VALIDATION OF BASIC DIAGNOSTIC METHODS FOR CHRONIC OBSTRUCTIVE BRONCHITIS IN PRIMARY HEALTHCARE SETTINGS

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Abstract. Chronic obstructive bronchitis represents a serious public health problem, particularly in regions with limited diagnostic capabilities. The research aims to develop simple and accessible methods for early detection and disease monitoring at the ambulatory care level. The study objective was to evaluate the effectiveness of available diagnostic methods (mMRC questionnaire, spirometry, pulse oximetry) for managing patients with suspected chronic obstructive bronchitis. The study included 80 patients (40-70 years old) with chronic cough and sputum production. Clinical, instrumental, and laboratory diagnostic methods were employed. The combination of the mMRC questionnaire and spirometry demonstrated high sensitivity (92%) and specificity (88%). Decreased oxygen saturation (≤94%) correlated with severe airway obstruction. Leukocytosis indicated bacterial infection, while intensive smoking and frequent exacerbations were associated with rapid disease progression. Available clinical and instrumental methods are effective for diagnosing and assessing the severity of chronic obstructive bronchitis in ambulatory settings.

Keywords: chronic obstructive bronchitis, diagnosis, spirometry, mMRC, pulse oximetry, radiography, outpatient practice, accessible methods, sensitivity, specificity.

Chronic obstructive bronchitis (COB) and chronic obstructive pulmonary disease (COPD) represent one of the most common causes of morbidity and mortality worldwide, particularly among individuals over 40 years of age, with prevalence increasing with age. Despite significant advances in diagnosis and treatment, COPD remains substantially underestimated and underdiagnosed, which is associated with

insufficient utilization of spirometry even in the presence of symptoms. According to population-based studies, patients with chronic bronchitis exhibit accelerated lung function decline, increased exacerbation risk, impaired quality of life, and elevated mortality risk compared to patients without bronchitis. Importantly, even in patients without significant obstruction, the presence of chronic cough and sputum is associated with more rapid disease progression and development of irreversible lung changes. In settings with limited resources and insufficient equipment of primary healthcare facilities with high-tech diagnostic methods, implementation of accessible and effective screening algorithms is particularly relevant, enabling timely identification of patients with COB and prevention of disease progression.

The aim of this study was to evaluate the diagnostic effectiveness of basic clinical and instrumental methods (mMRC questionnaire, spirometry, pulse oximetry) for detecting chronic obstructive bronchitis in outpatient settings.

Materials and Methods

A prospective observational study was conducted at the outpatient department of Tashkent State Medical Academy from September 2024 to March 2025. The study included 80 patients aged 40–70 years with clinical signs of chronic obstructive bronchitis (cough with sputum ≥3 months per year for two consecutive years). Exclusion criteria included bronchial asthma, oncological diseases, and refusal to participate.

The validated mMRC (Modified Medical Research Council) questionnaire was used to assess respiratory symptoms (Figure 1), comprising five questions for grading dyspnea: from 0 points (dyspnea only during intense exertion) to 4 points (dyspnea at rest). A result ≥2 points was considered a marker of high probability of COB.

Clinical and instrumental examination included spirometry with bronchodilator test (portable spirometer MIR Spirobank II), where the criterion for obstruction was FEV□/FVC ratio <0.7 after salbutamol inhalation. Pulse oximetry (Nonin Onyx 9500) was performed to measure SpO□ at rest. Chest radiography was performed when complications were suspected (pneumonia, emphysema). Laboratory

diagnostics included complete blood count (Mindray BC-30 analyzer) and sputum microscopy.

Statistical data processing was performed using SPSS v.28 software with application of ROC analysis to evaluate diagnostic accuracy of methods, multiple logistic regression to identify predictors of progression, and Pearson correlation analysis. All data were anonymized, measurements were conducted with adherence to reproducibility standards (for example, spirometry was performed three times with recording of the best result)[1–5].

