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Research article

Correlation between the Borg score, static disorders, and general symptomatology in patients with chronic dyspnea

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Abstract: Chronic dyspnea, as a clinical symptom, may be present in several pulmonary diseases and cardiologic diseases, as well as anemia, loss of physical fitness, or anxiety. Any musculoskeletal disorder has a negative impact on the quality of life and adaptation to exertion, both of which are crucial for autonomy and reintegration into society, as well as for enhancing the quality of life of patients with chronic dyspnea. The objective of this study is to comparatively evaluate the demographic data, the symptomatology associated with chronic dyspnea, and the anthropometric data of the patients concerning the level of dyspnea assessed with the Borg scale, based on the hypothesis that the intensity of chronic dyspnea is associated with increasing age and with a higher number of comorbidities. We conducted a cross-sectional study from January 1, 2021, to June 30, 2022, which included 146 patients with chronic dyspnea of various causes, divided into three groups based on the Borg dyspnea score value. Data analysis suggests a higher prevalence of chronic dyspnea among men; more than 80% of patients in the Borg score 1 and 2 groups are younger than 60 years of age, while the majority of patients in Borg score 3 group (85.45%) are older than 61 years, with significant differences between groups. The number of associated diseases and musculoskeletal disorders is >3 in the Borg score 3 group. Increased dyspnea is associated with a higher number of comorbidities, including musculoskeletal disorders. Also, elderly patients with moderate dyspnea more frequently manifest associated clinical symptoms compared to those with mild dyspnea, thus highlighting the impact of dyspnea severity on overall health.

Keywords: chronic dyspnea, postural and musculoskeletal imbalances, Borg score

1. Introduction

Dyspnea refers to respiratory discomfort and is characterized as a qualitative symptom with varying intensity [1]. A patient experiencing dyspnea due to an underlying condition that lasts between 4 and 8 weeks can be classified as having chronic dyspnea. The causes of dyspnea can vary widely, encompassing pulmonary and cardiac issues, as well as other factors such as anemia or anxiety. It is not uncommon for dyspnea to arise from a combination of these conditions [2]. As a manifestation of impaired cardiorespiratory function, dyspnea may also be observed in patients with musculoskeletal dysfunction [3]. This can negatively impact their exercise

tolerance, hinder their ability to perform occupational tasks, and ultimately diminish their quality of life [4]. The repercussions extend to both personal and professional aspects of the patient's life.

Musculoskeletal conditions have a significant impact on a patient's quality of life through pain, frailty, and disability. Osteoarthritis and back pain are among the most common causes of disability globally. The association with comorbidities and multimorbidities, such as cardiovascular, metabolic, obesity, non-neurological conditions, and mental health problems, means that these musculoskeletal conditions place increasing pressure on personal independence [5]. Regardless of musculoskeletal comorbidities, patients with cardiopulmonary diseases lead a predominantly sedentary life involving prolonged static postures with postural and muscle imbalances that ultimately target the respiratory muscles, which are also postural muscles. We can anticipate that a postural and muscle balance re-equilibration, together with effective respiratory training, would have favorable effects in patients with cardiorespiratory diseases with mild and mild forms of the disease [6].

There is an international concern for maintaining the functional independence of patients with chronic dyspnea, which would significantly reduce socio-economic and personal costs. Dyspnea of cardio-pulmonary origin associated with musculoskeletal co-morbidities has a negative impact on the patient's quality of life, so remedial treatment, through its effect on physical capacity and risk factors, can bring a definite long-term benefit, with positive professional, social, family and psychological consequences [7].

Cardiorespiratory and musculoskeletal rehabilitation is a multidisciplinary program and has as its main objective the prevention of physical deconditioning over the limit imposed by basic suffering. The rehabilitation program considers the personal needs of every patient, sets long-term goals, and uses therapeutical methods to improve physical capacity, regaining autonomy and socio-professional reintegration, obtaining in this way an improvement in the quality of the patient's life [8]. The coexistence of a musculoskeletal imbalance implies adapting the recuperatory program, by re-educating the patient, physical rehabilitation, and reducing the risk factors [9], all of them leading to improvement in the physical and mental condition, with beneficial consequences over the patient's socio-professional and family life [10, 11].

The objective of the study is to comparatively evaluate the demographic data, the symptomatology associated with chronic dyspnea, and the patient's anthropometric data related to the level of dyspnea evaluated with the Borg scale, based on the hypothesis that the intensity of chronic dyspnea is associated with increasing age, with a higher number of comorbidities and musculoskeletal dysfunction.

