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ORIGINAL ARTICLE

Frequency of Hypomagnesemia in Patients with Chronic Obstructive Pulmonary Disease (COPD)

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ABSTRACT

Objective: The purpose of this study is to assess the prevalence of hypomagnesemia among COPD patients (COPD).
Study design: A cross sectional study.
Place and duration of study: I have been offered a position in the Medicine & Pulmonology Department at Nishtar Hospital in Multan, Pakistan, which I will begin in March 2016 and remain in until February 2018.
Methodology: The non-probabilistic sequential sampling technique used to choose the final pool of 137 cases. Quantitative variables' means and standard deviations were determined. Quantitative evaluation included frequency counts and percentages for qualitative factors. Several effect modifiers have been taken into consideration via stratification, including age, diabetes, body mass index, COPD, high blood pressure, smoking, socioeconomic status, place of residence (race/ethnicity), and gender. A chi-square test for stratification was used to examine the data, and a P value of 0.05 was considered statistically significant.
Results: 30.81±14.74 Nearly eighty-one percent of the sample had illnesses that lasted more than 18 months, and the median duration of illness was also months (112). Fifty patients, or 36.5% of the total, were found to have low magnesium levels, with a mean blood magnesium level of 1.520.54 meq/liter.
Practical Implementation: There is a lack of data on the function of magnesium in preventing COPD exacerbations. Hypomagnesemia may prove to be helpful in establishing COPD exacerbation as a predictive factor, according to the research that is now being conducted. This could lead to the development of COPD intervention strategies other than the standard treatments, enhancing COPD patients' life quality, morbidity, and mortality.
Conclusion: Our results provide evidence that hypomagnesemia is common among people with COPD. Male gender, greater age, lower socioeconomic status, diabetes, hypertension, tobacco use, and longer disease duration were all associated with low magnesium levels.
Keywords: Chronic Obstructive pulmonary disease (COPD), frequency, hypomagnesemia.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is an airway illness that causes breathing difficulties. [1-3], Because of the high frequency and chronicity of COPD, there is a large need for resources to treat patients with chronic therapies (e.g., supplementary oxygen treatment, medicine), acute exacerbations that require frequent hospitalisations, and many visits to clinicians' offices. Third, COPD is one of the top causes of death and disability worldwide, and it has a significant and rising monetary and social impact. It's the fourth greatest cause of death worldwide, and experts say it's just going to get worse from here. Stratifying patients with COPD according to their exacerbation history and symptoms was advocated as a fundamental change in treatment guidelines by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) in 2011[4-6]. Increases in prevalence mean that COPD will overtake influenza as the third biggest cause of mortality globally by the year 2020. Slowly progressing airflow blockage is characterised by dyspnea and exercise limitations [7, 8].

Chronic obstructive pulmonary disease (COPD) is characterised by the coexistence of chronic bronchitis and emphysema, and people with COPD also suffer from asthmatic bronchitis. The inability to cough out mucus is a consequence of the smooth muscles of the bronchi contracting. The resulting deterioration in quality of life and increased likelihood of hospitalisation are only two of the potential outcomes of this impairment of pulmonary gas exchange[9].

Mg+2 is helpful in lowering bronchospasm, and there is accumulating evidence to suggest that Mg+2 depletion plays a role in asthma exacerbations. Magnesium plays an important role in the body by helping to stabilise mast cells, releasing neurohumoral mediators, causing bronchial smooth muscle cells to relax and constrict, and facilitating mucociliary clearance. There is evidence that magnesium may help prevent persistent lung problems. Asthma and chronic obstructive pulmonary disease (COPD) may be exacerbated by magnesium deficiency, according to some research. Inadequate evidence exist, however, on the effect of magnesium on the occurrence of COPD.[10]. Accordingly, Mg+2 may aid in the upkeep of COPD sufferers' condition. Despite this, there is a paucity of data connecting blood Mg+2 levels to COPD patient outcomes, especially in regards to illness flares, and one study found that 35% of COPD patients were hypomagnesemic[11].

