Comparison of Asthma Control Test (ACT) and Global Initiative for Asthma (GINA) in the Assessment of Asthma Control and Usefulness of Act in a Resource Poor Setting

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Research Article

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ABSTRACT

Background: The gold standard in assessing asthma control is the Global Initiative for Asthma (GINA) criteria. It is difficult to follow GINA criteria in assessing asthma control in resource poor settings because of the lack of access to pulmonary functions tests. The Asthma Control Test (ACT) questionnaire is a simple, self-administered, accessible and validated tool that is used in assessing control among asthmatics. The ACT has the added advantage that it does not require lung function assessment. However, its relationship with GINA guideline-defined asthma control has not been clarified in our setting.

Aim: The aim of this study is to assess asthma control through ACT and GINA, and to determine if the ACT can be as useful as the GINA-guidelines criteria in assessing asthma control in our setting.

Methodology: It was a cross-sectional analytical study. Asthma control was assessed by the ACT and GINA criteria questionnaires. Pulmonary function tests were performed on the subjects according to American Thoracic Society (ATS) guidelines. The sensitivity, specificity, negative and positive predictive values of ACT were determined.

Results: A total of 65 asthmatics participated in this study. The level of asthma control among the subjects was poor, 37% and 23% by ACT and GINA criteria respectively. There was a significant and positive correlation between the ACT and GINA. The Kappa score for the entire subjects was 0.66 representing a substantial agreement between the ACT and GINA.

Conclusion: Asthma control was poor among the subjects. The fact that ACT can predict GINA guidelines-based level of control further gives credence to its usefulness in a resource-poor clinical setting.

Key words: Asthma Control Test (ACT), Global Initiative for Asthma (GINA), Asthma Control, Forced Expiratory Volume in one Second (FEV1).

INTRODUCTION

Asthma is a worldwide disease which affects all ages, sex and racial groups. About 300million people worldwide have asthma and by 2025, it has been estimated that a further 100m people will be affected (John, 2006). In spite of the advances in the detection and treatment of the condition, asthma remains the cause of significant morbidity and economic burden (Smith et al., 1997). Although bronchial asthma is not curable, it is treatable and the best way to reduce the burden of the disease is to control it.

Asthma control refers to the control of disease manifestation both in terms of symptoms and laboratory investigations.

Global Initiative for Asthma (GINA) guidelines-defined (Revised, 2008) assessment of asthma control has been used in some setting to guide management decisions.

However, it is difficult to follow GINA criteria to evaluate asthma control because of lack of access to lung function assessment in our environment. A simple, applicable and accessible asthma control tool is therefore urgently needed.
for patients with bronchial asthma. While there is no comprehensive tool to identify and define control, several instruments (Vollmer et al., 2002; Juniper et al., 1999; Boulet et al., 2002; Nathan et al., 2004) have been developed, tested and validated for their reliability and reproducibility to measure asthma control. Among these questionnaires, the Asthma Control Test (ACT) developed by Nathan et al. (2004) is the most recent and simplified.

The ACT provides a more simplified assessment of asthma control. Lung function testing is not required and it’s very easy to use scoring method. The ACT was designed for use in daily practice as a supplementary measure to physician assessment and/or lung function testing but its relationship with GINA guideline-defined asthma control is not well understood in our setting.

AIM

The aim of this index study was to assess asthma control through ACT and GINA guidelines, and to determine if the ACT can be as useful as the GINA guidelines in assessing asthma control in our setting.

METHODOLOGY

This was a cross-sectional analytical study in which consecutive asthmatics were recruited in the outpatients’ medical clinics at the Obafemi Awolowo University Teaching Hospital (OAUTH), Ile-Ife, South West Nigeria between October 2009 and January 2011. Patients who satisfied the inclusion criteria were recruited in the study. The inclusion criteria were:

1) Age between 16-55 years.
2) Spirometric evidence of asthma defined by a bronchodilator reversibility test with a change in FEV₁ of at least 15% and/or 200ml.
3) Asthmatics without acute exacerbation of symptoms in the prior 4 weeks.

