TOGÜ SAĞLIK BİLİMLERİ DERGİSİ
Journal of TOGU Health Sciences
ISSN:2791-8653
Ay-Yıl/Cilt/Sayı: Ocak-2022/2/2
Araştırma Makalesi/Original Article

Assessment of Respiratory Function and Biomass Exposure in Workers in Kebab Restaurant: A Pilot Study

Kebap Restoranında Çalışanlarda Solunum Fonksiyonu ile Biyomas Maruziyetinin Değerlendirilmesi: Bir Pilot Çalışma

Nermin GÜRHAN[1], Ülkü POLAT [2], Nurdan KÖKTÜRK[3], Burak ŞİRİN[4], Meltem ALTINEL[5], Mehmet Haydar KAYA[6]

[1]Proffessor Doctor, PhD, Tokat Gaziosmanpaşa University Faculty of Health Sciences, Department of Nursing, Tokat, 0000-0002-3472-7115
[2] Proffessor Doctor, PhD, Gazi University, Faculty of Health Sciences, Department of Nursing, Ankara, 0000-0002-4293-1394
[3] Proffessor Doctor, Gazi University, Department of Chest Diseases, Faculty of Medicine, Gazi University, 0000-0002-2889-7265
[4] Reserecher Assistant, Tokat Gaziosmanpaşa University Faculty of Health Sciences, Department of Nursing,Tokat, 0000-0002-8485-5756.
[5] Nursing Staff, Ankara University, Ibni Sina Hospital, Department of Anesthesiology and Reanimation Intensive Care, Ankara, 0000-0002-3478-6094
[6] Nursing Staff, PhD, Faculty of Medicine, Gazi University, Ankara, 0000-0001-7818-9331

ÖZET

Amaç: Bu çalışma, kebap restoranı çalışanlarında solunum fonksiyonları ile biomas maruziyetini değerlendirmek amacıyla yapılmıştır.

Gereç ve Yöntem: Tanımlayıcı tipte olan araştırmanın örneklemini kebap restoranlarında çalışan 111 kişi oluşturmaktadır. Katılımcılara pre-bronkodilatör solunum fonksiyon testi (SFT) yapılarak FEV1, FVC, FEV1/FVC, PEF ve FEV1/FVC -LLN değerleri kaydedilmiş, KOAH değerlendirme testi (CAT) ve modifiye medikal araştırma konseyi (mMRC) nefes darlığı skalası uygulanmıştır. Verilerin değerlendirmesinde sayı,ortalama, yüzdelik, spearman korelasyon analizi ve çoklu regresyon analizi kullanılmıştır.

Bulgular: Tüm bireylerde FEV1/FVC (%80'in üzerinde) değeri normal ancak %47.7'sinde FEV1/FVC-LLN'si (normalin alt sınırı) normalin altında olarak değerlendirildi. regresyon analizine göre ≥40 yaş ve bireylerin ocak başında (saat/gün) geçirdiği sürenin FEV1/FVC- LLN değerini etkilediği bulundu (sırasıyla;p=0,000, p=0,010). CAT'i etkileyen faktörler ≥40 yaş ve sigara paket yılı olarak bulundu. (sırasıyla; p=0,012, p=0,017). Yakıt türü olarak odun kullananların CAT puanı, kömür ve talaş kullananlara göre daha yüksek bulundu (p=0,001).

Sonuç: Bu çalışma, obstrüktif akciğer hastalığı tanısında genç yaş riskli popülasyonda FEV1/FVC sabit oranının yetersiz kaldığını desteklemektedir. Bu sonuçlar biyomas kullanımının ve sigara kullanımının akciğer fonksiyonlarını etkilediğini göstermektedir. Bu çalışma aynı zamanda CAT skorunun akciğer fonksiyon bozukluğu olan riskli grupları belirlemede önemli olduğunu göstermiştir.

Anahtar kelimeler: KOAH, Biomas, Solunum fonksiyon testi, KOAH değerlendirme testi (CAT)

ABSTRACT

Objective: This study was conducted to assess respiratory functions and biomass exposure in kebab restaurant workers.

Material and Methods: The sample of the descriptive study consists of 111 people working in kebab restaurants. Pre-bronchodilator pulmonary function test (PFT) was performed on the participants, and FEV1, FVC, FEV1/FVC, PEF and FEV1/FVC LLN values were recorded, COPD assessment test (CAT) and modified medical research council (mMRC) dyspnea scale were applied. Number, mean, percentage, Spearman correlation analysis and multiple regression analysis were used in the evaluation of the data.

Results*:* All individuals had normal FEV_1/FVC (above 80%), however 47.7% of the subjects showed LLN (Lower limit of normal) of FEV_1/FVC below normal. According to regression analysis it was found that ≥40 age and period spent on chimney corner (hour/ a day) of individuals affected the LLN of FEV1/FVC (respectively; p=0.000, p=0.010). Factors influencing of CAT were ≥40 age and smoking pack-year (respectively; p=0.012, p=0.017). The CAT score of those using wood as a fuel type was higher than those using coal and sawdust (p=0.001).