2. Materials and Methods

2.1. Study Design

We conducted a cross-sectional study, which included a number of 146 patients, known to have chronic dyspnea of various causes, in which we followed the relationship between the degree of dyspnea, general symptoms, musculoskeletal dysfunction, and the presence of comorbidities. The study was conducted between 01.01.2021 and 30.06.2022, in the Medical Recovery Department of the Municipal Hospital Dr. Pop Mircea Marghita and Municipal Hospital Gavril Curteanu Oradea.

After applying the inclusion and exclusion criteria, the patients were divided into three groups according to the level of dyspnea assessed with the Borg scale (Figure 1).

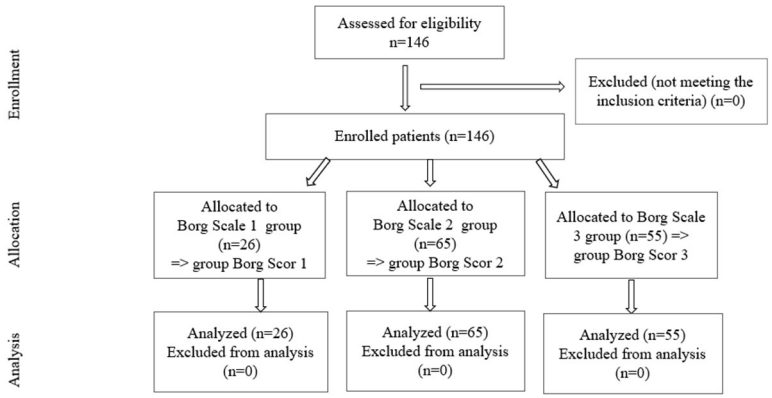


Figure 1. CONSORT flow diagram of the study

Inclusion/exclusion criteria

The patients included in the study were selected based on specific inclusion criteria, which primarily required the patient's consent to participate. We focused on patients with chronic cardiovascular, pulmonary, or other related diseases who complained of chronic dyspnea. Exclusion criteria included the following: dyspnea of psychogenic origin, the presence of comorbidities that contraindicated the treatment methods used in the study, acute heart failure from various causes, chest pain, significant peripheral edema, hemoptysis, rhythm disturbances, uncontrolled blood pressure, a score above 4 on the Borg score due to inability to participate in the assessments and training program.

2.2. Study tools

Associated symptoms, clinical manifestations, and additional information on their psychological and social status were monitored. The evaluation of patients involved several steps: first, an anamnesis was conducted where the patient described their sensations, respiratory discomfort, onset of symptoms, and how certain positions affected their dyspnea. Special attention was given to cardio-respiratory risk factors, along with information about any comorbidities and potential physical disabilities. We focused on the current symptoms and assessed the severity of dyspnea using the Borg scale. This was followed by a general clinical examination to rule out any acute pathologies. Additionally, we evaluated the musculoskeletal system, posture, and alignment, specifically looking for static disorders such as exaggerated thoracic kyphosis, forward head posture, and rounded shoulders, which may impact physical training.

To evaluate the patient's perception of effort related to dyspnea, the Modified Borg Scale was utilized (protocol dated April 22, 2021). The interpretation of dyspnea level is shown in Figure 2.

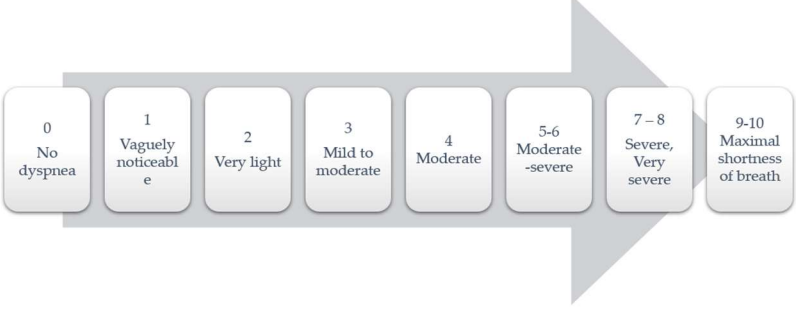


Figure 2. The interpretation of dyspnea level.

