Management of Asthma and COPD According to WHO PEN Protocol 3: A Cross-sectional Study

Tayseer Afifi*, Khamis Elessi, Mosab Samaan, Othman Alagha, Ahmed Abu Lamzi, Ahmed Alihasan, Belal Alhabil, Ayham Abu Elqomboz and Hazem Alagha

Faculty of Medicine, The Islamic University - Gaza, Gaza, Palestine

*Corresponding Author: Tayseer Afifi, Faculty of Medicine, The Islamic University - Gaza, Gaza, Palestine.

Abstract

Background: Asthma and chronic obstructive pulmonary disease (COPD) are two of the most common chronic lung illnesses worldwide. They share some common clinical manifestations such as cough and dyspnea. Therefore, distinguishing between these different pulmonary diseases can sometimes be difficult in practice. However, complete medical history and proper diagnostic testing usually allow easy differentiation. This is especially important because each condition has its own therapeutic approach. Thus, a definitive diagnosis is essential for sound treatment.

Objectives: The aim of this study was to describe the management of asthma and COPD in general practice. Furthermore, to evaluate the diagnostic criteria followed by Palestinian physicians in establishing the definitive diagnosis, and to assess disease severity among these patients.

Methods: A cross-sectional study involving patients who were already diagnosed with Asthma or COPD was conducted at Gaza Hospitals. Data was collected retrospectively using a self-designed questionnaire based on the WHO- PEN protocol 3. Selection of our convenient sample of medical records was based on adequacy of medical details in the files.

Results: Our results fall into two categories; asthmatic patients and COPD patients. The study included the review of 124 patients' records; 91 asthmatic patients and 33 COPD patients. The most frequent diagnostic criteria in asthmatic patients was that the symptoms respond to salbutamol. However, long term history of cough and sputum production was the most frequent diagnostic criteria for COPD patients. Asthmatic patients were more controlled than COPD patients and they adhere to doctor's counsel more than COPD patients. This, in turn, made COPD patients suffer more than asthmatic patients from disease exacerbations.

Conclusion: These results demonstrate fairly good adherence to the WHO-PEN protocol 3 in these hospitals reflecting a moderate quality of care and follow-up. Furthermore, the medical records were satisfying in general regarding the availability of the basic information we needed for our study. However, there were some deficiencies in some items such as how often the patient had exacerbations of the disease, which should be properly documented for better counseling for patients with high risk.

Keywords: Asthma; COPD; WHO PEN Protocols; Severity Assessment; Non-Communicable Disease (NCD); Gaza

Introduction

Asthma and chronic obstructive pulmonary disease (COPD) are among the most common chronic diseases of the lungs that cause considerable mortality and morbidity. Although typically classified as distinct entities, they both involve obstructive airflow limitation,

shortness of breath; cough, sputum and inflammation, and some describe them as existing along the same spectrum. However, these similarities can often cause difficulties in making the correct diagnosis by physicians in everyday practice [1]. These lung diseases differ from each other mainly in terms of pathogenesis, disease progression, prognosis, and treatment options [2]. They are major public health problems accounting for a considerable share of the disease burden in low- and middle-income countries (LMICs). In 2004, 6.8% of deaths in women and 6.9% in men in LMICs were caused by these chronic respiratory diseases, according to the WHO Global burden of disease report: update 2004.

It is important to distinguish between asthma and COPD for proper treatment, but early diagnosis and initiation of treatment remain a major challenge for even the experienced clinician and some pulmonologists [3]. The correct guideline-based diagnosis and appropriate pharmacological treatment of these two common diseases is extremely important.

Asthma and COPD present to a clinician in various forms and usually with non-specific symptoms and signs, leading to significant under-diagnosis and mis-diagnosis in some cases. Around 70% of asthmatics in the population aged more than 40 years remain undiagnosed and around 30% of patients diagnosed to have asthma do not have asthma [4,5]. The following two paragraphs present a summary on the pathophysiology of both diseases.

Early in the 1990's, asthma was categorized as either "allergic" or "non-allergic." Since then, advanced diagnostic techniques have allowed for a marked expansion of these categories, resulting in the identification of dozens of asthma phenotypes [6]. Most of these have defined discrete triggers, rather than unique pathophysiologic mechanisms. At its root, in people with asthma, the responses of the asthmatic airway to provocative stimuli remain constant: bronchoconstriction, bronchial mucosa hyper-responsiveness, and inflammation [6].

