

## ASTHMA CONTROL

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### ABSTRACT

**Background:** Asthma is a global health problem that affects 300 million individuals of all ages around a world. Despite international guidelines, asthma control is short of the goal in different parts of the world. **Aims of study:** To determine if the ACT can be as useful as the GINA-guidelines criteria in assessing asthma control. **Methods:** A cross-sectional study recruiting 64 patients aged >18 years with asthma were seen at chest clinic of Baghdad Teaching Hospital between February 2015 and May 2015. Asthma control was assessed using the GINA algorithm and the ACT score. **Results:** There were 64 patients enrolled in this study, 44 patients (68.8%) were female and 20 patients (31.2%) were male. According to ACT score 43 patient (67.2%) had an ACT score of (<15) and 21 patients (32.8%) had an ACT score of (15-19) and none patients had ACT (20-25). According to GINA classification, 49 patient (76.56%) classified as uncontrolled and 15 patients (23.44) classified as partly controlled and none patients classified as controlled. **Conclusion:** In our study we found high agreement between ACT score and GINA classification thus ACT score can substitute GINA in assessment of asthma control. Asthma control was also dependently associated with the individual patient's age group.

**KEYWORDS:** Asthma, health problem, GINA algorithm.

### INTRODUCTION

Asthma is a chronic inflammatory disorder of the airways, in which many cells and cellular elements play a role. The chronic inflammation is associated with airway hyper-responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night and in the early morning. These episodes are usually associated with widespread but variable airflow obstruction within the lung that is often reversible, either spontaneously or with treatment.<sup>[1]</sup> These variations are often triggered by factors such as exercise, allergen, irritant exposure, change in weather or viral respiratory infection.<sup>[2]</sup>

Asthma is a global health problem that affects around 300 million individuals of all ages, ethnic groups, and countries.<sup>[3]</sup> It is estimated that 250,000 people die prematurely each year as a result of asthma.<sup>[4]</sup> Proper care of patients with asthma involves the triad of systematic chronic care plans, self-management support, and appropriate medical therapy.<sup>[5,6]</sup>

Assessment of asthma should include the assessment of asthma control (both symptom control and future risk of adverse outcome), treatment issues particularly inhaler technique and adherence, and any comorbidities that could contribute to symptoms burden and poor quality of

life. Lung function, particularly forced expiratory volume in 1 second (FEV1) as a percentage of predicted, is an important part of future risk.<sup>[2]</sup>

Achieving and maintaining asthma control are fundamental elements of asthma management.<sup>[2]</sup> Practical tools are needed to assess asthma control in asthma management. Most tools used to evaluate asthma control consider airflow obstruction as a criterion. However, this is often very difficult to perform in developing countries such as Iraq because spirometers and peak flow meters are not readily available. A tool is required that measures the multidimensional nature of asthma control and that is easy and quick to administer and interpret in order to facilitate the assessment of asthma control in clinical practice. The ACT has proved to be a valid tool for this purpose.<sup>[7,8,9]</sup>

There are different validated measures for assessing symptoms to determine control of asthma, one of which is The Global Initiative for Asthma (GINA 2014) guideline which has proposed four criteria for evaluating asthma control. Well controlled asthma is defined by the absence of daytime symptoms (no more than twice a week), the absence of night-time waking, no limitations in activities, no need for rescue medication (no more than twice a week).<sup>[2]</sup>

**Table 1: GINA assessment of asthma control in adults.**

Asthma symptom control	Level of asthma symptom control
In the past 4 weeks, has the patient had:	Well Partly Uncontrolled controlled
• Daytime asthma symptom more than twice/week? Yes or No	None 1-2 3-4 of these of these of these
• Any night waking due to asthma? Yes or No	
• Reliever needed for symptom more than twice/week? Yes or No	
• Any activity limitation due to asthma? Yes or No	