A questionnaire (Appendix A) was administered regarding the presence of clinical manifestations, namely: pain, anxiety, asthenia/fatigability. Measurements were performed at the level of the torachus (V intercostal level) during inspiration and expiration to assess thoracic expansion and spirometric measurements to determine obstructive, restrictive or mixed ventilatory dysfunction. Spirometry is a physiological test that assesses the maximum volume of air that a person can breathe in and out under maximum exertion. Spirometry was performed with a Contec SP10 Spirometer, according to ATS/ERS guidelines. The patients are informed not to smoke, not to do increased physical exertion one hour before the test, not to consume substances that may affect the understanding of the procedure (8 hours before), and to eat properly, in order not to limit the thoracic expansion. Spirometers that measure both inspiration and expiration require a well-coordinated FVC maneuver, which includes four phases essential for accurate results. The patient must perform a maximal inspiration, followed by a 'burst' of expiration, rapid and complete expiration, a maximum of 15 seconds, and then a final inspiration to return to maximal lung volume. However, the variability of results can be significantly influenced by factors such as inadequate inspiration, premature termination of expiration, and varying patient effort. These issues emphasize the importance of correct technique and effective collaboration between patient and specialist to ensure the most accurate measurements in assessing lung function [12].

1.3. Ethical Approval

The research received approval from the Ethics Commission of the County Hospital (Approval No. 4842/03.12.2020) and adheres to the Declaration of Helsinki established by the World Medical Association.

1.4. Statistical Analysis

IBM SPSS Statistics for Windows software, version 29.0, was used for statistical processing of the study data (Armonk, NY: IBM Corp). Nominal data were described as frequency and percentage and continuous variables as mean, and standard deviation. Differences between groups were assessed using the Student's t-test and Chi-square test, with a significance threshold of $p < 0.05$.

3. Results

3.1.General cohort characteristics

The average age of the patients in the study was 58.19 years, with a standard deviation of 7.58 years. 63.70% of the participants were male. The majority came from urban areas, accounting for 75.35% of the group. Over 50% of the patients evaluated are actively employed, representing 56.85% of the total. Approximately 60% of the subjects had an elevated body mass index. In terms of the ability to perform activities of daily living (ADL), the data analysis indicates that 8.90% of the recruited patients were dependent.

3.2. Distribution of cases by Borg score and age

The distribution by age groups in relation to the degree of dyspnea (Borg score) is summarized in Table 1. Data analysis suggests that more than 50% of patients belonging to the age group below 50 years have a Borg 1 score; those belonging to the age group 51-60 years have a Borg 2 score, in the percentage of about 65%, and those aged 61 years and above have a Borg 3 score in the percentage of 85%.

Table 1. Distribution of cases by Borg score and age.

Age	Borg Scor 1 (n=26)	Borg Scor 2 (n=65)	Borg Scor 3 (n=55)
	N (%)	N (%)	N (%)
<50 years	14 (53,85)	10 (15,38)	2 (3,64)
51-60 years	11 (42,31)	42 (64,62)	6 (10,91)
>61 years	1 (3,85)	13 (20,00)	47 (85,45)

The mean age was 64,25±5,26 years in patients with Borg score 3 (Figure 3), significantly higher than in those with Borg score 1 or Borg score 2 (50,54±5,80 years, diff=-13.710, 95%CI: -16.2855--11.1345, t= -10.596, df=79, p<0.001, respectively 56,14±5,83 years, dif=-8.110, 95%CI: -10.1332--6.0868, t= -7.938, df=118, p<0.001).

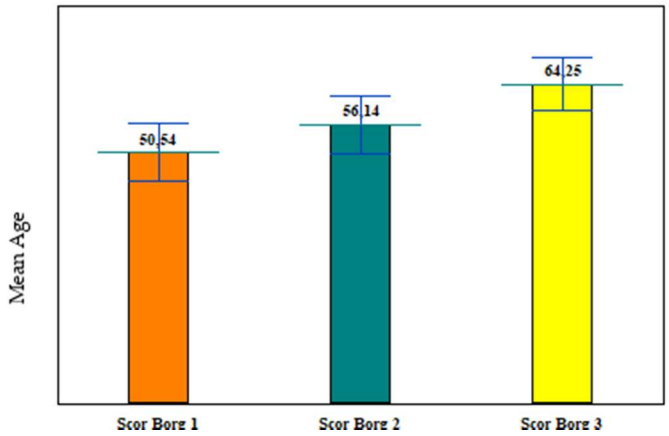


Figure 3. Distribution of cases by Borg score and age

3.3. Distribution of cases by Borg score and sex

Regardless of the severity of dyspnea, men predominated in our study group, the percentage being higher in patients with Borg Scor 1 (69.239%), a percentage not significantly higher than the percentages recorded in patients with Borg Scor 2 or Borg Scor 3 (61.54%, diff=7.69%, 95%CI: -14.3882%-26.4331%, $\chi 2$=0.470, p=0.493, respectively 63.64%, dif=5.59%, 95%CI: -16.7724%-25.0368%, $\chi 2$=0.241, p=0.624), results summarized in figure 4.