Chronic obstructive pulmonary disease is a syndrome of progressive airflow limitation which, in contrast to asthma, is not fully reversible. It is characterized by abnormal inflammatory responses of the lungs to noxious particles or gases leading to structural changes and narrowing of the small airways. This pathophysiology results in hyperinflation of the lungs (i.e. an increase of end expiratory lung volume due to airflow limitation), weakened respiratory muscles, and inefficient gas exchange [7]. Early definitions of COPD distinguished different types (e.g. chronic bronchitis, emphysema). This distinction is not in the current definition, but individual patients present with along spectrum. An asthma-COPD overlap syndrome is also recently recognized [8].

Properly functioning health systems are vital for prevention and control of NCDs, and for improving health outcomes in general. For equity and efficacy of health care centers and outpatient departments, they intend to implement these tools to strengthen the service delivered to NCDs patients. However, there is paucity of evidence on the use of WHO PEN protocol 3 in delivering high-quality service to patients. Therefore, the present study aimed to (1) evaluate the diagnostic criteria followed by Palestinian physicians in establishing the definitive diagnosis, (2) to assess the tests utilized to confirm the diagnosis and (3) to assess the adequacy and appropriateness of treatment according to the disease severity. Finally, authors want to check if the patients received enough information and counseling regarding their conditions.

Methods

Study design and settings

This cross-sectional study was carried out in three major hospitals in Gaza where asthmatic and COPD patients are closely managed. These hospitals are Shifa Medical Complex (SMC), Nasser Medical Complex (NMC) and Alaqsa Hospital (AH). The study involved 124 patients diagnosed with either asthma or COPD who attended at these centers during the period from June 1st to September 1st 2018.

All eligible men and women from all ages were included as study population. However, patients who had lung cancer, pregnant women, mentally retarded and bed-ridden patients were excluded from the study.

WHO PEN Protocol 3

WHO PEN Protocol 3 belongs to a group of protocols developed by WHO and named The WHO Package of Essential Noncommunicable Disease Interventions (WHO PEN). This protocol beside other in the same series are generally meant for primary and secondary care in low-resource settings as an innovative and action-oriented set of cost-effective interventions that can be delivered to an acceptable quality of care [9].

Protocol 3 in particular is concerned with the management of Asthma and COPD and treat their exacerbations. It provides recommendation on asthma and COPD treatment as well as their exacerbation management.

Data collection

Six medical students were trained for one week on study protocol, tools and data collection techniques of the study. Data were collected using a self-designed questionnaire based on the WHO- PEN Protocol 3. The survey tool contained three domains, first one includes questions related to demography and socio-economy, tobacco, physical activity level and known allergies of patients. The second domain includes diagnostic criteria and severity assessment of patients. And the third domain encompassed the treatment plan and patients' counsel. The tool was revised after conducting a pilot study among 15 medical records. The data were collected retrospectively choosing files with enough details, in case the file was not completed, it was excluded.

Definitions of variables

Education status was categorized as no schooling and attended school [10]. A smoker was the one who has smoked currently or who quit smoking less than one year before the assessment [9]. For occupation, respondent working in paid governmental and nongovernmental organization was labeled as employed, running own business as self-employed, and student or housewife or non-paid worker as unemployed [11].

Statistical analysis

Data were analyzed using the SPSS version 23.0. Frequency distributions and percentages were computed for all the variables.

Ethical consideration

Ethical clearance was obtained from Directorate General of Human Resources Development at Ministry of Health, State of Palestine. Written consent was gained form hospitals' heads to enable us to review medical records. Study objectives, data collection procedures, benefits and risks of the study, confidentiality, and anticipated use of the results were explained to research committee in the ministry in detail before executing our work.

Results

Baseline characteristics

Results are divided to two categories; asthmatic patients and COPD patients. The study included the review of 124 patients' records; 91 asthmatic patients and 33 COPD patients. Most of asthmatic patients were females (n = 58), while males were dominant in COPD's (n = 31). The mean age was 45 in asthmatic patients. On the other hand, it was 61 in COPD patients. The higher proportion of sample attended or attend school. Most patients are classified as self-employed as they run their own business. This, in some cases, was the probable cause of their disease and its progression. Most asthmatic patients are young which explains their physical activity more than COPD patients. On the other hand, the old age and multiple disease exacerbation prevent COPD patients from their daily activities. Table 1 summarizes the study population characteristics.