The validated and international asthma control test (ACT) has also been developed to facilitate and standardize the assessment of symptom control of asthma control. The ACT survey is a patient-completed questionnaire with 5 items assessing asthma symptoms (daytime and nocturnal), use of rescue medications, and the effect of asthma on daily functioning. Each item includes 5 response options corresponding to a 5-point rating scale. In scoring the ACT survey, responses for the 5 items are summed to yield a score ranging from 5 to 25. The patient classified as uncontrolled if had score <15 and classified as partly controlled if had score 15-19 and classified as well controlled if had score 20-25. A cut-off point <1 was used for under control of asthma.<sup>[10]</sup>

#### Asthma control test

- A. In the past **4 weeks**, how much of the time did your **asthma** keep you from getting as much done at work, school, or at home?
1. All of the time.
  2. Most of the time.
  3. Some of the time.
  4. A little of the time.
  5. None of the time.
- B. During the past **4 weeks**, how often have you had shortness of breath?
1. More than once a day.
  2. Once a day.
  3. 3 to 6 times a week.
  4. Once or twice a week.
  5. Not at all.
- C. During the past **4 weeks**, how often did your **asthma** symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?
1. 4 or more nights a week.
  2. 2 to 3 nights a week.
  3. Once a week.
  4. Once or twice.
  5. Not at all.
- D. During the past **4 weeks**, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?
1. 3 or more times per day.
  2. 1 or 2 times per day.
  3. 2 to 3 times per week.

4. Once a week or less.
  5. Not at all.
- E. How would you rate your **asthma** control during the **past 4 weeks**?
1. Not controlled at all.
  2. Poorly controlled.
  3. Somewhat controlled.
  4. Well controlled.
  5. Completely controlled.

Exacerbations of asthma are episodes of a progressive increase in shortness of breath, cough, wheezing, or chest tightness, or a combination of these symptoms requiring systemic steroids or emergency department visits and admission.<sup>[6]</sup> Assessment of the risk of exacerbations can be inferred from the medical history. Patients who have had exacerbations requiring emergency department (ED) visits, hospitalization or intensive care unit (ICU) admission, especially in the past year, have a great risk of exacerbations in the future.<sup>[11]</sup>

The test most used for assessing the risk of future adverse events is spirometry, especially forced expiratory volume in 1<sup>st</sup> second (FEV1) expressed as a percent of the predicted value or a proportion of the forced vital capacity (FVC) or FEV1/FVC. A low forced expiratory volume in 1<sup>st</sup> second (FEV1) is associated with an increased risk of asthma exacerbations-the lower the FEV1, the greater the risk.<sup>[12]</sup>

#### AIM OF STUDY

- 1- To determine if the ACT can be as useful as the GINA-guidelines criteria in assessing asthma control.
- 2- To determine the agreement between the two rating systems.
- 3- To determine the consistency across age, gender, and body mass index.

#### PATIENTS AND METHODS

##### Study design, setting and timing

This was a cross-sectional study recruiting ambulatory patients with asthma at chest clinic of Baghdad Teaching Hospital from 1<sup>st</sup> of February to 31<sup>th</sup> of May 2015.

### Sampling and patients

64 patients participated in our study, 44 of them were female and 20 were male. Data about (age, gender, body mass index and educational level) were collected from participant. Asthma control was assessed in two ways: using the GINA classifications scheme and ACT score. The characteristics of GINA classification used in the study were daytime symptoms, nocturnal symptoms, need for reliever medication, limitation of activity.

The validated and international asthma control test (ACT) questionnaire was used to assess the control of asthma. The ACT survey is a patient-completed questionnaire with 5 items assessing asthma symptoms (daytime and nocturnal), use of rescue medications and the effect of asthma on daily functioning. Each item includes 5 response options corresponding to a 5-point rating scale. In scoring the ACT survey, responses for each of the 5 items were summed to yield a score ranging from 5 (poor control of asthma) to 25 (complete control of asthma). A cut-off point <19 was used for under control of asthma.