Conclusion: This study supports the fact that FEV_1/FVC fixed ratio remains insufficient in early age risk population in the diagnosis of obstructive lung disease. These results show that the use of biomass and smoking affects lung function. This study also showed that the CAT score is important in identifying risky groups with impaired lung function.

Keywords: COPD, Biomass, Respiratory function test, COPD assessment test (CAT)

Sorumlu yazar/Corresponding author:
Ülkü POLAT, Gazi University Faculty of Health Sciences, Department of Nursing. Emek Bişkek Street, Gazi Universtiy, No:2, 06490 Çankaya/Ankara/Turkey, ugorgulu@gazi.edu.tr, ulku_gorgulu@yahoo.com
Başvuru/Submitted: 24.02.2022 **Kabul/Accepted:**29.05.2022
Cite this article as: Gürhan N, Polat Ü, Köktürk N, Şirin B, Altınel M, Kaya MH. Assessment of Respiratory Function and Biomass Exposure in Workers in Kebab Restaurant: A Pilot Study. J TOGU Heal Sci. 2022;2(2):161-176.

INTRODUCTION

Half of world population uses biomass fuels as the primary resource of local energy. It is reported that biomass fuels are mostly used in developing countries and rural areas (1,2). Approximately 3 billion people across the world burn solid fuels containing biomass and coal particularly in indoor environment (3). Biomass fuel usage is near-zero in industrialized countries while it is higher than 80% in China, India, Sub Saharan Africa countries, on the other hand 50-75% of households use biomass fuel for cooking particularly in rural areas in Latin America. In Turkey, it is reported that biomass usage is 30% in urban areas, 30% in rural areas while it is 90% in Central Anatolia, Eastern and Southeastern Anatolia regions (4).

Biomass is the most significant risk factor beside tobacco products in occurrence of obstructive lung diseases in developing countries. Biomass fuels used in these countries (plant product wastes such as wood, wood coal, animal manure and fodder, weed, shrubbery, paraffin oil) is frequently used in rural areas for cooking or heating purpose (4,5). The World Health Organization (WHO) is indicated that high levels of smoke associated with the use of biomass fuel and coal used for heating or cooking, especially in low and middle-income countries, cause indoor air pollution. Environmental exposure to tobacco smoke, indoor air pollution and occupational dusts, fumes and chemicals are considered to be the major risk factors for COPD. (6)

Biomass fuel exposure results in high morbidity and mortality rates in human beings. The basic irritants release from burning of biomass fuels that affect respiratory tracts include carbon, nitrogen, sulphur oxides, unburned hydrocarbon particles and polycyclic organic compounds like benzo [&]-pyrene that has carcinogenic effects. Previous studies indicate that biomass usage results in many acute or chronic respiratory or non-respiratory diseases which particularly include upper and lower respiratory tract infections, obstructive airway diseases, asthma, pulmonary tuberculosis, pulmonary fibrosis, lung cancer, low-birth-weight, cataract and oral /nasopharyngeal carcinoma (7,8,9).

Existence of biomass exposure is considerably higher compare to smoking in underdeveloped or developing countries (5,9). It is reported that biomass exposure is responsible for 15-20% of total COPD cases in developing and underdeveloped countries, while the results of studies conducted in our country are of similar nature (8). It is stated that approximately 50% of deaths in COPD patients in developing countries are associated with biomass exposure (10). The risk of exposure to smoke increases by lighting a fire and use of

flueless cooker. It has been evidenced that this exposure increases chronic obstructive pulmonary disease (COPD), chronic bronchitis and childhood respiratory system infection frequency, results in death in children below five years old, exacerbates asthma symptoms and causes functional disruption (8).

Even though kebab cooking is an important occupation in Turkey, the relationship between intensive smoke/biomass exposure and the prevalence of chronic pulmonary diseases in individuals working in kebab restaurants has not been detremined. Our study aims to examine symptoms and respiratory functions in chimney corner working kebab chefs and search whether or not they are a risky group particularly in terms of COPD.

MATERIALS and METHODS

Study Design and Participants

This study was depictive type and conducted in order to evaluate symptoms and make a respiratory functional assessment in chimney corner working kebab chefs. The study universe was composed of 207 individuals working in kebab shops in Gaziantep and Mersin between July 15 and October 15 of 2017.

This study was carried out with the individuals who were working in kebab restaurants where was a non-smoking places/closed area. Therefore, the study sample is composed of 111 individuals who have voluntarily agreed in participating the research. Because the prohibition of tobacco consumption has applied in public places and workplaces/closed areas with the comprehensive tobacco control law, which entered into force on May 19, 2008 in Turkey. Thus, this law prevents the passive effects of smoking smoke. Research data has been collected with face-to-face interview method and RFT. In order to collect data, necessary approval was obtained from the Gazi University Ethics Committee (Research Code No: 2017-446) anda verbal permission was received from the workplaces where the study was to be done.