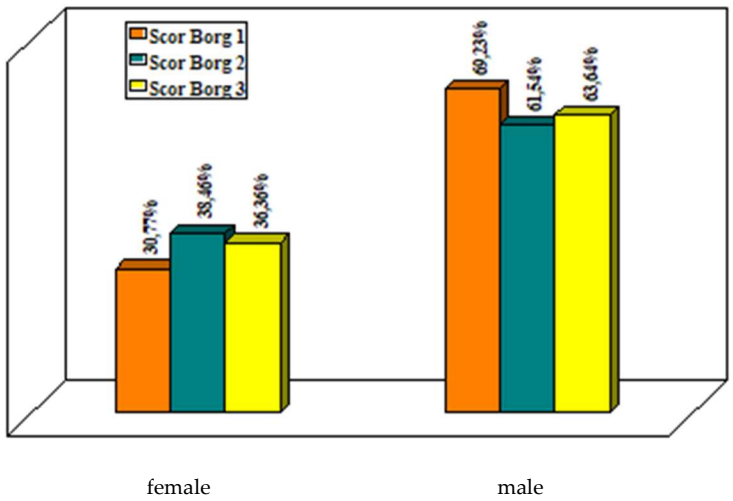


Figure 4. Distribution of cases by Borg score and sex.

3.4. Distribution of cases by Borg score and pathology associate

Regardless of the severity of dyspnea (table 2), pulmonary diseases were the most common, their prevalence being insignificantly higher in patients with Borg Scor 3 (70.91%) than in those with Borg Scor 1 (61.54%, dif=9.37%, 95%CI: -11.3022%-30.9948%, $\chi2$=0.702, p=0.402) and significantly higher than those with Borg Scor 2 (53.85%, dif=17.06%, 95%CI: -0.3757%-32.8816%, $\chi2$=3.637, p=0.057).

Table 2. Distribution of cases according to Borg score and associated pathology

Associated pathology	Borg Scor 1 (Nt=26)	Borg Scor 2 (Nt =65)	Borg Scor 3 (Nt =55)
	N (%)	N (%)	N (%)
Cardiac	6 (23,08)	19 (29,23)	34 (61,82)
Digestive	5 (19,23)	22 (33,85)	29 (52,73)
Heamatological	1 (3,85)	6 (9,23)	9 (16,36)
Metabolic	2 (7,69)	18 (27,69)	29 (52,73)
Neurological	2 (7,69)	10 (15,38)	24 (43,64)
Obesity	10 (38,46)	20 (30,77)	16 (29,09)
Pulmonary	16 (61,54)	35 (53,85)	39 (70,91)
Rheumatology	1 (3,85)	11 (16,92)	2 (3,64)

Nt – total number of patients in group, N – number of patients

Table 3 suggests the number of associated diseases; data analysis suggests that more than 75% of patients in the Borg score 3 group have 3 or more associated comorbidities.

The highest mean number of associated diseases was recorded in patients with Borg Scor 3 (3.40), insignificantly higher than in those with Borg Scor 1 and Borg Scor 2 (1.77, dif=-1.630, 95%CI: -2.1077--1.1523, t= -6.791, df=79, p<0.001, respectively 2.22, dif=-1.180, 95%CI: -1.5080--0.8520, t= -7.123, df=118, p<0.001).

Table 3. Distribution of cases according to Borg score and number of associated diseases

No. of associated diseases	Borg Scor 1 (n=26)	Borg Scor 2 (n=65)	Borg Scor 3 (n=55)
	N (%)	N (%)	N (%)
1	9 (34,62)	6 (9,23)	2 (3,64)
2	15 (57,69)	42 (64,62)	11 (20,00)
≥3	2 (7,70)	17 (26,16)	42 (76,36)
Nr. medium	1,77±0,71	2,22±0,67	3,40±1,12

3.4. Distribution of cases by Borg score and associated symptoms

Table 4 summarizes the clinical manifestations reported by the patients included in the study. Sleep disorders had a prevalence of 69.23% in patients with Borg Scor 1, a percentage not significantly higher than in patients with Borg Scor 2 (55.38%, diff=13.85%, 95%CI: -8.5193%-32.5235%, $\chi2$=1.460, p=0.227, but significantly higher than those with Borg Scor 3 (45.45%, dif=23.78%, 95%CI: 0.5643%-42.7024%, $\chi2$=3.959, p=0.047). Asthenia/fatigue had a prevalence of 87.27% in patients with Borg Scor 3, significantly higher than in patients with Borg Scor 1 or Borg Scor 2 (19.23%, diff=68.04%, 95%CI: 46.2427%-80.5404%, $\chi2$=35.687, p<0.001, respectively 64.62%, dif=22.65%, 95%CI: 7.2260%-36.3851%, $\chi2$=8.084, p=0.005). Anxiety recorded the highest prevalence, regardless of the severity of dyspnea, the maximum prevalence being 92.73% in patients with Borg Scor 3, not significantly higher than in patients with Borg Scor 1 (88.46%, dif=4.27%, 95%CI: -8.2407%-22.2561%, $\chi2$=0.403, p=0.526), but significantly higher than in patients with Borg Scor 2 (78.46%, dif=14.27%, 95%CI: 1.3153%-26.5186%, $\chi2$=4.719, p=0.030).