### Inclusion criteria

- 1- Patients who satisfied the inclusion criteria (>18) years old.
- 2- Asthmatic since 12 months at least.

### Exclusion criteria

- 1- Subjects were excluded if hospitalised for asthma or had an acute upper or lower respiratory tract infection within 4 weeks prior to study.
- 2- Pregnant ladies were excluded from the study due to variable effects of pregnancy on bronchial asthma.

- 3- Patients with diagnosis other than asthma such as physician diagnosed COPD, bronchiectasis, lung cancer, and cardiac illness were also excluded due to confounding effects.
- 4- Smokers and ex smokers were also excluded.
- 5- Patients with significant respiratory distress due to an exacerbation that required emergency department visit or admission.

### Statistical analysis

Data of all patients were entered and analyzed by using the statistical package for social sciences (SPSS) software for windows version 22. Descriptive statistics were presented as mean  $\pm$  standard deviation (SD) for continuous variables and as frequencies and proportions (%) for categorical variables.

Student's t test (independent 2 samples) was used to compare means of age in between two groups according to ACT level (<15 or 15- 19).

Chi square was used to assess the significance of association in between groups regarding the categorical variables.

Agreement between ACT and GINA was calculated using percent agreement calculation and Kappa statistics.

### RESULTS

There were 64 patients enrolled in this study, of them 44 (68.8%) were female and 20 patients (31.2%) were male.

Mean, standard deviation, minimum and maximum values for continuous variable age, height, weight, body mass index and history of disease in years.

**Table 3-1: Distribution of patients according to age, body mass index and history of disease in years.**

Variable	Mean	Std. deviation	Minimum	Maximum
No. of patient <b>N(64)</b>	46.67	10.756	22	
Age of patient (in years)	159.48	8.826	140	<b>65</b>
Height of patient (in centimeters)	80.52	14.087	50	<b>180</b>
Weight of patient (in kilo grams)	31.53	4.364	24.60	<b>102</b>
Body mass index (kg/m <sup>2</sup> )	15.77	13.015	2	<b>39.90</b>
History of disease (in years)	46.67	10.756	22	<b>45</b>

**Table 3- 2: Distribution of patients according to gender, educational level and professional status.**

Variable	Frequency	(%)
Gender of participant		
Male	20	31.2
Female	44	68.8
Education level of participant		
Cannot read	19	29.7
Primary	34	53.1
Secondary	6	9.4
University	3	4.7
Higher education	2	3.1
Professional status		
Non active	28	43.8
Active	36	56.3

There were 64 patients enrolled in this study, of them 43patient (67.2%) had an ACT score of (<15) and 21 patients (32.8%) had an ACT score of (15-19) and none patients had an ACT 20-25.

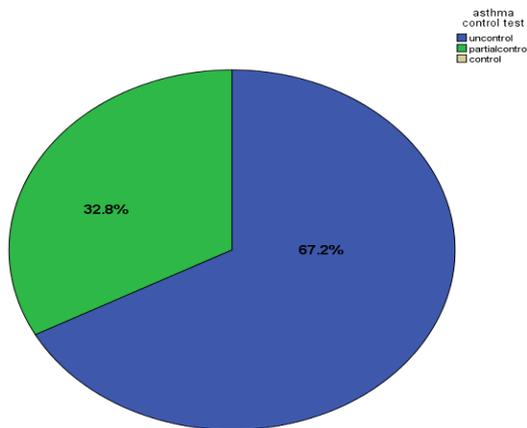


Figure 3-1 Distribution of asthmatic patients according to ACT Score

According to GINA classification, 49 patient (76.56%) classified as uncontrolled and 15 patients (23.44) classified as partly controlled and none patients classified as controlled.