Since the literature indicates that persons with COPD have a significant frequency of hypomagnesemia (35%), I want to conduct research to quantify this prevalence. To analyse blood Mg levels in the COPD population in Pakistan, we lack appropriate local data since serum Mg levels are not routinely monitored in this group. We'll have a solid database of area demographics thanks to the planned study. If hypomagnesemia is shown to be prevalent, this study might lead to the development of guidelines for the diagnosis and treatment of low blood magnesium levels.

MATERIAL AND METHODOLOGY

Study Design: Cross-sectional study
Study Setting: Study was conducted by the Nishtar Hospital's Department of Medicine & Pulmonology, which I will begin in March 2016 and remain in until February 2018.

The study went on after the researchers were given the go light by the hospital's ethics committee.
Sampling Technique: Nonprobability sequential sampling was used
Sample Size: Total sample of 137 patients was calculated using WHO online calculator ntaking expected frequency of hypomagnesemia to be 72% with 80% confidence level & 5 % margin of error.[21]
Data Collection Procedure: Patients between the ages of 30 and 60, with an almost equal number of males and women evaluated

for inclusion, were sought out for involvement in the study. Only patients who had been unwell for at least six months were included in the research. Ischemic heart disease, lung cancer, obstructive sleep apnea, asthma, and other respiratory issues disqualified individuals from this study. Also, individuals with advanced COPD and impaired sensorium, as well as pregnant women, were not included in the study.

Patients and their carers were given a thorough explanation of the study's procedures before providing their approval. All information submitted was kept confidential, and the patient who took part in the study was assured that they would have no negative effects as a result of their participation. All of the information was recorded using a specialised Performa. Serum magnesium levels were analysed from three millilitres of blood taken from a vein and forwarded to the central laboratory at Nishtar Hospital Multan to prove that the patient had hypomagnesemia. Records were kept of each patient's demographic information, including their age, weight, height, location, socioeconomic status, and illness duration. Hypertension, diabetes mellitus, and smoking status were all recorded for each participant. Hypomagnesemia was diagnosed when serum magnesium levels were less than 1.5 meq/liter.

Data Analysis: Descriptive information including age, blood magnesium levels, and duration of illness were analysed using the mean and standard deviation. Rates and percentages were broken down by age range, race/ethnicity, education level, occupation, marital status, country of origin, smoking history, diabetes, hypertension, socioeconomic status, and obesity. Using stratification, we controlled for demographic factors that may have affected the results, including age, diabetes, obesity, COPD duration, hypertension, smoking, income, housing status, and gender. Stratification enabled us to achieve this. The impacts of these variables were analysed using a post-stratification chi-square test. The most current version of SPSS was used to enter all of the data and perform the statistical analysis. If the associated p-value was less than 0.05, it was considered to be statistically significant.

RESULTS

About one-hundred-and-thirty-seven persons were included in the research because they had COPD and satisfied the inclusion criteria. A total of 133 people took part in the study, 53 female (38.7%) and 84 male (61.3%). The average age of our patients was 56.79 4.81 years (with minimum age was 40 years while maximum age was 60 years). Female patients had a mean age of 53.776.60, while males averaged 58.691.09 years. The median age of our patients is 50 years old. Only 41 people (29.5%) came from areas outside major metropolitan areas, whereas 96 people (70.5%) lived in urban areas.109 (74.6%) had low incomes, and 28 (20.4%) had moderate incomes. Of our patients, 56 (40.9%) were diagnosed with hypertension and 28 (20.4%) were diagnosed with diabetes. Out of a total of 66 participants, 30 (21.9%) were found to be obese, 41 (29.9%) to be overweight, and 66 (48.2%) to be at a healthy weight. A total of 53 (38.5%) of our study participants had a documented smoking history. Overall, the duration of disease was 30.81 months (standard deviation, 14.74 months), and 112 people (81.8%) were affected by conditions that lasted more than 18 months. Our patients had a mean blood magnesium level of 1.520.54 meq/liter (range: 1.15 meq/liter to 2.75 meq/liter), with 36.5% of them having hypomagnesemia. Table-I