Procedures

All participants had undergone pre-bronchodilator respiratory function test (RFT). Spirometric measurement maneuvers have been described for all patients by the same researcher before the test. The measurements were performed in sitting position and by using nose clip in compliance with recommendations of the European Thoracic Society (ERS). When the measurement fails in some individuals, the measurement technique has been described again by the researcher and repeated measurements (max 8) have been performed until the

measurement result is obtained. The measurements have been performed by using device (MIR Spirodoc Hand Type Spirometer). Forced expiratory flow velocity in 1 second (FEV1), forced vital capacity (FVC), ratio of these two values (FEV_1/FVC), peak expiratory flow (PEF), LLN for the lowest limit of normal FEV_1, FVC, FEV_1/FVC, PEF, FEV1/FVC and z scores for FEV1 /FVC have been recorded for all participants, COPD Assessment Test (CAT) and Modified British Medical Research Council (mMRC) dyspnoea scale was applied. Application of data collection tools and respiratory function test measurement has been completed in a period of 20-30 minutes for each patient.

Data Tools

Data collection tools included Questionnaire Form, COPD Assessment Test (CAT), Modified British Medical Research Council (mMRC) Survey.

Questionnaire Form: Questionnaire Form includes 31 questions with respect to socio-demographic characteristics of participants (age, gender, education, marital status etc.) and the risk factors considered to have impact on occurrence of COPD disease (smoking, smoking period (pacet/year), biomass fuel type being used, period of chimney corner working, total working period, surface area of chimney area, childhood respiratory diseases history, existing chronic pulmonary diseases history etc.). Data collection form has been developed by researchers in company with etnographic observation and literature (1-20).

COPD Assessment Test (CAT): CAT is a short test that is easy to apply composed of eight items. Developed by Jones et al. (2009) to measure the impact of COPD on patients, the CAT test is a validated, short and simple test to support health status assessment and communication between patient and physician (11). Validity and reliability of this survey in our country have been evidenced by Yorgancıoğlu et al. (12). CAT has a scoring range of zero to 40. The CAT score was classified into four groups of low, medium, high and very high4 based on the impact level of disease on health status. (CAT score <10:low, 10-20:Medium, 21-30:High, >30: very high) (11,12).

Modified British Medical Research Council (mMRC) Survey*:* Fletcher et al. developed the mMRC dyspnea scale while working on the respiratory problems of coal miners in the 1940s (13). A short scale that has been used for years for rating impacts of respiratory disorder in daily activities. The mMRC dyspnea score is a 5-point (0–4) scale based on the severity of dyspnea. In 2011, the GOLD committee determined a high symptomatic limit of 2 or greater in mMRC (14,15).

Data Analysis

SPSS (Statistical Package for Social Sciences) 15.0 statistical program has been used in data assessment. Mean, percentage, Chi-square test, Spearman correlation analysis and multiple regression analysis have been used in data assessment.

RESULTS

Identifying Characteristics of Participants

30.6% of participants of our study was 40 years and older and the average age was 34.13±11.30. All the participants were male, 66.7% were married and 36% were secondary school graduates. 64% of participants were smokers and average period of smoking was 15.31 ±9.31 years. The mean smoking history was 13.20± 19.68 packet/year (20 ≤packet -years in 95.8%). Family structure of 77.5% of individuals was elementary family and economic status was middle, the longest period of living in a location was urban area in 95.5% of participants. 55.9% of participants were working on chimney corner, 38.7% as waiters and 5.4% as cashiers. Average working period of individuals was 11.54±1.78, working year of 28.9% was equal to 6-10 years, and that of 95.5% was ≥30 pack years smoked. The period spent on chimney corner in a day was 1-5 hours in 58.62% of participants while 42.3% uses stove as a household heating tool. Biomass fuel type they use was coal in 54.1%, wood in 40.5% and sawdust in 5.4% (Table 1).

Respiratory Complaints of Participants

27% of individuals participating in our study had cough continuing for more than 3 months of a year and 24.3% had phiegm complaint, respiratory disorder and stertorous respiration have not been declared by any case. Those who have such complaints for short term only in case of common colds are respectively 33.3%, 27.9%, 34.2%, 26.1%. It is reported in the study that 18% of individuals had childhood respiratory tract infections frequently, 15.3% had pulmonary diagnosis in the past. When the pulmonary diagnoses received by participants are queried, it has been determined that chronic pulmonary disease diagnoses include COPD, chronic bronchitis, and asthma (1 individual had COPD (0.9%), 8 individuals had bronchitis (7.2%), 4 individuals had asthma (3.6%) diagnosis). It is determined among participants who do not smoke but have biomass exposure, 1 person has

Table 1. Descriptive Characteristics of Participants (n=111)