Study variables	Asthma	COPD	Total
Gender			
Male	33	31	64
Female	58	2	60
Age in years			
5 - 25	9	0	9
25 - 45	29	3	32
45 - 65	31	12	43
≤65	22	18	40
Smoking			
Smokers	4	28	32
Non-smokers	87	5	92
Educational status			
Not schooling	10	4	14
Primary	13	2	15
≥ Secondary	68	25	93
Occupation			
Employed	17	3	20
Self employed	43	13	56
Unemployed	23	9	32
Retired	8	6	14
Physical activity status			
Inactive	31	23	54
Active	60	10	70

Table 1: *Characteristics of study subjects.*

Diagnostic criteria

First, for asthmatic patients, the most frequent diagnostic criterion was that symptoms respond to salbutamol. The early appearance of symptoms in childhood comes in the second place. It is well noticed that females' symptoms are triggered by infection and stress more than males. Little patients have night symptoms which means that patients' symptoms are well-controlled. Table 2 shows the frequency distribution among males and females.

	Diagnostic Criteria	Frequency	Gender	
			M	F
DC1	Symptoms since childhood or early adulthood.	27	12	15
DC2	History of hay fever, eczema and/or allergies.	20	9	11
DC3	Intermittent symptoms with asymptomatic periods in between.	6	4	2
DC4	Symptoms worse at night or early morning.	10	6	4
DC5	Symptoms triggered by respiratory infection, exercise, weather changes or stress.	13	3	10
DC6	Symptoms respond to salbutamol.	35	16	19

Table 2: *Distribution of diagnostic criteria among asthmatic patients. DC: Diagnostic Criterion.*

Interestingly, some patients required more than one diagnostic criterion to establish their diagnosis. However, most patients required only one diagnostic criterion for diagnosis. On the other hand, three diagnostic criteria were needed to diagnose 7 patients. Figure 1 demonstrates the number of diagnostic criteria needed for each patient.
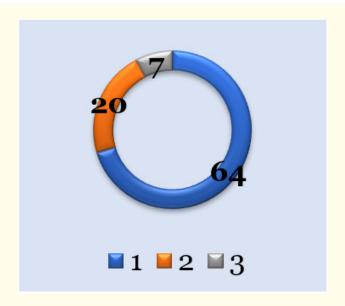

Figure 1: Number of diagnostic criteria required for diagnosis among asthmatic patients.

Second, for COPD patients, long term history of cough and sputum production was the most frequent diagnostic criteria followed by history of smoking. Smoking is recognized a major cause of COPD especially if it was more than 20 pack year. Interestingly, one woman had a history of smoking in comparison to 27 men. COPD manifests in the middle age and more frequent after the age of 40. However, it is noticed in table 1 that three patients are less than 40. Which makes the fact that COPD could appear before the age of 40. The rest of diagnostic criteria are clarified in table 3.

	Diagnostic Criteria	Frequency	Gender	
			M	F
DC1	History of heavy smoking, i.e. > 20 cigarettes per day for > 15 years.	15	14	1
DC2	History of heavy and prolonged exposure to burning fossil fuels in an enclosed space, or high exposure to dust in an occupational setting.	0	0	0
DC3	Symptoms started in middle age or later (usually after age 40).	11	9	2
DC4	Symptoms worsened slowly over a long period of time.	2	2	0
DC5	Long history of daily or frequent cough and sputum production often.	29	27	2
DC6	Starting before shortness of breath.	0	0	0
DC7	Symptoms that are persistent with little day-to-day variation.	1	1	0

Table 3: Distribution of diagnostic criteria among COPD patients. DC: Diagnostic Criterion.