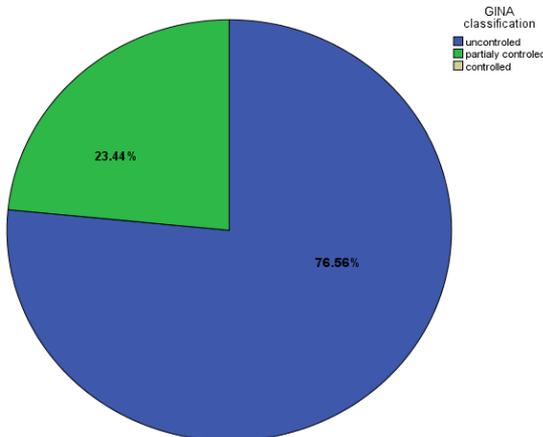


Figure 3-2: Distribution of asthmatic patients according to GINA classification

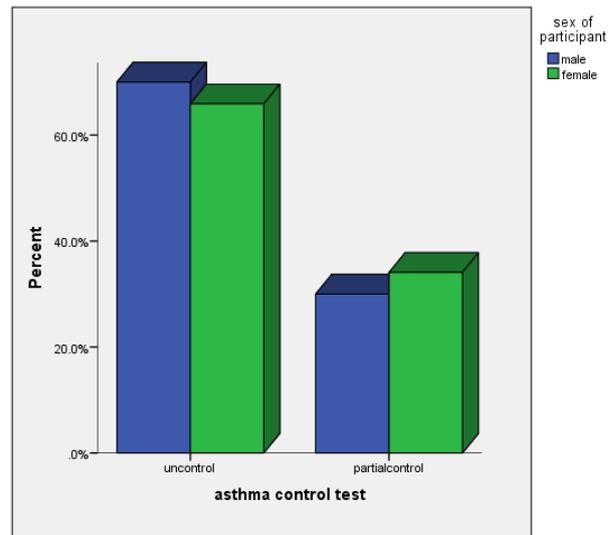


Figure 3-3: Distribution of gender by ACT

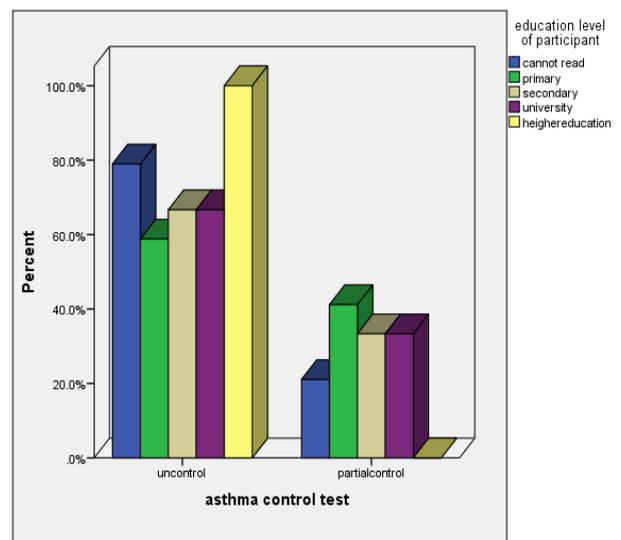


Figure 3-4: Distribution of education level by ACT

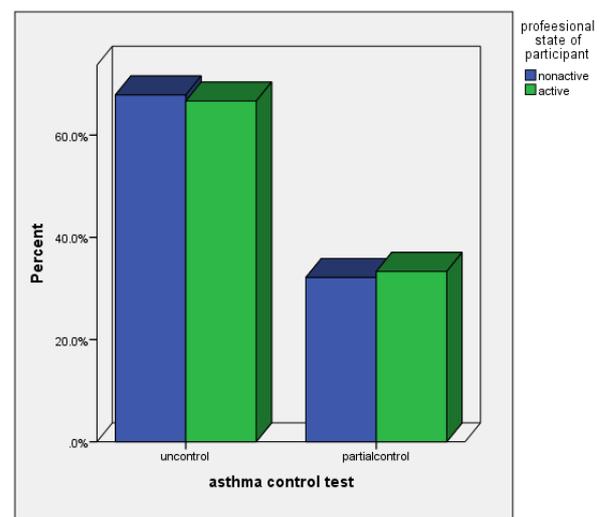


Figure 3-5: Distribution of professional status by ACT

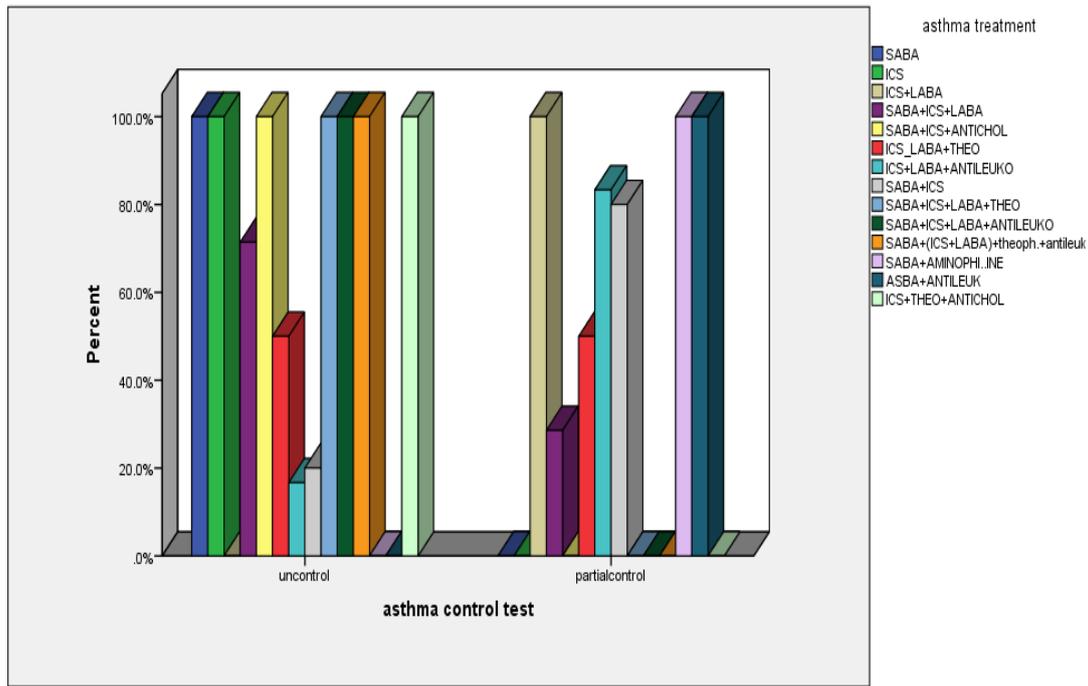


Figure 3-6: Distribution of asthma treatment by ACT

**Table 3-3: Summarizes the patients characteristics distributed by ACT score level, There was significant differences had been found in between those patients with <15 ACT score vs. those with 15- 19, regarding the age and in both comparison P<0.05.**

There was no significant differences had been found in between those patients with < 15 ACT score vs. those with 15- 19, regarding the gender and in both comparison P>0.05.

There was no significant differences had been found in between those patients with < 15 ACT score vs. those with 15- 19, regarding the BMI.

Educational level, professional status and history of disease in years, in each comparison P>0.05.

Regarding the distribution of GINA classification by ACT score, It had been found that out of the 49 patients with GINA classification which classified as uncontrolled, 43 patients (87.8%) were labeled as uncontrolled on ACT (ACT<15), and 6 patient (12.2%) labeled as partially controlled ACT (15-19) and none labeled as controlled **P.value <0.001**, in contrast out of 15 patient with GINA classification which classified as partial control 15 patient (100%) were labeled as partially controlled on ACT(15-19), and none patients classified as uncontrolled.