Age (mean±sd:34.13± 11.30)	**n**	**%**

<40	77	69.4
≥40	34	30.6
Gender		
Male	111	100
Level of education		
Primary graduate	36	32.4
Secondary school graduate	40	36.0
High school graduate	28	25.2
University graduate	7	6.3
Marital status		
Married	74	66.7
Single	37	33.3
Types of family strucrure		
Primary family	86	77.5
Extended family	23	20.7
Fragmented family	2	1.8
Economic situation		
High	7	6.3
Middle	86	77.5
Low	18	16.2
The longest living location		
Urban	106	95.5
Rural	5	4.5
Working position		
Chimney corner	62	55.9
Waiter	43	38.7
Cashiers	6	5.4
Working period (year) (mean±sd:12.83± 8.94)		
1-5	27	27.8
6-10	28	28.9
11-15	20	20.6
≥16	22	22.7
Daily working period (hour) (mean±sd:11.54± 1.78)		
6-10	5	4.5
11-30	106	95.5
Period spent on chimney corner (hour/ a day) (mean±sd: (4,71 ± 4,05)		
1-5	65	58.6
6-10	37	33.3
11-20	9	8.1
Used square meter of stove (m ^{2})		
1-5 m ^{2}	81	73.0
6-10 m ^{2}	15	13.5
11-15 m ^{2}	11	9.9
16 -20 m ^{2}	4	3.6
Used heating tool		
Stove	47	42.3
Electric heater	6	5.4
Natural gas	33	29.7
Air-conditioner	25	22.5
Used fuel type		
Coal	60	54.1
Wood	45	40.5
Sawdust	6	5.4
Smoking		
smoker	71	64.0
Nonsmoker	40	36.0
Pack-years smoked (13.20± ±19.68 **)**		
≤20	3	4.2
≥30	68	95.8

COPD, 2 persons have chronic bronchitis, 1 person has asthma diagnosis, while among those who some and have biomass exposure, 6 persons have chronic bronchitis, 3 persons have asthma diagnosis.

Respiratory Function Test, CAT and mMRC Results of Individuals

When pre-bronchodilator RFT's of participants are assessed in our study, FEV1 value of 9%, FVC value of 7%, PEF value of 20.7% is below 80%. FEV_1/FVC value of all individuals is above 70% but FEV1/FVC- LLN value of 47.7% is below the limit value. FEV1/FVC –z score of all individuals is both above -1.96 and -1.64. CAT score of 45% of participants is ≥10, mMRC score of 15.3% is ≥2 (Table 2).

Table 2. Respiratory Function Test, CAT and mMRC Results of Individuals (n=111)

Results of measurement	Number	%
FEV_1 (predicted %)		
0-79	10	9.0
≥80	101	91.0
FVC (predicted %)		
<80	8	7.2
≥80	103	92.8
FEV1/FVC		
≥70	111	100.0
FEV1/FVC LLN		
Low	53	47.7
Normal	58	52.3
PEF (predicted %80)		
<80	23	20.7
≥80	88	79.3
CAT		
<10	61	55
≥10	50	45
mMRC		
<2	94	84.7
2≥	17	15.3

Correlation Between Respiratory Function Test Parameters of Individuals According to Some Variables (Correlation Analysis Results)

The correlation of respiratory function test parameters of participants of our study is given in table 4. Accordingly, A negative correlation between FEV1/FVC-LLN percentage value and age (r=-0.895, p=0.000), working period (r=-0.552, p=0.000), period of time spent on chimney corner (r=-0.282, p=0.005) and but a positive correlation between that the way of work (r= 0.242, p=0.016) was found. The working year was a negative and significant correlation wtih FEV1 (r=-0.248, p=0.023), FVC (r=-0.320p=0.003), but a positive correlation with PEF (r=0,216, p=0.046) and mMRC (r=0.228, p=0.025). The age was positevely

associated with FEV1/FVC (r=0.293, p=0.003) and CAT score (r=0.194, p=0.042). The type of fuel used was positevely associated with CAT score (r=0.206, p=0.030) (Table 3)

Table 3. The Correlations Among Some Variables with CAT, mMRC and Respiratory Function Test Parameters of Individuals

Descriptive characteristics	FEV1	FVC	FEV1/FVC	FEV1/FVCLLN	PEF	CAT	mMRC
Age (year)	r=-0.037 p=0.720	r=-0.103 p=0.313	**r=0,293* p=0,003***	**r=-0.895* p=0.000***	r=0.144 p=0.156	**r=0.194* p=0.042***	r=0.175 p=0.066
Smoking pack-year	r=0.062 p=0.639	r=-0.063 p=0.632	r=0,039 p=0,766	r=-0.082 p=0.528	r=0.65 p=0.621	r=0.144 p=0.232	r=0.082 p=0.494
Working period(year)	**r=0.248* p=0.023***	**r=0.320* p=0.003***	r=0,138 p=0,205	**r=-0.552* p=0.000***	**r=0.216* p=0.046***	r=0.166 p=0.104	**r=0.228 * p=0.025 ***
Period spent on chimney corner (hour/ a day)	r=-0.081 p=0.435	r=-0.102 p=0.318	0,081 0,430	**r=-0.282* p=0.005***	r=0.117 p=0.252	r=-0.064 p=0.501	r=-0.015 p=0.879
Used fuel type Coal Wood Sawdust	r=-0.038 p=0.711	r=-0.042 p=0.679	r=0,108 p=0,289	r=-0.114 p=0.264	r=0.013 p=0.898	**r=0.206* p=0.030***	r=0.297 p=0.310
Way of working Chimney corner Waiter Cashiers	r=0.060 p=0.559	r=0.066 p=0.520	r=-0,077 p=0,451	**r= 0.242* p=0.016***	r=-0.198 p=0.051	r=0.027 p=0.781	r=-0.092 p=0.334