Subjects were excluded if they had co-morbid conditions like hypertensive heart failure and COPD. Those with uncertain diagnosis of asthma and patients with acute severe asthma were also excluded.

A total of 65 patients participated in this study. Asthma control was assessed by self-reported Asthma Control Test (ACT), and GINA guidelines-defined levels of control questionnaires. ACT is a 5-item survey that assesses interference with activity, shortness of breath, nocturnal symptoms, rescue medications and self-rating of asthma control. It is scored from 5-25 with higher scores reflective of better asthma control. An ACT score of 20-25 suggest well controlled, 15-19 represents not well controlled and less than 15 poorly controlled. Patients were classified based on the ACT scores into the various categories.

After the ACT categorization, patients were further classified according to the GINA guidelines into controlled, partly controlled and uncontrolled. The GINA classification was based on clinical symptoms, limitations of activities, need for rescue medications, lung function parameter (FEV₁ or Peak Expiratory Flow, PEF) and acute exacerbation of asthma in the prior one year. Pulmonary function tests were performed according to American Thoracic Society (ATS) guidelines (1994 Update) using standardized spirometer, MICRO MEDICAL LTD, USA.

Data obtained were analyzed with Statistical Package for Social Sciences (SPSS) version 16.0. The Chi-square test was used to determine statistical significance of association between categorical variables while t-test was used for the continuous variables. Correlation between the levels of asthma control by GINA-guidelines and ACT were assessed using Pearson’s linear correlation co-efficient.

The Kappa statistic was used to measure agreement and correctly classified rates between ACT binary split of Not Well Controlled/Poorly Controlled versus Well Controlled on one hand and GINA binary split of Partly Controlled/Uncontrolled versus Controlled asthma (Landis and Koch, 1997) on the other. The Kappa statistic is a means of measuring agreement beyond chance between two sets of observations using categorical data and is interpreted as follows: 0.81-1.0 almost perfect, 0.61-0.80 substantial, 0.41-0.60 moderate, 0.21-0.40 fair, 0.00-0.20 slight and < 0 poor agreement.

The sensitivity, specificity, negative and positive predictive values of ACT were determined. P-value of <0.05 was considered significant.

RESULTS

Table I below shows the clinical and demographic characteristics of the subjects group based on ACT scores. ACT scores <20 denotes ‘Not well controlled’ while ACT scores >/=20 represents ‘Well controlled asthma’. Ten (42%) of
the Well Controlled group used controller medications compared to 5(12\%) of the Not Well Controlled group and the difference was statistically significant (p<0.006).

**TABLE I: The clinical and demographic characteristics of the subjects based on the ACT scores.**

<table>
<thead>
<tr>
<th>Clinical and Demographic Characteristics</th>
<th>ACT(/&gt;=20) N0=24</th>
<th>ACT(&lt;20) N0=41</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean + SD)</td>
<td>36.7+12.9</td>
<td>34.3+10.9</td>
<td>0.42</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male n(%)</td>
<td>11(41%)</td>
<td>16(59%)</td>
<td></td>
</tr>
<tr>
<td>Female n(%)</td>
<td>13(34%)</td>
<td>25(66%)</td>
<td>0.59</td>
</tr>
<tr>
<td>Duration of Asthma, years (Mean +SD)</td>
<td>10.3+7.5</td>
<td>12.1+10.9</td>
<td>0.46</td>
</tr>
<tr>
<td>Age of onset, years (Mean +SD)</td>
<td>24.6+17.4</td>
<td>19.4 +14.2</td>
<td>0.19</td>
</tr>
<tr>
<td>FEV1, Litre (Mean+ SD)</td>
<td>2.12+0.94</td>
<td>1.82+0.80</td>
<td>0.19</td>
</tr>
<tr>
<td>Use of Controller Medications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes n(%)</td>
<td>10(42%)</td>
<td>5(12%)</td>
<td></td>
</tr>
<tr>
<td>No n(%)</td>
<td>14(58%)</td>
<td>36(88%)</td>
<td>0.006</td>
</tr>
</tbody>
</table>

A total of 65 asthmatics participated in this study. Of these, 24(37\%) had ACT scores of at least 20 having 37\% of well controlled asthma while 15(23\%) of the subjects had controlled asthma based on the GINA guidelines-defined levels of control (table II).