**Table 3-3: Patients characteristics and GINA classification distributed by ACT score.**

Variable		ACT score		P. value
		<15 (n=43)	15- 19 (n=21)	
Age (years)	Mean ± SD	48.26 ± 8.432	43.43 ± 14.095	0.001 [S]
Gender n (%)	Male	14 (70)	6( 30)	0.491 [NS]
	Female	29 (65.9)	15 (34.1)	
GINA classification	Uncontrolled	43 (87.8)	6(12.2)	.000 [S]
	Partially controlled	0 (0.0)	15(100)	
	Controlled	0	0 (0.0)	
Body mass index	Mean ± SD	31.541±4.292	31.521±4.614	0.991 [NS]
Education level of participant (%)	Cannot read	15(23.4)	4(6.3)	0.124 [NS]
	Primary	20(31.3)	14(21.9)	
	Secondary	4(6.3)	2(3.1)	
	University Higher education	2(3.1)	1(1.6)	
		2(3.1)	0(0.0)	
Professional Status (%)	Non active	19(29.7)	9(14.1)	0.920 [NS]
	Active	24(37.5)	12(18.8)	
Hx. of disease in years	Mean ± SD	15±11.524	17.33±15.838	0.505 [NS]

**Table 3-4: Distribution of asthma treatment by ACT.**

			Asthma Control Test	
			Uncontrolled	Partially Controlled
Asthma Treatment	SABA	Count	13	0
		% of Total	20.3%	0.0%
	ICS	Count	3	0
		% of Total	4.7%	0.0%
	ICS+LABA	Count	0	2
		% of Total	0.0%	3.1%
	SABA+ICS+LABA	Count	5	2
		% of Total	7.8%	3.1%
	SABA+ICS+ANTICHOL	Count	4	0
		% of Total	6.3%	0.0%
	ICS_LABA+THEO	Count	2	2
		% of Total	3.1%	3.1%
	ICS+LABA+ANTILEUKO	Count	1.6%	7.8%
		% of Total	1.6%	7.8%
	SABA+ICS	Count	1	4
		% of Total	1.6%	6.3%
	SABA+ICS+LABA+THEO	Count	6	0
		% of Total	9.4%	0.0%
SABA+ICS+LABA+ANTILEUKO	Count	4	0	
	% of Total	6.3%	0.0%	
SABA+(ICS+LABA)+theop.+antileuk	Count	1	0	
	% of Total	1.6%	0.0%	
SABA+AMINOPHI..INE	Count	0	4	
	% of Total	0.0%	6.3%	
SABA+ANTILEUK	Count	0	2	
	% of Total	0.0%	3.1%	
ICS+THEO+ANTICHOL	Count	3		
	% of Total	4.7%	0.0%	
Total	Count	43	21	
	% of Total	67.2%	32.8%	

The distribution of ACT categories by the GINA classes is shown in table (3-5). It had been found that good agreement present between ACT and GINA, 77.1% and this percent is high due to small sample size.

ACT agreed the GINA in 43 patients with uncontrolled, 15 patients with partially controlled and none patients with controlled) and had been found the uncontrolled patients by GINA is (49) while uncontrolled patients by ACT is (43) and this indicate small difference between them.

**Table 3-5: Agreement between GINA classification and ACT classification of asthma control.**

ACT \ GINA	GINA-defined control			Total
	Uncontrolled N(%)	Partially controlled N(%)	Controlled N(%)	
Uncontrolled(<15)	43(87.8)	0(0.0)	0(0.0)	43(67.2%)
Partially controlled (15-19)	6(12.2)	15(100)	0(0.0)	21(32.8%)
Controlled ( $\geq 20$ )	0(0.0)	0(0.0)	0(0.0)	0(0.0%)
Total	49(100)	15(100)	0(0.0)	64(100%)
Percent agreement = 77.1%				

**Kappa=0.77, p<0.001 ACT=Asthma Control Test; GINA=Global Initiative for Asthma.**

## DISCUSSION

The principal finding of this study is that asthma control in the chest clinic of Baghdad Teaching Hospital is very poor and one of the explanations for this is that Baghdad Teaching Hospital is a tertiary center and as referral for many hospitals in the country so the severe cases from

these hospitals were referred to Baghdad Teaching Hospital.