Pain was reported by 94.55% of patients with Borg Scor 3, significantly higher than in patients with Borg Scor 1 and Borg Scor 2 (30.77%, dif=63.78%, 95%CI: 42.3867%-78.4904%, $\chi2$=36.937, p<0.001, respectively 60.00%, dif=34.55%, 95%CI: 20.0615%-47.2107%, $\chi2$=19.244, p<0.001). As in the case of pain, the prevalence of musculoskeletal dysfunction was higher in patients with Borg Scor 3 (65.45%), significantly higher than in patients with Borg Scor 1 or Borg Scor 2 (19.23%, diff=46.22%, 95%CI: 23.3747%-61.7139%, $\chi2$=14.902, p<0.001, respectively 40.00%, dif=25.45%, 95%CI: 7.5130%-41.1562%, $\chi2$=7.663, p=0.006).

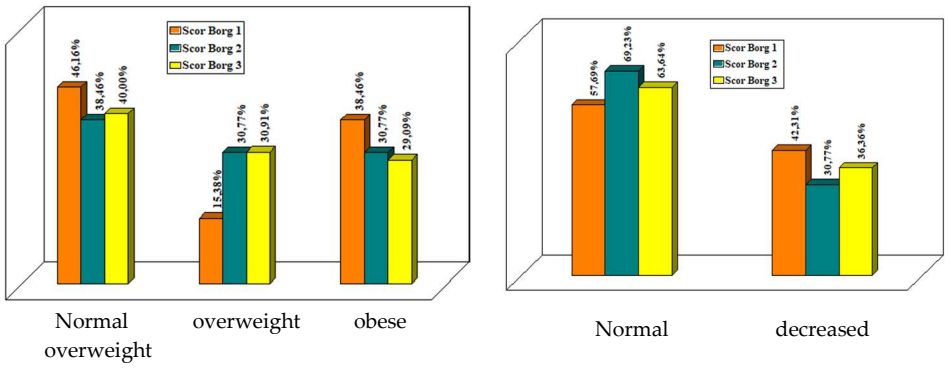
Most cases without locomotor symptoms were found in patients with Borg Scor 1 (61.54%), significantly higher than in patients with Borg Scor 2 or Borg Scor 3 (26.15%, dif=35.39%, 95%CI: 13.0226%-53.8425%, $\chi2$=9.953, p=0.002, respectively 3.64%, dif=57.90%, 95%CI: 37.0042%-74.1478%, $\chi2$=33.817, p<0.001).

Table 4. Distribution of cases according to Borg Score and symptomatology

Symptomatology	**Borg Scor 1 (n=26)**		**Borg Scor 2 (n=65)**		**Borg Scor 3 (n=55)**	
	N	**%**	**N**	**%**	**N**	**%**
General symptoms						
Sleep disorders	18	69,23	36	55,38	25	45,45
Asthenia/fatigue	5	19,23	42	64,62	48	87,27
Anxiety	23	88,46	51	78,46	51	92,73
Locomotor symptoms						
Pain	8	30,77	39	60,00	52	94,55
Musculoskeletal disorders	5	19,23	26	40,00	36	65,45
Without	16	61,54	17	26,15	2	3,64

3.5. Distribution of cases by Borg score and anthropometric indices

In patients with Borg Scor 1, normal weight accounted for 46.16% (figure 4a), not significantly higher than those with Borg Scor 2 or Borg Scor 3 (38.46%, dif=7.70%, 95%CI: -13.5238%-29.0584%, $\chi2$=0.451, p=0.502, respectively 40.00%, dif=6.16%, 95%CI: -15.6717%-28.0523%, $\chi2$=0.272, p=0.602). The prevalence of obesity was 38.46% in patients with Borg Scor 1, not significantly higher than those with Borg Scor 2 or Borg Scor 3 (30.77%, diff=7.69%, 95%CI: -12.3532%-29.1096%, $\chi2$=0.492, p=0.483, respectively 30.77%, dif=9.37%, 95%CI: -11.3022%-30.9948%, $\chi2$=0.702, p=0.402). 42.31% of patients with Borg Scor 1 had decreased respiratory thoracic expansion (Figure 4b), a percentage not significantly higher than in patients with Borg Scor 2 or Borg Scor 3 (30.77%, dif=11.54%, 95%CI: -9.0926%-32.7291%, $\chi2$=1.089, p=0.297, respectively 36.36%, dif=5.95%, 95%CI: -15.3952%-27.9050%, $\chi2$=0.261, p=0.609).



a. b.