The Comparison Analysis of CAT, mMRC and Respiratory Function Test Parameters to According Some Variables of Individuals

In this study, the CAT score of those with 30 ≥ pack-years smoked was found statistically significantly higher than those with ≤20 pack-years smoked (X^2 =4.204, p=0.040). It was found that those who used wood as a fuel type had a higher CAT score than those who used coal and sawdust (X^2=7.516, p=0.023) (Table 4).

The Impact of Some Variables on CAT, mMRC and Respiratory Function Test Parameters of Individuals (Regression Analysis Results)

In multivariate regression analysis; when standardized regression coefficients (ß) were taken into account, it was determined that ≥40 age and smoking pack- year affected CAT scores (respectively; ß=0.224, 0.012, ß= 0.226, p=0.017) as well as FEV1/FVC-LLN was affected by period spent on chimney corner(hour/ a day) and ≥40 age (respectively; ß=-0.259, 0.010, ß= -0.446, p=0.000). The CAT score of those using wood as a fuel type was higher than those using coal and sawdust (ß=0.316, p=0.001) (Table 5).

Table 4. Comparison Analysis of CAT, mMRC and Respiratory Function Test Parameters to According Some Variables of Individuals

Descriptive characteristics		**FEV1**		**FVC**		**FEV1/FVC**		**FEV1/FVC LLN**		**PEF**		**CAT**		**mMRC**	
	N	**X^2**	**P**	**X^2**	**p**	**X^2**	**p**	**X^2**	**p**	**X^2**	**p**	**X^2**	**p**	**X^2**	**p**
Way of working															
Chimney corner	62														
Waiter	43	81.087	0.508	80.900	0.175	48.176	0.543	72.635	0.523	7.891	0.746	52.637	0.603	4.480	0.811
Cashiers	6														
Smoking															
smoker	71	49.965	0.159	37.481	0.356	25.797	0.418	44.465	0.186	55.949	0.107	2.578	0.108	3.237	0.072
nonsmoker	40														
Pack-years smoked	≤20														
	≥30	12.168	68 1.000	13.513	0.994	18.182	0.835	16.652	0.955	18.378	0.987	**4.204**	**0.040***	1.350	0.245
			3												
Used fuel type															
Coal	60	60													
Wood	45	86.041	41 0.359	69.979	0.478	50.210	0.465	86.579	0.150	74.079	0.855	**7.516**	**0.023***	4.146	0.126
Sawdust	6		6												

***Chi-square test wa used, p<0.05**

Table 5. CAT, mMRC Values of Individuals Aged Over 40 Years, Smoker, Using Wood as Fuel Type (n=111)

	CAT				**mMRC**				**FEV1FVC-LLN**			
	B	**β**	p	**CI(%95)**	**B**	**β**	p	**CI(%95)**	**B**	**β**	p	**CI(%95)**
Nonsmoker + Used fuel type-Coal±<40 age (constant)												
Wood	5.787	0.316	**0.001***	2.572-9.001	0.313	0.175	0.067	-0.022-0.649	-0.972	-0.100	0.334	-2.962-1.018
Sawdust	0.791	0.020	0.824	-6.252-7.834	-0.076	-0.019	0.839	-0.811-0.660	-1.914	-0.090	0.386	-6.274-2.446
Period spent on chimney corner(hour/ a day)	-1.654	-0.118	0.175	-4.056-0.749	-0.109	-0.080	0.389	-0.360-0.142	-0.296	-0.259	**0.010***	-0.510--0.073
≥40 age	4.379	0.224	**0.012***	0.992-7.766	0.348	0.182	0.054	-0.006-0.702	-4.524	-0.446	**0.000***	-6.361--2.687
Pack-years smoked ≥30	0.344	0.226	**0.017***	0.062-0.627	0.119	0.057	0.556	-0.280-0.519	0.000	0.002	0.984	-0.033-0.033

***Multiple regression analysis, CI: Confidence Interval (%95), p<0.05**

DISCUSSION

Passive smoking and inhalation of contaminants releasing by biomass burning which result in in-house air pollution have a significant role in occurrence of COPD (8,16). Respiratory symptoms and effects on RFT parameters and COPD frequency have been analyzed in a young adult population who are exposed to coal or wood smoke intensively by reason of the work of chimney corner cooking and approximately half of which has smoking habit (16).