**TABLE II: Distribution of the respondents according to the ACT scores and GINA guidelines-based levels of control.**

<table>
<thead>
<tr>
<th>ASTHMA CONTROL</th>
<th>NO</th>
<th>PERCENTAGE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACT CLASSIFICATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poorly controlled</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>Not well controlled</td>
<td>28</td>
<td>48</td>
</tr>
<tr>
<td>Well controlled</td>
<td>24</td>
<td>37</td>
</tr>
<tr>
<td><strong>GINA CLASSIFICATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncontrolled</td>
<td>26</td>
<td>40</td>
</tr>
<tr>
<td>Partly controlled</td>
<td>24</td>
<td>37</td>
</tr>
<tr>
<td>Controlled</td>
<td>15</td>
<td>23</td>
</tr>
</tbody>
</table>

In this study, there appeared to be an association between ACT and GINA guidelines-defined classifications of asthma control. There was a statistically significant and positive correlation between ACT “well controlled”, “not well controlled”, “poorly controlled” and that of GINA “controlled”, “partly controlled” and “uncontrolled” respectively as shown in table III.
TABLE III: Pearson’s correlation (r) of ACT with GINA guideline-defined classifications of asthma control.

<table>
<thead>
<tr>
<th>ACT LEVELS OF ASTHMA CONTROL</th>
<th>Poorly</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled</td>
<td>(r) p-value</td>
<td>(r) p-value</td>
</tr>
<tr>
<td>Controlled</td>
<td>(r) p-value</td>
<td>(r) p-value</td>
</tr>
</tbody>
</table>

GINA LEVELS OF ASTHMA CONTROL

<table>
<thead>
<tr>
<th>GINA LEVELS OF ASTHMA CONTROL</th>
<th>Well</th>
<th>Not Well</th>
<th>Poorly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled</td>
<td>(0.49) 0.00</td>
<td>(-0.26) 0.04</td>
<td>(-0.32) 0.00</td>
</tr>
<tr>
<td>Partly Controlled</td>
<td>(-0.03) 0.80</td>
<td>(0.27) 0.032</td>
<td>(0.23) 0.064</td>
</tr>
<tr>
<td>Uncontrolled</td>
<td>(-0.39) 0.001</td>
<td>(-0.041) 0.75</td>
<td>(0.47) 0.000</td>
</tr>
</tbody>
</table>

There appeared to be an agreement between ACT and GINA in classifying the levels of asthma control. With a cut-off points of >/=20 ACT scores (well controlled asthma), <20(not well controlled asthma) and a binary split for GINA classification (partly controlled/uncontrolled versus controlled asthma), the Kappa score for the entire subjects was 0.66 representing a substantial agreement as shown in table IV below.

TABLE IV: Agreement between GINA and ACT classifications of asthma control and the performance (sensitivity, specificity, positive and negative predictive values) of the ACT in predicting GINA categories of asthma control.

<table>
<thead>
<tr>
<th>ACT</th>
<th>ACT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>&gt;/=20</td>
<td></td>
</tr>
<tr>
<td>n (%)</td>
<td>n(%)</td>
<td>n(%)</td>
</tr>
<tr>
<td>GINA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partly Controlled/Uncontrolled</td>
<td>38(58.4%) a</td>
<td>3(4.6%) b</td>
</tr>
<tr>
<td>Controlled</td>
<td>7(11%) d</td>
<td>17(26%) e</td>
</tr>
<tr>
<td>Total n (%)</td>
<td>45(69.4%) g</td>
<td>20(30.6%) h</td>
</tr>
</tbody>
</table>

Kappa score=0.66,p<0.000,percentage agreement=85% Sensitivity*a/c=92.7%, specificity*d/f=71%, + predictive value*a/g=84%, - predictive value*e/h=85%

*Sensitivity is the percentage of patients with GINA-defined partly controlled/uncontrolled asthma who were identified by the ACT as belonging to this group.

*Specificity is the percentage of patients with GINA-defined controlled asthma who were identified by ACT as belonging to this group.