Figure 4. a. Distribution of cases according to Borg Scor and weight status; b. Distribution of cases according to Borg Scor and respiratory thoracic expansion.

Spirometry (Table 5) determined normal values in 80.77% of patients with Borg Scor 1, significantly higher than in patients with Borg Scor 2 or Borg Scor 3 (40.00%, dif=40%, 95%CI: 17.6827%-55.5763%, $\chi2$=11.765, p<0.001, respectively 16.36%, dif=63.64%, 95%CI: 41.4548%-76.9577%, $\chi2$=30.368, p<0.001). The restrictive syndrome was recorded in 29.09% of patients with Borg Scor 3, significantly higher than in patients with Borg Scor 1 and Borg Scor 2 (3.85%, dif=25.24%, 95%CI: 6.9932%-38.6685%, $\chi2$=6.698, p=0.010, respectively 13.85%, dif=15.24%, 95%CI: 0.5729%-29.7695%, $\chi2$=4.160, p=0.041). Obstructive syndrome was recorded in 40.00% of patients with Borg Scor 2 and Borg Scor 3, significantly higher than in patients with Borg Scor 1 (15.38%, dif=24.62%, 95% CI: 2.9303%-40.7180%, $\chi2$=4.849, p=0.028). The mixed syndrome was recorded only in patients with Borg Scor 2 and Borg Scor 3, the percentage being insignificantly higher than in patients with Borg Scor 3 (14.55% vs 6.15%, diff=8.40%, 95% CI: -2.7019%-20.6014%, $\chi2$=2.316, p=0.128).

Table 5. Distribution of cases according to Borg Score and spirometric evaluation

Spirometric evaluation	Borg Scor 1 (n=26)		Borg Scor 2 (n=65)		Borg Scor 3 (n=55)	
	N	%	N	%	N	%
Normal	21	80,77	26	40,00	9	16,36
Restrictive syndrome	1	3,85	9	13,85	16	29,09
Obstructive syndrome	4	15,38	26	40,00	22	40,00
Mixed syndrome	0	0,00	4	6,15	8	14,55

3.6. Distribution of cases by Borg score and causes of dyspnea

Pulmonary dyspnea was determined in 70.91% of patients with Borg Scor 3 (table 6), the percentage being insignificantly higher compared to the percentage of patients assigned to group 1 (Borg Scor 1), p=0.402, but significantly higher than in patients assigned to group 2 (Borg Scor 2), p=0.057. Cardiac dyspnea was also recorded in patients with Borg Scor 3 (21.82%), the percentage being insignificantly higher than in cases with Borg Scor 1 or Borg Scor 2 (7.69%, diff=14.13%, 95%CI: -4.5590%-27.8565%, $\chi2$=2.435, p=0.119, respectively 13.85%, dif=7.97%, 95%CI: -5.7177%-22.0541%, $\chi2$=1.300, p=0.254). Other causes of dyspnea were recorded in 32.31% of patients with Borg Scor 2, a percentage not significantly higher than in patients with Borg Scor 1 (30.77%, dif=1.54%, 95%CI: -20.1732%-20.2340%, $\chi2$=0.020, p=0.887), but significantly higher than in patients with Borg Scor 3 (7.27%, dif=25.04%, 95%CI: 10.8336%-37.8973%, $\chi2$=11.231, p<0.001).

Table 6. Distribution of cases according to Borg Scor and causes of dyspnea

Causes of dyspnea	Borg Scor 1 (n=26)		Borg Scor2 (n=65)		Borg Scor 3 (n=55)	
	Nr.	%	Nr.	%	Nr.	%
Pulmonary	16	61,54	35	53,85	39	70,91
Cardiac	2	7,69	9	13,85	12	21,82
Others	8	30,77	21	32,31	4	7,27