COPD diagnosis is validated with below 70% post-bronchodilator FEV1/FVC (expected%) that is currently a simple and widely used RFT parameter (GOLD 2017). On the other hand, it has been evidenced that use of fixed ratio may result in excessive diagnosis in elderly population and insufficient diagnosis in young population and for that reason the use of LLN gives more accurate results (21,22,23).

The study population is composed of young adult and middle age group. Only 30.6% of the cases is above 40 years old. It is determined that FEV1/FVC (expected%) ratio is ≥70% in all participants, while it is below 80% in 0.9% (1 individual) but LLN value of almost half (47.7%) is low and majority of these individuals (69.4%) is composed of young adults below 40 years old. This result is in compliance with some study results in the literature, that supports the idea that considering only FEV1/FVC <70% fixed value in assessment of participants in terms of COPD may result in false diagnosis (14,15). In this study, the FEV1/FVC LLN values of individuals aged 40 years and older were found to be lower than those aged 40 years and younger. This result supports the view that FEV1/FVC LLN should be evaluated in determining the diagnosis of COPD, which is especially common in people aged 40 and over.

It has been recommended to assess COPD with the composite assessment tool since 2011. According to this, the status of high symptomatic has been determined as mMRC≥ 2 or CAT≥10 (14,15). In this direction, it has been determined that CAT score of 45% of participants of our study is ≥10, mMRC score of 15.3% is ≥2. This result indicates that there are some participants with “excessive symptom” and “excessive respiratory disorder” even though they did not catch the COPD GOLD diagnosis criterion and not diagnosed with a pulmonary disease yet.

The finding that fuel type used by individuals positively affects the CAT value is in compliance with the literature, indicating that internal environment air pollution risk factors

other than smoking have a role in occurrence of respiratory symptoms and supporting that biomass fuel type affects the respiratory functions (5,24,25,26). In this study, the CAT scores were significantly higher in wood users compare to charcoal and sawdust group.

Smilarly, Ngahane and et al. Found that respiratory symptoms and reduced lung function were more pronounced among women using wood than the alternative fuels as cooking fuel (27). Some studies demonstated that traditional cooking wood was increase the risk of lung diseases (25,28,29) and there was a significant relationship between biomass fuel and COPD(26,30).The results of this study show that the occurrence of respiratory symptoms due to biomass exposure is seen at a high rate.

Montes de Oca et al. found biomass exposure (>10 y) and smoking >20 pack-years were found to be a risk factor for COPD, the smoking was a possible confounding factor for the association between biomass and COPD **(**post-bronchodilator FEV1/FVC < 0.70); similar results were found with the lower limit of normal definition (31). In the stuy of Duan, ıt was found COPD patients with biomass smoke exposure alone had higher CAT scores than patients with only tobacco or occupational exposure (32). These studies show that both smoking and biomass exposure also affect the CAT score. In this study was found that the CAT score of those with 30 ≥pack-years smoked and those using wood as a fuel type was higher, the FEV1/FVC-LLN was affected by period spent on chimney corner (hour/ a day). This finding showed that the participants in the study were at risk for respiratory problems.

Previos studies reported chronic exposure to biomass fuel as cause of increase in respiratory symptoms airflow limitation and impairment of pulmonary functions (26-30). In a similar study, it was found that the exposure time to biomass smoke was an effective factor in changing lung functions both obstructive and restrictive lung disease (33). In the study, Maas and et al. was found that chronic airway diseases and especially chronic bronchitis was found to be seen in high prevalence persons in serving as the primary household cook using a wood fire for food preparation (34). In the study conducted by Ngahane et al. on effects of cooking fuel smoke on respiratory symptoms and lung function in semi-rural women, it was shown that the main respiratory symptoms related to using wood as a cooking fuel were dyspnea on exertion and chronic cough suggestive of chronic bronchitis. In addition, they found 2 cases of COPD and 13 cases of restricted lung function (27).

When the pulmonary diagnoses of participants of our study are evaluated, chronic pulmonary disease diagnoses include COPD, chronic bronchitis, asthma (1 person COPD

(0.9%), 8 persons chronic bronchitis (%7.2), 4 persons asthma (%3.6)). It is determined in our study that among individuals who do not smoke but only have biomass exposure, 1 person has COPD, 2 persons have chronic bronchitis and 1 person has asthma diagnosis while among individuals who smoke and have biomass exposure, 6 persons have chronic bronchitis and 3 have asthma diagnosis. When the literature is analyzed, it is observed that the studies which assess biomass among the risk factors other than smoking in COPD are mostly conducted on women who live in rural areas and the number of studies comparing biomass usage in smoker and non-smoker groups is limited. Similar to findings of our study, Desalu et al. reported that the percentage of occurrence of chronic bronchitis in 269 non-smoker women in Nigeria is 10.6% (29). In another study held by Umoh and Petrs in Nigeria, it is determined that 19.9% of 342 individuals who engage in fishery and use biomass fuel for cooking have decline in their pulmonary functions and chronic bronchitis (25). However, the existence of some risk factors like smoking is not recorded in this study and it may be said that it supports our study in terms of indicating the impact of occupational exposure. In another research held by Mukherjee et al. in India, airway obstruction was reported in 4.6% of women who smoke and use biomass fuel in cooking (26). In the study held by Yakışan et al. on 52 patients who are followed-up with COPD diagnosis in our country, it is determined that frequent occurrence of COPD in women not smoking and living in rural areas may be correlated with biomass usage (16).