Using the GINA based algorithm, 49 (76.56%) of the patients were classified as having uncontrolled asthma and 15 (23.44%) of patients were classified as having

partly controlled asthma, and none patient classified as controlled asthma. Using the ACT score also, 43 patients (67.2%), scored <15 that corresponds to poor control of asthma in the current study, and 21 patients (32.8%) individuals scored 15-19 that corresponds partly control of asthma and none classified as well-controlled asthma 20-25, which is a better estimate of asthma control compared with results that obtained from GINA algorithm.

The results observed were similar with the worldwide control of asthma in the AIR trial in North America, Europe, Japan and the Asia-Pacific region with data from 10,939 patients in 29 countries.<sup>[13]</sup> Another study in North Africa, the Maghreb Study, showed only 7.6% of the subjects were considered to have controlled and 50.9% to have uncontrolled asthma and 41.5% considered to have partly controlled when the GINA based algorithm was used.<sup>[14]</sup>

This finding is poor comparable with a pan-European cross-sectional survey done in 2008, with results of 57% of adult asthmatics had 'not well-controlled' asthma on a validated symptom instrument,<sup>[15]</sup> (ACT score <19).

Another study done in Vietnam predicted GINA defined 'not controlled asthma' with a sensitivity of 70% and specificity of 93%. The questionnaire score correlated well with treatment modifications and lung function parameters (FEV1 and PEF). The ACT is easily and quickly completed by patients and can serve as a useful tool in everyday practice to guide adjustments in asthma therapy.<sup>[16]</sup>

Finally, asthma control was also dependently associated with the individual patient's age group, P.value=0.001. This finding was similar with the study done in the Netherlands, Disease control in the general practice patients with asthma, where patients inadequately controlled were usually older compared to those with a good disease control.<sup>[17]</sup>

The poor level of control likely resulted from the relatively very low proportion of patients using the recommended prophylactic controller medication (inhaled corticosteroids alone or in association with long acting b-agonists which are the prophylactic treatments recommended by GINA). Most of the patients used only medications that quickly relieve asthma symptoms, but that has no role in controlling the underlying inflammation of the airways.

The kappa level of agreement between the two systems was 0.77, representing high agreement between the two rating systems. Another positive finding in this study was no extreme difference in classification of asthma control between the two rating systems: no patient had an ACT score of >20 while having GINA-defined uncontrolled asthma and no patient with GINA defined controlled asthma had an ACT score of <15 (Table 3-5).

## CONCLUSION AND RECOMMENDATION

### Conclusions

1. In our study we found high agreement between ACT score and GINA classification thus ACT score can substitute GINA in assessment of asthma control.
2. The ACT is easily and quickly completed by patients and can serve as a useful tool in everyday practice to guide adjustments in asthma therapy.
3. Asthma control was also dependently associated with the individual patient's age group, where patients inadequately controlled were usually older compared to those with a good disease control.

### Recommendation

The ACT is a reliable and simple tool that does not require spirometry measurements. this might be a significant asset in the management of outpatients with asthma in Iraq.

### List of Abbreviations

<b>FEV1</b>	Forced expiratory volume in the first second
<b>FVC</b>	Forced vital capacity
<b>PEF</b>	Peak expiratory flow
<b>GINA</b>	Global initiative for asthma
<b>ACT</b>	Asthma control test
<b>ED</b>	Emergency department
<b>ICU</b>	Intensive care unit
<b>COPD</b>	Chronic obstructive pulmonary disease
<b>BMI</b>	Body mass index
<b>SPSS</b>	statistical package for social sciences
<b>AIR</b>	Asthma insight and reality

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