3.6. Musculoskeletal pathology associated with apathetics with chronic dyspnea

Table 7 suggests the musculoskeletal disorders identified at clinical examination of the patients included in the study. Head protraction was recorded in 43.64% of patients with Borg Scor 3, a percentage not significantly higher than in those with Borg Scor 1, but significantly higher in those with Borg Scor 2 (34.62% diff=9.02%, 95%CI: -13.7318%-29.0852%, $\chi2$=0.588, p=0.443, respectively 38.46%, dif=5.18%, 95%CI: -12.0860%-22.1954%, $\chi2$=0.328, p=0.567). The highest percentage of patients with thoracic kyphosis was recorded in 80.77% of patients with Borg Scor 1, a percentage not significantly higher than in patients with Borg Scor 2 or Borg Scor 3

(61.54%, dif=19.23%, 95%CI: -2.3508%-35.4386%, $\chi2$=3.074, p=0.080, respectively (56.36%, dif=24.41%, 95%CI: 2.0932%-41.3344%, $\chi2$=4.520, p=0.034).

Regardless of the severity of dyspnea, muscle contractions were the most common (80-89%). The highest prevalence of muscle contractions was recorded in patients with Borg Scor 2 (89.22%), a percentage not significantly higher than in patients with Borg Scor 1 and Borg Scor 3 (88.46%, diff=0.76%, 95%CI: -11.6297%-19.0318%, $\chi2$=0.011, p=0.917, respectively 80.01%, dif=9.21%, 95%CI: -3.7530%-22.7246%, $\chi2$=1.965, p=0.161). The most frequent localization of muscle contractions was recorded at the level of the upper trapezius, regardless of the severity of dyspnea, the highest percentage being recorded in patients with Borg Scor 1 (88.46%), a percentage not significantly higher than in patients with Borg Scor 2 or Borg Scor 3 (78.45%, diff=10.01%, 95%CI: -9.2826%-23.7000%, $\chi2$=1.211, p=0.271, respectively (69.10%, dif=19.36%, 95%CI: -1.0599%-34.4896%, $\chi2$=3.515, p=0.061).

Table 7. Prevalence of Vertebral Static Disorders by Borg Scor

Musculoskeletal disorders	**Borg Scor 1 (n=26)**		**Borg Scor 2 (n=65)**		**Borg Scor 3 (n=55)**	
	Nr.	**%**	**Nr.**	**%**	**Nr.**	**%**
Static disorders						
Head protraction	9	34,62	25	38,46	24	43,64
Thoracic kyphosis	21	80,77	40	61,54	31	56,36
Muscle contractures	23	88,46	58	89,22	44	80,01
Pectoralis major	14	53,84	37	56,92	27	49,10
Upper trapezius	23	88,46	51	78,45	38	69,10
Lower trapezius	16	61,54	37	56,92	24	43,64
Sternocleidomastoid	10	38,46	19	29,23	8	14,55

Table 8 suggests the distribution according to the number of associated musculoskele tal disorders. Most cases without vertebral static disorders were recorded in patients with Borg Scor 3 (18.18%), a percentage not significantly higher than in those with Borg Scor 1 or Borg Scor 2 (11.54%, dif=3.63%, 95%CI: -16.4660%-16.0324%, $\chi2$=0.179, p=0.673, respectively 10.77%, dif=10.61%, 95%CI: -4.3284%-20.6450%, $\chi2$=2.263, p=0.133). The association of the 3 vertebral statistic disorders was recorded in 41.82% of patients with Borg Scor 3, the percentage is significantly higher than in patients with Borg Scor 1 (34.62%, dif=28.69%, 95%CI: 9.1273%-46.0205%, $\chi2$=8.497, p=0.004), but not significantly higher than with Borg Scor 2 (33.85%, dif=18.45%, 95%CI: -7.7141%-41.2261%, $\chi2$=1.813, p=0.178).

Table 8. Distribution of cases according to the number of associated static disorders

Number of associated static disorders	Borg Scor **1 (n=26)**		Borg Scor **2 (n=65)**		Borg Scor **3 (n=55)**	
	Nr.	**%**	**Nr.**	**%**	**Nr.**	**%**
No static disturbances	3	11,54	7	10,77	10	18,18
1 static disorder	2	7,69	15	23,08	14	25,45
2 static disorders	12	46,15	21	32,31	8	14,55
3 static disorders	9	34,62	22	33,85	23	41,82

4. Discussion

Dyspnea is a complex, unpleasant, and subjective respiratory symptom in which the individual perceives an increased difficulty in the breathing process [13]; it is frequently encountered in medical practice, with significant implications for patient health [14]. It can be associated with various conditions [15]; most commonly associated with heart and lung disease [16], being an important predictor of mortality. The correct assessment of dyspnea requires a systematic approach, starting with a detailed medical history and rigorous physical examination, followed by appropriate diagnostic tests. Implementation of a staged testing protocol, including laboratory

tests and imaging investigations, is essential to identify the underlying causes and to develop an effective treatment plan [2].