*Positive predictive value is the percentage of patients whom ACT predicts correctly to have partly controlled/uncontrolled asthma based on the GINA classification.

*Negative predictive value is the percentage of patients whom ACT predicts correctly to have controlled asthma based on GINA classification.
DISCUSSION

Several evidence-based guidelines (Global Initiative for Asthma Revised Guideline, 2008; Roche et al., 2005; Holt et al., 2003) on the management of bronchial asthma have been developed in the last two decades and goals of management have been defined. Studies in several countries (Adeyeye et al., 2008; Fitz et al., 2006; Rabe et al., 2000; Lai et al., 2003; Neffen et al., 2005) have, however, shown that a large majority of patients have failed to attain the goals of treatment. Achieving and maintaining asthma control are fundamental elements of asthma management and practical tools are needed to assess asthma control. Most tools used to evaluate asthma management consider spirometric finding as a criterion. However, this is often difficult to perform in a developing country such as Nigeria because lung function testing is not readily available in most hospitals in Nigeria.

This study was aimed at assessing asthma control in a developing country using the ACT, a tool that does not require lung function testing and to clarify its relationship with another tool, GINA which requires lung function testing as a criterion.

In our study, 24(37%) of the respondents had ACT score of 20 and above which denotes well controlled asthma and only 15(23%) of the subjects had controlled asthma as defined by GINA. The findings of this study showed that asthma was poorly controlled among the subjects.

Our study showed a positive and significant association between ACT and GINA guidelines-defined levels of asthma control.

In this study, ACT was found to be able to predict GINA guidelines-defined not controlled asthma with a positive predictive value of 84%, sensitivity of 92.7% and specificity of 71%. The sensitivity is similar to a study from the Philippines, 92.3%(Mendoza et al., 2007) but higher figures were reported in China, 80% (Lai et al., 2006), Korea, 85%(Zhou et al., 2007) and Vietnam, 70% (Vinh et al., 2011).

A multinational cross-sectional survey carried out by a group of Researchers (Thomas et al., 2009) also showed that ACT can predict GINA guideline-defined levels of asthma control. In this study, the correctly classified rate was 85% and the Kappa statistics of 0.66 suggested a substantial agreement between the two rating systems.

Overall, only 7% of patients with GINA Partly controlled/Uncontrolled asthma with an ACT score of >/=20 failed to meet the GINA definition of controlled asthma. This showed that ACT can serve as an alternative useful screening tool in asthma management and it corroborated the work of Stempel et al. (2005) who found in his study that ACT may serve as a useful screening tool in the community to determine whether patients had controlled or uncontrolled asthma.

In our study, only 26% of the respondents were on controller medications. This could be as a result of financial constraints leading to inability to procure controller medications, and poorer adherence. This is lower compared to the work of Mark et al. (2007) who found out that 35.6% of adult asthmatics with daily symptoms and 41.4% with symptoms on most days were taking controller medications.

There was a significant positive correlation between ACT scores and use of controller medications. This finding was similar to a work done by Green (2010) in South Africa who also found out that asthmatics on controller medications achieved better control. This finding was also highlighted by the Gaining Optimal Asthma Control (GOAL) study (Bateman et al., 2004) which confirmed that asthma control is a feasible outcome and is associated with marked improvement in quality of life and substantial reduction in morbidity.

CONCLUSION

Conclusively ACT correlates with GINA among our study subjects. Since ACT is inexpensive, simple and rapidly completed by patients we hope that it use in clinical practice would make detection of not well controlled asthma easier, leading to improve adherence to the controller medications.

The fact that this instruments correlates with GINA guidelines-based levels of asthma control further gives credence to its usefulness in clinical setting and with a potential to be used in larger studies in a resource poor setting.

Limitations

This study is limited because it is a hospital-based study so may not be generally representative of all the asthmatics in the general population. A community-based study would have added value to this finding.
ACKNOWLEDGEMENT

The authors wish to thank all members of the Respiratory Unit, Department of Medicine, Obafemi Awolowo University Teaching Hospital, Ile-Ife where this work was carried out for all their efforts, time and assistance. I thank all the subjects that participated in this study for their cooperation.

REFERENCES