Hypomagnesemia was present in 46 males and four females with statistically significant difference (p<0.001). All patients with hypomagnesemia belonged to 46-60 years age group and no patient was in 30-35 years age group with statistically significant difference (0.001). Among patients of rural areas, 19 had hypomagnesemia while 31 patients from the urban areas had hypomagnesemia, the difference being statistically insignificant (p=0.126). Of all hypomagnesemic patients, 46 were poor while other four belonged to middle class with statistically significant difference (p=0.008). Of all hypomagnesemic patients, 15 were diabetic and 35 were non-diabetic (p=0.047); three were hypertensive and 47 were normotensive (p<0.001); 31 were smokers and 19 were non-smokers (p<0.001); and eight had a normal weight, 12 had an overweight condition, and 30 had obesity (p 0.001). All hypomagnesemic patients had disease duration of more than 18 months (p<0.001). Table-II

Patients with COPD who had experienced symptoms for a longer period of time were more likely to have hypomagnesemia than those whose symptoms had subsided more quickly as shown in table 3.

Table-1: Baseline data and Demographic

Variable	Number (percentage)
Age	
30-45 years	15 (10.9%)
46-60 years	122 (89.1%)
Gender, (male / female)	84 (61.3%) / 53 (38.7%)
Residence, (rural / urban)	41 (29.9%) / 96 (70.1%)
Socioeconomic status	
Poor	109 (79.6%)
Middle	28 (20.4%)
Diabetes mellitus	28 (20.4%)
Hypertension	56 (40.9%)
Smoking	53 (38.7%)
Weight	
Normal	66 (48.2%)
Overweight	41 (29.9%)
Obese	30 (21.9%)
Disease duration	
Up to 18 months	25 (18.2%)
More than 18 months	112 (81.8%)
Hypomagnesemia	50 (36.5%)

Table-2: Comparison of data between normal patients and patients with hypomagnesemia

Variable		Hypomagnesemia (n=50)	Normal (n=87)	p-value
Gender	Male (N=84)	46	38	<0.001
	Female N=53)	04	49	
Age	30-45 years (N=15)	00	15	0.001
	46-60 years (N=122)	50	72	
Residence	Rural (N=41)	19	22	0.126
	Urban (N=96)	31	65	
Socioeconomic status	Poor (N=109)	46	63	0.008
	Middle class (N=28)	04	24	
Diabetes mellitus	Yes (N=28)	15	13	0.047
	No (N=109)	35	74	
Hypertension	Yes (N=56)	03	53	<0.001
	No (N=81)	47	34	
Smoking	Yes (N=53)	31	22	<0.001
	No (N=84)	19	65	
Disease duration	Up to 18 m (N=25)	00	25	<0.001
	> 18 months (N=112)	50	62	
Weight	Normal (N=66)	08	58	<0.001
	Overweight (N=41)	12	29	
	Obese (N=30)	30	00	

Data is entered as number.

Table 3: Symptom Duration with Serum Magnesium

Symptom(Days)	Hypomagnesemia (n=50)	Normal (n=87)
Sputum Productio	5.71±3.72	4.52±3.41
Cough	7.11±3.81	4.31±2.52
Duration of COPD exacerbation	8.14±5.31	5.21±3.42
Dyspnea	6.99±4.12	5.52±3.22

DISCUSSION

Patients with chronic obstructive pulmonary disease (COPD) share symptoms with those of hyperresponsive airways, which are a hallmark of both chronic bronchitis and emphysema. The significance of a high serum magnesium content in lung illnesses is being increasingly recognized. An imbalance in magnesium levels is well-known to be seen in patients with lung illness. For both people and economies, chronic obstructive pulmonary disease (COPD) is a major contributor to suffering and death. The incidence of chronic obstructive pulmonary disease (COPD) has risen in tandem with the rise of industrialization and tobacco use. Patients with chronic obstructive pulmonary disease (COPD) frequently require hospitalisation due to exacerbations. Symptoms of a COPD exacerbation include a narrowing of airways, an increase in mucus production, and inflammation triggered by the body's own immune response.[12,15]

