should explore this topic, producing

and refining instruments to assess shoulder girdle retraction in the neonatal population to reduce biases in the assessment of clinical signs. The use of standardized methods is extremely important for the early identification of these alterations, allowing timely intervention to reduce the possible impacts on the neuropsychomotor development of children undergoing hospitalization.

Conclusion

The results of the present study allow us to conclude that the evaluation of suggestive signs of shoulder blade girdle retraction in newborns and infants has high intra-examiner reliability and moderate inter-examiner reliability. Assessments that require more handling by the child, such as the scarf sign, were more compromised, potentially due to the difference in the experience of the evaluators. However, the observation of clinical signs through a protocol and the measurement of simple measures of the distance between the shoulder blades obtained good inter-examiner agreement and may be an alternative to standardizing the assessment of different professionals with different levels of expertise.

Authors' contributions

Santos LSF and Albergaria TFS participated in the idealization and design of the research, data collection, interpretation of results, writing and review of the research and contributions to the final version of the scientific article. Villa Flor CJDR helped with the idealization and design of the research, review and contribution to the final version. Pinto Junior EP and Pedreira RBS participated in the research design, statistical analysis of research data, interpretation of results, review and contributed to the final version.

Competing interests

No financial, legal or political conflicts involving third parties (government, companies and private foundations, etc.) were declared for any aspect of the submitted work (including, but not limited to grants and funding, participation in an advisory board, study design, preparation manuscript, statistical analysis, etc.).

References

1. Lessa NMC. Avaliação do desenvolvimento postural e do desempenho motor em crianças de 4 a 6 anos de idade nascidas prematuras: visão fisiterapêutica [dissertação] [Internet]. Rio de Janeiro: Instituto Fernandes Figueira, Fundação Oswaldo Cruz; 2006. Available from: https://www.arca.fiocruz.br/handle/icict/3495

2. Toso BRGO, Viera CS, Valter JM, Delatore S, Barreto GMS. Validation of Newborn positioning protocol in Intensive Care Unit. Rev Bras Enferm. 2015;68(6):835-41. https://doi.org/10.1590/0034-7167.2015680621i

3. Moreira EG, Grave MTQ. Avaliação do desenvolvimento motor de crianças prematuras nascidas em uma pequena cidade do do Vale do Rio dos Sinos. Revista Destaques Acadêmicos [Internet]. 2014;6(3):64-71. Available from: http://www.univates.br/revistas/index.php/destaques/article/view/416

4. Lanza FC, Gazzoti MR, Palazzin A. Fisioterapia em Pediatria e Neonatologia da UTI ao Ambulatório. São Paulo: Editora Manole; 2012.

5. Prado C, Vale LA. Fisioterapia Neonatal e Pediátrica. São Paulo: Editora Manole; 2012.

6. Moreira AMNM. A intervenção precoce em recém-nascidos pré-termo: o posicionamento, a correcção postural e neuromuscular [dissertação] [Internet]. Porto: Universidade do Porto; 2004. Available from: https://hdl.handle.net/10216/23342

7. Groot L. Posture and Mobility in preterm infants. Developmental Medicine & Child Neurology. 2000;42(1):65-8. https://doi.org/10.1111/j.1469-8749.2000.tb00028.x

8. Oliveira MP, Melo MFA, Sá SMP. Retração Escapular e RN prematuros Sob Ventiação Mecânica Invasiva: Relato de Caso. Anais da XII Mostra Científica e Cultural da Bahiana; 2012; Salvador, BA.

9. Johansen K, Persson K, Sonnander K, Magnusson M, Sarkadi A, Lucas S. Clinical utility of the Structured Observation of Motor Performance in Infants Within the child health services. PLOS ONE. 2017;12(7):e0181398. https://doi.org/10.1371/journal.pone.0181398

10. Gomes JS, Albergaria TFS, Flor CJDRV, Pinto Júnior EP, Gomes IML. Scapular waist retraction in newborns admitted to an Intermediate Care Unit. Rev Pesqui Fisioter. 2021;11(1):96-105. https://doi.org/10.17267/2238-2704rpf.v11i1.3369

11. Amiel-Tison C. A method for neurologic evaluation within the first year of life. Curr Probl Pediatr. 1976;7(1):1-50. Cited: PMID: 975863.

12. Georgieff MK, Bernbaum JC. Abnormal shoulder girdle muscle tone in premature infants during their first 18 months of life. Pediatrics. 1986;77(5):664-9. Cited: PMID: 3703633.

13. Leksulchai R, Cole J. Scarf ratio: A method of measuring the Scarf Sign in preterm born infants. Aust J Physiother. 2000;46(2):85-90. https://doi.org/10.1016/s0004-9514(14)60316-0

14. Silva RS, Paes AT. Teste de concordância Kappa. Einsten: Educ Contin Saúde [Internet]. 2012;10(4):165-6. Available from: http://apps.einstein.br/revista/arquivos/PDF/2715-165-166.pdf

15. Terry KK, Mae YL. A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. J Chiropr Med. 2016;15(2):155–63. https://doi.org/10.1016/j.jcm.2016.02.012

16. Tecklin JS. A criança de alto risco. In: Fisioterapia pediátrica. Porto Alegre: Artmed; 2002. p.69-96.

17. Boyd EA, Torrance GM. Clinical measures of shoulder subluxation: their reliability. Can J Public Health. 1992;83 (Suppl 2):S24-8. Cited: PMID: 1468045.