Figure 2 shows the number of diagnostic criteria required for diagnosis. It is clear that most patients needed more than one criterion in contrast to asthmatic patients.
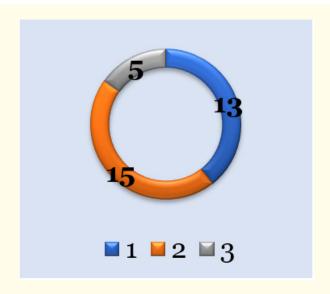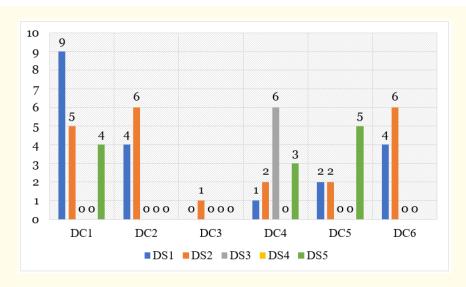
Figure 2: *Number of diagnostic criteria required for diagnosis among COPD patients.*

Severity assessment

Asthmatic patients were assessed regarding Disease Severity (DS). We followed the protocol items which were (DS1) respiratory rate more than 25 breaths/minute, (DS2) Heart rate ≥ 110 beats/minute, (DS3) Inability to complete sentences in one breath, (DS4) altered conscious level, exhaustion, arrhythmia, hypotension, cyanosis, silent chest, poor respiratory effort and (DS5) SpO_2 <92%. We computed disease severity frequency in comparison to diagnostic criteria. We found that patients who had childhood symptoms suffered the most from their respiratory rate being more than 25 breaths/minute. Furthermore, patients with night symptoms suffered the most from inability to complete sentences in one breath. It is important to say that none of the patients had altered consciousness level, hypotension or arrhythmia. Figure 3 spots light on how many patients per each diagnostic criterion suffered during the course of the disease.
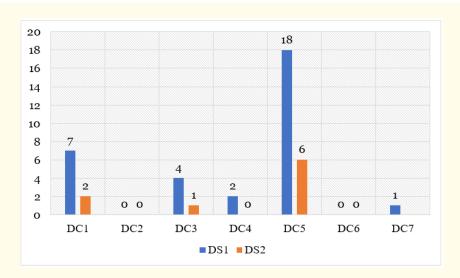

Figure 3: *Distribution of severity assessment among patients classified according to their diagnostic criteria. (asthmatic patients).*
DC: Diagnostic Criterion; DS: Disease Severity.

Citation: Tayseer Afifi., *et al.* "Management of Asthma and COPD According to WHO PEN Protocol 3: A Cross-sectional Study". *EC Pulmonology and Respiratory Medicine* 8.10 (2019): 811-820.

The previous figure reflects that most patients had their disease been controlled well as the number of patients who suffered from disease severity is not significant. This, in turn, means that patients follow their treating physician instructions thoroughly.

On the other side, COPD patients suffered more than asthmatic patients. Their Disease Severity (DS) items are; (DS1) being breathless at normal activity, and (DS2) being breathless at rest. We also computed disease severity frequency in comparison to patients' diagnostic criteria. As illustrated in figure 4, patients from all diagnostic criteria groups suffered from being breathless with normal activity. However, few patients had episodes of being breathless at rest.

Figure 4: Distribution of severity assessment among patients classified according to their diagnostic criteria. (COPD patients). DC: Diagnostic Criterion; DS: Disease Severity.

It is not surprising that COPD patients suffered more, as they continue to smoke cigarettes despite their disease. Moreover, their reckless behavior in following physicians' counsel. Which ends in poor disease control?

Treatment and counseling

All patients were treated according to protocol recommendations. The treatment was appropriate to the disease severity in almost all cases. In addition to disease treatment, patients were followed up very well to monitor their compliance and adherence to instructions. Furthermore, whenever patients had a disease exacerbation, they were treated accordingly and hospitalized when needed. Asthmatic patients were counseled on paying more attention to their work environment and avoidance of all precipitant allergens. On the other hand, COPD patients were counseled mostly on smoking cessation and following doctors' instructions properly.

Some patients had associated comorbidities especially heart diseases. They were more evident in COPD patients. These patients were prescribed statins and aspirin for that.

Discussion

To the best of our knowledge, this study is the first to compare the actual clinical practice at major Gaza strip hospitals with best recommendations derived from WHO PEN Protocol 3. Afifi., *et al*. [12] conducted a study on WHO PEN Protocol 1 at Gaza primary health care centers. On the other hand, many trials in different countries [13,14] attempted to integrate these protocols into their health systems and most of them proved that, the PEN program is useful for developing health service and managing NCDs.