There were 137 people who met our criteria for inclusion and were involved in COPD studies. Fifty-three women (38.7%) and eighty-four men (61.3%) made up the total number of research participants. Our results are consistent with those of Sertogullarindanet al.[5], who also reported a preponderance of males (56 percent) in their sample. Gologanu et al.[12] found a similarly male-dominated sample. According to Maula et al.[13], 65.4% of COPD patients were men, which is consistent with the findings of our study. According to Waqas et al.[14] study, male patients outnumbered female patients 30% of the time with a prevalence of 70%. These findings are consistent with those of our study. 53% of male patients with COPD were found to have it by Hassan et al.[15], which matches the findings of our investigation. According to Motiani et al.[16], 20% of COPD patients were women, compared to 80% of male patients, which follows the same trend as the findings of our study.

The ages of the participants ranged anywhere from 56.79 to 48.1 on average. Those interested must be at least 40 years old and no older than 60. The average age of patients with male genitalia was 58.69±1.09 years, whereas that of patients with female genitalia was 53.77±6.60. According to the results of our research, 89.1% of our patient group comprised of persons between the ages of 46 and 60 years. The research by Gologanu et al.[12] had a median age of 66.2, which is a substantially higher age than the average age in our sample. Since our inclusion criteria barred patients older than 60 from taking part in the trial, this disparity exists (30-60 years range). The average age of Bannu was calculated to be 60.18±11.67 years, which is quite close to the results of a research done by Maula et al.[13]. Those of Sertogullarindan et al.[5], who reported 67±10 years, likewise came up with values that were somewhat higher than ours. The results of Phulpoto et al.[17], who reported that the average age of COPD patients was 56.8±7.8 years, are similar to the data that we have obtained. Our findings are in accordance with those that were reported by Motiani et al.[16], who discovered that the average age of the patients was 60.87±10.93 years. Similar results were found in study by Mahishale et al. [18], which showed an average age of 58±9.6 years.

Twenty-eight patients, or 20.4%, were discovered to have diabetes, while fifty-six patients, or 40.9%, were found to have hypertension. The prevalence of diabetes in individuals with COPD was found to be 21.24% in a research by Mahishale et al.[18] After asking patients about their tobacco use, we found that 53 (38.5%) were regular smokers. Researchers from Peshawar called Zaman et al.[19], found that an additional 34% of these people were smokers. Our results were corroborated by those of Gumus et al. [10], who discovered that 25% of COPD patients also had hypertension and 15% had diabetes.

Magnesium levels in our patients' blood varied from 1.15 to 2.75 meq/L, on average. Our patients had a hypomagnesemia prevalence of 36.5 percent. Our examination confirmed the prevalence of hypomagnesemia to be 35%, which is in line with the prevalence that do Amaral et al.[11], discovered. In keeping with the data that we got, Gumus et al. [10] identified 1.88 0.26 meq/l. Our findings are congruent with those of a research that was undertaken in Jammu and Kashmir by Singh et al.[20], which revealed that hypomagnesemia was widespread in that area at a rate of 34%.

Total 137 COPD patients is a sufficient sample size for our investigation. The current study may be regarded thought-provoking in light of the paucity of evidence addressing non-conventional therapy alternatives for COPD. One caveat of our research is that we couldn't separate out the effects of active and passive smoking. Additionally, the authors suggest doing additional regional interventional studies to evaluate the effects of magnesium replacement therapy on recovery, mortality rate, and quality of life in people with COPD.

CONCLUSION

Low magnesium levels were seen in a significant proportion of our COPD sample. Hypomagnesemia was highly associated with male gender, older age, lower socioeconomic status, diabetes, hypertension, smoking, and longer illness duration.

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