



The Egyptian Society of Chest Diseases and Tuberculosis
Egyptian Journal of Chest Diseases and Tuberculosis

www.elsevier.com/locate/ejcdt
www.sciencedirect.com



ORIGINAL ARTICLE

A simple, reliable quantitative score for grading chest X-ray in adult asthma



Al-Said A. Haffor ^{a,*}, Magdi Ismaeel ^b

^a College of Applied Medical Sciences in Wadi Aldwasir, Wadi Aldwasir 11991, Saudi Arabia

^b General Hospital in Wadi Aldwasir, Wadi Aldwasir 11991, Saudi Arabia

Received 3 April 2014; accepted 15 May 2014

Available online 10 June 2014

KEYWORDS

Asthma;
Chest X-ray;
Perihelia marking;
PEF;
Wheezing;
FR;
HR

Abstract The purpose of the present study was to rate the level of spread of the morphological changes on chest X-ray (CXR), using the modified Shwachman–Kulczycki (S–K) rating scale, in relation to changes in routinely measurable parameters in outpatient clinic, such as frequency of respiration (FR), heart rate (HR), wheeze (WHZ) and peak expiratory flow (PEF). Asthma patients were classified into 4 groups; Group-1 ≤ 2 visits per week with reversible symptoms, Group-2 two visits per week with irreversible symptoms, Group-3: 3–4 visits per week with irreversible symptoms; Group-4: patients with severe shortness of breath in whom SaO₂ was threatening, hence were admitted as inpatients. CXR for group-2 showed bilateral increase in perihelia marking, broncho-vascular markings but normal lungs fields and ruled out for costophrenic angles. Group-3 showed hyperinflation, obvious perihelia marking associated with bronchial thickening and blocking as well as unfolding aorta, with significantly ($p < 0.05$) lower PEF, higher HR, FR and WHZ than group 1 and 2. There was also some evidence of bronchial edema with clearly observed fleeting terminal bronchial opacities. CXR for Group-4 showed, extensive atelectasis secondary to obstruction and infection due to bronchiolitis and/or signs of right heart failure. Intra-class correlation coefficient showed a significant ($p < 0.05$) reliability among evaluators of CXR, implying its consistent applicability. Based on the results of the present study it can be concluded that monitoring PEF, FR, WHZ and HR parameters in outpatient clinic can be an objective estimate of the S–K score in order to classify the severity of asthma-induced-morphological changes in CXR.

© 2014 Production and hosting by Elsevier B.V. on behalf of The Egyptian Society of Chest Diseases and Tuberculosis. Open access under [CC BY-NC-ND license](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Introduction

Asthma is a lung disease that is characterized by inflammation, obstruction, and hyper responsiveness of the airways. Acute inflammation is nonspecific response of tissue injury and may lead to tissue repair. In contrast asthma represents a chronic inflammatory process of the airways followed by healing whose end results involve altered morphology of the airways referred to as remodeling [35,23,25] which in turn leads to a widespread

* Corresponding author. Tel.: +966 0507201601.

E-mail address: a.haffor@sau.edu.sa (A.-S.A. Haffor).

Peer review under responsibility of The Egyptian Society of Chest Diseases and Tuberculosis.

narrowing at different degrees of severity. Narrowing of the airways causes recurrent episodes of wheezing, dyspnea, chest tightness, cough, tachypnea and tachycardia particularly at night and/or in the early morning. The inflammation also causes an associated increase in airway responsiveness to stimuli specific to bronchospasm, edema and mucus hyper-secretion [7,2,22,41]. The assessment of asthma progressions has been made based on pulmonary function, physical examination and chest X-ray (CXR) [1,31]. Although no single parameter has been identified to assess the severity of asthma, CXR is a useful method of assessment of asthma because it helps to exclude other pathological conditions such as edema, bronchogenic carcinoma, left ventricular failure, and bronchiectasis. A chest X-ray (CXR) includes the chest, airways, lungs, heart, large arteries, ribs, and diaphragm; hence it involves many useful clinical information and organs that can be affected by the morphological alterations of the airways that underlie the pathological consequences manifested by chronic inflammations in the airways [11]; In addition CXR provides a rough estimate of the degree of hyperinflation like diseases such as emphysema and in revealing complications or alternative causes of wheezing [10,40,42] as well as it provides more useful information in the initial diagnosis of bronchial asthma in excluding complications such as pneumonia.