Our study provides a snapshot of the general practice and management of asthma and COPD in Gaza Strip. We observed that asthma was mostly managed for repeated exacerbations, but, encouragingly, one-third of COPD patients were for follow up and counsel. GPs classified asthma as well controlled for more than three-quarters of patients. Although it is difficult to assess the appropriateness of treatment from cross-sectional data, the findings suggest appropriate prescribing relative to WHO PEN Protocol recommendations.

Most of COPD patients were over 40 years of age. However, three patients in our sample were younger than that. This significantly addresses the importance of recognizing COPD at younger age. Studies [15] have shown that there is association between some genetic predispositions such as alpha-1 antitrypsin deficiency and young age of COPD patients. On the other hand, others concluded that heavy smoking could result in appearance of symptoms before the age of 40 [16]. It is important for health care professionals to be aware of asthma-COPD overlap syndrome as it may appear at younger age.

The diagnosis of asthma was easier for health care professionals than COPD. As noticed in the results, most asthmatic patients were diagnosed using one diagnostic criterion. However, more than one diagnostic criterion was required to diagnose COPD patients. This also may be due to the complexity of symptoms and the old age at presentation. It was interesting to find that most patients with these respiratory conditions are physically active. It was also found that the level of education is correlated to treatment compliance. Patients with higher level of education seemed to be healthier.

It is clear that the earlier the symptoms appear in asthma, the more sever disease course will be. Furthermore, the more likely to have exacerbations. Also work conditions were associated with disease development and disease severity. Patients were counseled on changing their work environment and some responded well. Subsequently, their symptoms relieved after changing their work conditions. Asthmatic patients committed very well to doctors' treatment and advice, which, in turn, resulted in mild disease course in most patients. In contrast, COPD patients didn't follow doctors' instructions thoroughly. This leads to more aggressive disease.

Chronic cough and sputum production, associated with an abundance of mucus-producing elements in the large airways, are major symptoms of COPD. In our study, smokers with COPD reported significantly more chronic cough and phlegm than non-smoker patients, which is consistent with the knowledge that tobacco smoke is responsible for goblet cell hyperplasia and chronic over-secretion of mucus [17,18]. It was well observed that smokers with COPD had more severe disease than non-smokers.

There are several limitations to the current study that should be considered. First, it is a retrospective investigation, and data collection was based on medical records. Apart from smoking history, risk factors for COPD, such as occupation and indoor air pollution, were not analyzed because of incompleteness of data. Second, this was a cross-sectional study, whereas longitudinal follow-up cohort research is required to look into whether differences in lung function decline and treatment responses exist between smokers and non-smokers with COPD.

Nevertheless, these limitations do not prevent the conclusion that non-smokers with COPD have less impairment of airflow limitation and gas exchange, and a lower prevalence of emphysema, chronic cough, and sputum compared with their smoking counterparts. Tobacco cessation is warranted in smokers with COPD. Smoking cessation was evident in all COPD patients' records.

For asthmatic patients, they were managed at the outpatient departments. These settings are of an ideal opportunity to ensure that a patient has an asthma action plan. All asthmatic patients or their parents should be well-informed on the best way to manage exacerbations. A written action plan provides the necessary information for exacerbation management in an easily accessible format for use in an emergency. Asthmatic patients in our study were well managed and they had well-organized action plan. This, in turn, led to improved asthma outcomes. We noticed variation in the level of adherence is extreme in children with asthma. Thus, for school-aged children, we recommend a copy of the action plan should be provided to the school.

The researchers found too little literature that spot light on this issue. Most published work focused on the pathophysiology and developing medical treatments. There is a need to look deep into patients' status with these diseases. They could be best studied using

WHO PEN protocol guidance. We also recommend further research to be done in our setting and a clear strategy should be planned to unify practice among all health care professionals in Gaza Strip hospitals.