In this study, chronic dyspnea of pulmonary cause predominates in all three study groups, similar to the data published by S Kotlyarov et al. (2019, n= 3621). In the same study, the higher prevalence of dyspnea in women is supported [14, 17], invoking the particularity of their hormonal status. However, in our study, male patients predominated (63.70%), which can be explained by the particularity of the cohort evaluated (patients who were referred to the medical rehabilitation office, and who had associated musculoskeletal pathology). High BMI is considered a risk factor for dyspnea, being found in our study in about 60% of the patients.

The mean age of the recruited patients was 58.19±7.58. In the study, the mean age increased in proportion to the degree of dyspnea; thus the mean age was 64.25 years in patients with Borg Scor 3, significantly higher than in those with Borg Scor 1 or Borg Scor 2 (50.54 years, $p<0.001$, respectively 56.14 years, $p<0.001$). The increase with age in the prevalence of dyspnea is also supported by other authors [14, 17].

The study published by I Naz (2022, n=47) suggests that patients with chronic obstructive pulmonary disease (COPD) have significant postural changes, including increased thoracic and lumbar curvatures and decreased thoracic mobility. These postural changes are associated with increased severity of dyspnea and reduced lung function, as reflected by parameters such as forced expiratory volume and forced vital capacity. Also, COPD patients adopt compensatory postural strategies under dynamic conditions to maintain stability, suggesting a complex interaction between posture and respiratory function [18]. In our study, more than 80% of paravertebral muscle contractures were identified, regardless of the study group. The most affected muscle was the upper trapezius muscle. In terms of vertebral static disorders, the most frequently encountered were accentuated thoracic kyphosis and head protraction.

Previous research has highlighted a variety of factors associated with chronic neck pain, including decreased muscle strength, muscle fatigue, limited mobility, abnormal head posture, and proprioceptive disturbances. Perry's study et al. (2004) confirmed a correlation between breathing impairment and musculoskeletal pain [19]. The pilot study published by E Kapreli et al. (2009) showed a significant correlation between anterior head posture and decreased respiratory muscle strength in patients with cervical disorders. These findings suggest that biomechanical changes in the cervicothoracic region, together with alterations in the force-length ratio of the muscles, play a key role in influencing respiratory performance. Therefore, therapeutic approaches aimed at correcting posture and optimizing muscle function could have a beneficial impact on the respiratory capacity of these patients [20].

The number of musculoskeletal disorders increases with the degree of dyspnea. These findings emphasize the importance of postural assessment in the management of patients with chronic dyspnea, given its impact on patients' quality of life and functional capacity [18].

The male predominance determined in our study could be explained by the significantly higher percentage of chronic dyspnea of pulmonary etiology. COPD has been perceived mainly as a male-specific condition, but this is largely based on the fact that more men smoke regularly than women [21].

The etiology of pain in COPD is complex and multifactorial, underlying pulmonary and extrapulmonary pathophysiologic mechanisms. Pain is related to musculoskeletal disorders and spinal deformities, while fatigue can be considered as a result of pathological changes at the pulmonary level. These symptoms interact in a way that suggests the activation of common brain networks, which may lead to altered

pain perception and difficulty in discriminating noxious stimuli. Correlations between fatigue, dyspnoea, and pain have also been observed in COPD patients as well as in other medical conditions, indicating a possible association between these symptoms. The study published by Y. W. Chen et al. (2018) carried out on COPD patients suggest an increased incidence of fatigue and pain in these patients in high percentages (77% and 74%, respectively) [22]. In our study, asthenia and pain are present in similar percentages (more than 65%, respectively 68%), with an increase proportional to the degree of dyspnea.

A number of cross-sectional studies show a significant link between respiratory symptoms and anxiety and depression. The results suggest that there is a causal relationship between the occurrence of symptoms of anxiety, depression, and dyspnoea, emphasizing the importance of psychological state in the assessment and management of patients with respiratory problems [23, 24]. In agreement with these studies, our study suggests the presence of anxiety in more than 85% of the patients included in the study, its incidence increasing proportionally with the intensity of dyspnea; it is present in 92.73% of patients in Borg Score 3 group, significantly higher than in Borg Score 2 group (p=0.030).

5. Conclusions

Increased dyspnea is associated with a greater number of comorbidities, including musculoskeletal conditions. Elderly patients with moderate dyspnea also manifest associated clinical symptoms more frequently compared to those with mild dyspnea, thus highlighting the impact of dyspnea severity on overall health.

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