The quantitative rating scale of the radiological appearances on CXR in asthma can be interpreted in terms of the impact of underlying chronic inflammations of the bronchial tree. Thus it provides useful diagnostic profile as well as it points out the status about patient responses to treatment and healing [20,21,28,32]. Furthermore a numerical prediction of CXR rating score based on regularly measured parameters such as breathing rate (FR), heart rate (HR), peak expiratory flow (PEF) and wheezing; allows for its implementations in primary care clinic and in general physician office without the need for X-ray equipments. Despite this applicable and useful tool for the management of asthma, the literature lacks a quantitative rating score regarding the severity of asthma as it appears on CXR.

The Shwachman–Kulczycki (S–K) score published seven decades ago [39], was the first rating scale to assess the severity of cystic fibrosis – CF on CXR. It was developed to provide the perceived overall clinical status and radiological evaluation and represented a corner stone in the history of CF. The present study is the first report to implement the S–K scoring system in asthma. Our goal was to implement the S–K scoring system to classify asthma severity in a single numerical score from regularly measurable parameters in outpatient clinic such as peak expiratory flow (PEF), wheezing (WHZ), frequency of respiration (FR) and heart rate (HR).

We have derived a simple regression equation from regularly measurable parameters (in general physician office and in primary care outpatient clinics) to provide a single numerical score to classify the severity of asthma induced CXR morphological changes.

Materials and methods

Sample selection

A sample of 40 adult asthmatic patients, ranging in age from 20 to 55 years old were classified into four groups of different

severities of asthma; intermittent, mild persistent, moderate persistent, and severe. Asthma patients with additional clinical conditions related to cancer, eczema, and chronic illnesses (diabetes mellitus, chronic kidney disease, etc.), or chronic inflammation (rheumatoid arthritis, cigarette smokers) were excluded from the study.

Physical examination

A Chest disease physician conducted patients' physical examinations that included but not limited to frequency of respiration (FR), auscultation of the chest wheezing (WHZ), heart rate (HR) and reviewing chest X-ray (CXR).

Modified Schwachman-Kulczki (S–K) Rating Scale of the Chest X-ray

The Schwachman–Kulczki (S–K) scale was originally conducted on cystic fibrosis patients with a numerical value of 25 for healthy and 5 for most severe [39,27]. We modified the S–K scale by excluding the first category for healthy and the modified scale score used in the present study ranged from 5 to 20 with 5 being the most severe and 20 being the least severe asthma. We also allowed a range of 3 in each category to allow for more accuracy by the evaluators. For example a range of 3 to 5 (rather than single point of 5) wherein 3 is observed severe signs at best, 4 observed severe signs, and 5 observed severe signs at least. Similarly 8–10 range implied 3 observations of moderate signs, 13–15 implied a range of mild signs and 18–20 implied a range of intermittent signs of asthma.

Statistical analysis

Statistical analysis was conducted using SPSS for Windows, v.16 (SPSS Inc., Chicago, IL, USA). Data were tested for normality using normal probability subroutine. A One Way Analysis of variance was used to evaluate groups' mean differences. Tukey, post hoc multiple comparisons, was used to conduct pair-wise mean comparisons. The effects of the independent variables (PEF, WHZ, FR, HR) on the outcome variable (S–K score) were evaluated using step-wise multiple regression analysis. The linearity and correlation among variables studied were generated using Pearson product moment correlation. Intra-class multiple correlations were used to evaluate the reliability of the S–K rating score of the chest X-ray (CXR) image based on the evaluators' pathological observations [44].

Results

Descriptive findings

Descriptive findings of the modified Shwachman–Kulczki rating scale

The average S–K rating score of the assessment of patients' chest X-ray (CXR) of asthma severity of the three evaluators for all groups are presented in Table 1.

Table 2 presents information regarding patients' classification, CXR pathological findings, frequency of symptoms and related physiological measures. The criteria used to score the

Download English Version:

<https://daneshyari.com/en/article/3400213>

Download Persian Version:

<https://daneshyari.com/article/3400213>

[Daneshyari.com](https://daneshyari.com)