In conclusion, it is evidenced in our study that participants have different risk factors which may lead to respiratory tract obstruction not dependent on smoking in consistent with the literature.

CONCLUSION

In this study, FEV1/FVC values of participants are normal while FEV1/FVC-LLN values are low almost half of them. This situation supports the fact that FEV1/FVC fixed ratio remains insufficient in the risk population particularly in COPD diagnosis. In furtherance, it is determined that CAT which is a COPD life quality survey is in high values in half of the cases.

In addition to smoking, environmental or occupational exposure to the smoke of biomass fuels are important risk factors for the development of many respiratory diseases such as COPD. For this reason, it is extremely important to take protective measures against these risk factors that may cause indoor air pollution. In this study, it was determined that participants have different risk factors which may negatively affect respiratory functions other than smoking with respect to age, period spent on chimney corner (hour/ a day) and biomass fuel type used.

The results of this study emphasize the importance of evaluating occupationally risky groups in terms of these risk factors.

Biomass exposure is existing in all smoker and non-smoker participants in this study and it has been indicated that the risk factors other than smoking may affect respiratory function parameters and frequency of symptom occurrence in patients. However, the smoker and non-smoker groups are not divided as those having and not having biomass exposure and not assessed as the control group. For this reason, this is not a study conducted by using a control group which would indicate whether these factors are effective alone on COPD. Limited number of samples was found with respect to conductance of study out of the clinic and at different regions in the country.

Acknowledgements: We thank all individuals participated in this study.

Ethics Committee Approval: Ethics committee approval was obtained Gazi University Ethics Committee (Research Code No: 2017-446)

Declaration of Conflicting Interests: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: It is not funding to report for this submission

Author Contributions: Study Desing: NG, NK; Data Collection: BŞ, MA, MHK; Data Analysis: ÜP; Manuscript Writing: ÜP, NK, NG.

References

1.Akhtar T, Ullah Z, Khan MH, Nazli R. Chronic bronchitis in women using solid biomass fuel in rural Peshawar. Pakistan Chest. 2007;132(5):1472-1475.

2.Prasad R, Singh A, Garg R, Giridhar GB. Biomass fuel exposure and respiratory diseases in India. Biosci Trends. 2012 ;6(5):219-228.

3.Sood A. Indoor fuel exposure and the lung in both developing and developed countries: an update. Clin Chest Med. 2012 ;33(4):649-665.

4.Babalık A, Bakırcı N, Taylan M, et al. Biomass smoke exposure as a serious health hazard for women. Tuberk Toraks. 2013; 61(2):115-21.

5.Moreira MA, Barbosa MA, Jardim JR et al. Chronic obstructive pulmonary disease in women exposed to wood stove smoke. Rev Assoc Med Bras 2013;59(6):607-613.

6. World Health Organization.Chronic obstructive pulmonary disease (COPD)-WHO.Retrieved on 28.05.2022 from https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd).

7. Kanmaz ZD, Özülkü E, Yentürk E, et al. BiomassMaruziyeti Olan Kadın Olgularda Pulmoner Arter Basıncının Değerlendirilmesi. Biomass ve Pulmoner Hipertansiyon. JAREM 2017; 7: 16-20.

8.Cimrin AH, Karaman C. Kadinlarda biomass ve mesleksel toza maruziyet astıma yol açabilir mi? Tuberkuloz ve Toraks. 2011; 59(4):388-391.

9.Aşker S, Ekin S, Arısoy A, et al. Sigara ve Tandır Dumanın COPD ile İlişkisi. Van Tıp Dergisi 2014; 21(4): 225-229.

10. Kamal R, K Srivastava AK , Kesavachandran CN, Bihari V, Singh A. Chronic obstructive pulmonary disease (COPD) in women due to indoor biomass burning: a meta analysis. Int J Environ Health Res. 2022;32(6):1403-1417.

11. P W Jones , G Harding, P Berry, I Wiklund, W-H Chen, N Kline Leidy. Development and first validation of the COPD Assessment Test. Eur Respir J.2009 ;34(3):648-54.

12.Yorgancıoğlı A, Polatlı M, Aydemir Ö, et al. COPD değerlendirme testinin Türkçe geçerlilik ve güvenilirliği. Tüberküloz ve Toraks. 2012 ;60(4): 314-320.

13.Fletcher CM, Elmes PC, Fairbairn MB, et al. The significance of respiratory symptoms and the diagnosis of chronic bronchitis in a working population. Br Med J. 1959; 2: 257-66.

14.Global Initiative for Chronic Obstructive Lung Disease. Pocket Guide to COPD Diagnosis, Management, and Prevention. A Guide for Health Care Professionals. 2017 Report. Retrieved on 5.03.2018 from http://www.goldcopd.org.