Conclusion

The is some evidence that, no all hospitals and departments Gaza hospitals follow clear and unified steps to distinguishing between asthma and COPD. Therefore, the presence of clear protocols with clear recommendations would make it more feasible. Hospitals, where this study was conducted at, showed slight differences in the management of these patients. Our findings suggest a moderate adherence to WHO PEN Protocol 3. Practice should be improved in order to reach optimal clinical outcomes and effective treatment costs. Furthermore, the medical records were generally satisfying regarding the availability of the basic information needed. However, there were some deficiencies in some items such as how many times the patient had an exacerbation of the disease, which should be properly documented for better follow up. We recommend better file documentation and training of health providers on WHO PEN protocol. Additional research is required to identify measures that can improve adherence in order to develop our health care settings.

Competing Interest

Authors declare that they have no competing interests.

Funding

None.

Authors' Contribution

Afifi T prepared the study proposal, study tools and conducted the pilot study. Abu-Lamzi A, Alhabil B, Alagha H, Alagha O, Abu-Elqomboz A and Alihasan A collected the data and entered them to SPSS. Afifi T and Samaan M analyzed the data. Afifi T wrote the initial draft of the article and prepared the final draft. Elessi K supervised the study. All authors approved the final draft.

Availability of Data and Materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Bibliography

1. Carolan BJ and Sutherland ER. "Clinical phenotypes of chronic obstructive pulmonary disease and asthma: recent advances". *Journal of Allergy and Clinical Immunology* 131.3 (2013): 627-634.

2. Chang J and Mosenifar Z. "Differentiating COPD from asthma in clinical practice". *Journal of Intensive Care Medicine* 22.5 (2007): 300-309.

3. Rothe T. "COPD and asthma: same but different". *Praxis (Bern 1994)* 101 (2012): 233-237.

4. Gonzalez-Garcia M., *et al*. "Prevalence, risk factors and underdiagnosis of asthma and wheezing in adults 40 years and older: a population based study". *Journal of Asthma* 52.8 (2015): 823-830.

5. Pakhale S., *et al*. "(Correcting) misdiagnoses of asthma: a cost effectiveness analysis". *BMC Pulmonary Medicine* 11 (2011): 27.

6. Hekking PW and Bel EH. "Developing and Emerging Clinical Asthma Phenotypes". *Journal of Allergy and Clinical Immunology: In Practice* 2.6 (2014): 671-680.

7.   Sutherland ER and Cherniack RM. "Management of chronic obstructive pulmonary disease". *New England Journal of Medicine* 350.26 (2004): 2689-2697.

8.   Postma DS and Rabe KF. "The Asthma-COPD Overlap Syndrome". *New England Journal of Medicine* 373 (2015): 1241.

9.   World Health Organization. "Prevention and control of noncommunicable diseases: guidelines for primary health care in low resource settings". World Health Organization (2012).

10. The United Nations Educational, Scientific and Cultural Organization (UNESCO). ISCED: International standard classification of education (1997).

11. Mahesh Kumar Khanal MSA., *et al*. "Total cardiovascular risk for next 10 years among rural population of Nepal using WHO/ISH risk prediction chart". *BMC Research Notes* 10 (2017): 120.

12. Tayseer Afifi., *et al*. "Evaluating the Adherence of Primary Health Centers in Gaza Strip to the WHO-PEN Protocol 1: A Cross-Sectional Study". *Journal of Clinical Review and Case Report* 4.5 (2019).

13. Rammell Martinez., *et al*. "Use of the WHO Package of Essential Noncommunicable Disease Interventions after Typhoon Haiyan". *Western Pacific Surveillance and Response Journal* 6.1 (2015): 18-20.

14. Choe Suk Hyon., *et al*. "Package of essential noncommunicable disease (PEN) interventions in primary health-care settings in the Democratic People's Republic of Korea: a feasibility study". *WHO South-East Asia Journal of Public Health* 6.2 (2017): 69-73.

15. Reddel HK., *et al*. "Assessment and management of asthma and chronic obstructive pulmonary disease in Australian general practice". *Australian Family Physician* 46.6 (2017): 413-419.

16. Leading cause of death, illness and impoverishment (2019).

17. Ekberg-Jansson A., *et al*. "Respiratory symptoms relate to physiological changes and inflammatory markers reflecting central but not peripheral airways. A study in 0 year-old 'healthy' smokers and never-smokers". *Respiratory Medicine* 95 (2001): 40-47.

18. Higenbottam T., *et al*. "Lung function and symptoms of cigarette smokers related to tar yield and number of cigarettes smoked". *Lancet* 1.8165 (1980): 409-411.