Grade	Severity	Problem Description	Answer Options
0	None	Dyspnea only occurs during strenuous exercise, with the exception of very intense exertion	Yes, No
1	Mild	Dyspnea occurs when hurrying or when climbing a slight hill or incline	Yes, No
2	Moderate	Dyspnea causes the patient to walk slower than other people of the same age, or necessitates making stops while walking at their own pace on level ground	Yes, No
3	Severe	Dyspnea causes the patient to make stops when walking at a distance of approximately 100 meters or after a few minutes of walking on level ground	Yes, No
4	Very Severe	Dyspnea makes it impossible for the patient to leave their home unassisted, or dyspnea occurs when dressing and undressing	Yes, No

Fig.1. mMRC (Modified Medical Research Council) Dyspnea Scale

Results

The study conducted at the outpatient department of Tashkent State Medical Academy (September 2024 – March 2025) with participation of 80 patients (65% males, mean age 56±8 years) revealed significant diagnostic value of accessible methods in managing chronic obstructive bronchitis (COB). The combination of mMRC questionnaire and spirometry demonstrated high accuracy: in 87% of patients with mMRC score ≥2, obstruction was confirmed (FEV□/FVC <0.7). Pulse oximetry proved to be a reliable marker of disease severity: SpO□ reduction to ≤94%

correlated with pronounced impairment of lung function (FEV□ <60% in 78% of patients). Chest radiography, performed in 45% of participants, detected signs of emphysema in only one-third of cases, predominantly in severe obstruction. Laboratory data showed that leukocytosis (>9×10□/L) was associated with bacterial colonization of sputum (OR 2.8), while eosinophilia (>5%) was rare (12%) and did not affect prognosis. Smoking >20 pack-years and frequent exacerbations (>2/year) became key predictors of rapid COB progression, increasing risk 3.2 and 4.1-fold, respectively.

Table 1.

Comparative Characteristics of Diagnostic Value and Predictors of COB Progression

Parameter	95% CI	p
Sensitivity of mMRC + spirometry	92% (85–97%)	<0.001
Specificity of mMRC + spirometry	88% (79–94%)	<0.001
Correlation between SpO□ and FEV□	r = -0.62	<0.001
RR for smoking >20 pack-years	3.2	0.01
RR for ≥2 exacerbations/year	4.1	0.047
Leukocytosis and bacterial colonization	OR 2.8	0.03

The obtained data confirm that an algorithm based on questionnaire, spirometry, and pulse oximetry enables effective diagnosis and stratification of patients with COB in outpatient settings, minimizing the use of costly imaging methods.

Discussion

In discussing the research results, it is important to note that the obtained data confirm the high diagnostic value of accessible examination methods, such as the mMRC questionnaire, spirometry, and pulse oximetry, in managing patients with chronic obstructive bronchitis (COB) in the outpatient settings of Tashkent State Medical Academy. These results are consistent with current international

recommendations and studies that emphasize the importance of early diagnosis and risk stratification of COB using simple and cost-effective tools[6–8].

Comparison with existing studies demonstrates that the role of spirometry as the gold standard for COB diagnosis is confirmed in our work: the sensitivity and specificity of the proposed algorithm (mMRC + spirometry) were at the level of best global practices, which is supported by data from, for example, studies published by Alotaibi and colleagues, where the importance of accessible methods for optimizing COPD detection in resource-limited settings is emphasized. At the same time, unlike some international recommendations that propose including CT in the diagnostic algorithm, our results show that basic methods are sufficient for primary care, which allows substantial reduction of diagnostic costs[2,8,9].

Pulse oximetry, according to our data, is a reliable marker of obstruction severity, which is also consistent with results of studies published in JAMA and other high-impact journals, where SpO□ was used as an indicator of condition severity in patients with COPD exacerbations. However, in several studies, for example, in articles on COPD diagnosis, the need for cautious interpretation of SpO□ values is noted, as they may be overestimated in patients with chronic hypoxemia[10–13].

Chest radiography in our study had limited diagnostic value, which is consistent with international consensus statements, where CT is recommended only in the presence of specific indications. This confirms the appropriateness of abandoning routine use of radiography in favor of more informative methods when there is no suspicion of complications[14–17].

The identified association of leukocytosis with bacterial colonization of sputum also corresponds to data from other studies, where pathogen isolation was more frequently noted in patients with chronic bronchitis and severe obstruction. This emphasizes the importance of laboratory methods for detecting infectious complications and optimizing antibiotic therapy[18–20].

Despite the high diagnostic effectiveness of the proposed algorithm, it is important to consider the limitations of the study: a relatively small sample size drawn from a single clinic and the lack of long-term data regarding disease

progression. These limitations are also characteristic of other studies focused on optimizing COPD diagnosis in outpatient settings[21,22].

Thus, the results of this study support the implementation of combined questionnaires, spirometry, and pulse oximetry in outpatient practice for early diagnosis and risk stratification of COPD. This aligns with the principles of evidence-based medicine and enables optimal use of healthcare resources. Future research should aim to assess long-term outcomes with this algorithm and its effect on patient quality of life[23–25].

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