15.Türk Toraks Derneği'nin GOLD 2017 Kronik Obstrüktif Akciğer Hastalığı (COPD) Raporuna Bakış. KOAH'lı Olgunun Tanısı Ve Değerlendirilmesi. Retrieved on 5.03.2018 from http://toraks.org.tr/uploadFiles/book/file/1042017161917-tumu.pdf.

16.Yakışan A, Özbudak Ö, Çilli A, et al. KOAH 'lı Kadın Hastalardaki Risk Faktörleri. Dicle Tıp Dergisi 2006; 33(4): 215-219.

17. TTD Astım Tanı ve Tedavi Rehberi 2016 - Türk Toraks Derneği. Astım-KOAH Overlap Sendromu Tanı ve Tedavisi. Retrieved on 5.03.2018 from http://www.toraks.org.tr/uploadFiles/ book/file/ 108201 7TTD-Astim-Tani-ve-Tedavi-Rehberi-2016.pdf.

18.Mohamed Hoesein FA, Zanen P, Lammers JW. Lower limit of normal or FEV1/FVC < 0.70 in diagnosing COPD: an evidence-based review. Respir Med. 2011;105(6):907-915.

19.Mannino DM, Buist AS, Vollmer WM. Chronic obstructive pulmonary disease in the older adult: what defines abnormal lung function? Thorax. 2007; 62: 237-241.

20.Bhatt SP, Sieren JC, Dransfield MT, et al. Bhatt SP, Sieren JC, Dransfield MT, et al. Comparison of spirometric thresholds in diagnosing smokingrelated airflow obstruction.Thorax. 2014;69(5):409-14.

21.Izquierdo Alonso JL, De Lucas Ramos P, Rodriguez Glez-Moro JM. The use of the lower limit of normal as a criterion for COPD excludes patients with increased morbidity and high consumption of health-care resources. Arch Bronconeumol. 2012; 48 (7): 221-264.

22.Tan WC, Sin DD, Bourbeau J, et al.Characteristics of COPD in never-smokers and ever-smokers in the general population: results from the CanCOLD study. Thorax. 2015; 70(9):822-829.

23.Huang WC, Wu MF, Chen HC, et al. Features of COPD patients by compa ring CAT with mMRC: a retrospecttive, cross-sectional study. NPJ Prim Care Respir Med. 2015;25:15063.

24.Perez-Padilla R, Schilmann A, Riojas-Rodriguez H. Respiratory health effects of Indoor air pollution. Int J Tuberc Lung Dis. 2010;14:1079–1086.

25.Umoh VA, Peters E. The relationship between lung function and indoor air pollution among rural women in the Niger Delta region of Nigeria. Lung India. 2014; 31(2):110-115.

26.Mukherjee S, Roychoudhury S, Siddique S, Banerjee M, Bhattacharya P, Lahiri T, Ray MR. Respiratory symptoms, lung function decrement and chronic obstructive pulmonary disease in pre-menopausal Indian women exposed to biomas ssmoke. Inhal Toxicol. 2014; 26:866–872.

27. Ngahane BHM,Afane Ze E, Chebu C, et al.E ffects of cooking fuel smoke on respiratory symptoms and lung function in semi-rural women in Cameroon. Int J Occup Environ Health. 2015;21(1):61-65.

28.Fullerton DG, Suseno A, Semple S, Kalambo F, Malamba R, White S, et al. Wood smoke exposure, poverty and impaired lung function in Malawian adults. Int J Tuberc Lung Dis. 2011;15(3):391–398.

29.Desalu OO, Adekoya AO, Ampitan BA.Increased risk of respiratory symptoms and chronic bronchitis in women using biomass fuels in Nigeria. Sendto J Bras Pneumol. 2010;36(4):441-446.

30.Liu S, Zhou Y, Wang X, et al. Biomass fuels are the probable risk factor for chronic obstructive pulmonary disease in rural South China. Thorax. 2007;62:889– 897.

31. De Oca MM, Zabert G, Moreno D, et al. Smoke, Biomass Exposure, and COPD Risk in the Primary Care Setting: The PUMA Study. Respir. Care 2017;62(8):1058-1066.

32. Duan J, Cheng W, Zeng Y, Chen Y. , et al. Characteristics of Patients with Chronic Obstructive Pulmonary Disease Exposed to Different Environmental Risk Factors: A Large Cross-Sectional Study. Int J Chron Obstruct Pulmon Dis. 2020;15:2857-2867.

33. Balcan B , Akan S , Ugurlu AO , et al. Effects of biomass smoke on pulmonary functions: a case control study. Int J Chron Obstruct Pulmon Dis. 2016;19;11:1615-22.

34.Maas A, Kothe H, Centeno IP, Leiva MJG et al. Prevalence of Chronic Bronchitis and Respiratory Health Profile of a Population Exposed to Wood Smoke in Nicaragua. J Health Pollut. 2020;10(26): 200607.