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Predictive Value of “Jones Morbidity Index” in Northern Iranian Asthmatic Patients

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ABSTRACT

Asthma is the major chronic respiratory inflammatory disease in all ages. The validity and predictability of revised Jones Morbidity Index (JMI) as a simple and practical tool for asthma evaluation morbidity has not yet been tested in Iran. This study aimed to evaluate the predictability and validity of a revised JMI in northern Iran. As a one-year follow up study, 210 adult asthmatic patients were visited in an asthma clinic in the town of Babol (north of Iran) at two stages.

At first stage, in addition to demographic information, 3 simple questions of revised JMI were asked and Pulmonary Expiratory Flow Rate (PEFR) for each patient was measured. Based on modified JMI, patients were categorized in three groups: Low, Medium, and High morbidity. At the second stage, after one year, patients were visited again and in addition to their last year medical records, the same questionnaires were filled. The validity of the index checked by PEFR values at two stages and its predictability was evaluated by morbidity factors during the last year. From hundred and seventy (170) patients who were able to fulfil the second stage of the study, 55 patients (32%) had been categorized as low, 88 patients (52%) as medium, and 27 patients (16%) as high morbidity.

The percentages of patients PEFR to the estimated normal values in these three categories (90.8%, 74.7%, and 55.3% respectively) were significantly different which shows a good correlation between PEFR values and asthma morbidity ($p < 0.001$). The relative risks of high morbidity group for hospitalization from asthma and needing oral steroids during the one year period were 4.1 (CI = 1.27 to 13.1), 1.96 (CI = 0.97 to 3.96) respectively which are significantly higher than the other two categories ($P < 0.05$).

Since the modified JMI showed an acceptable validity and predictability in northern patients of northern Iran, we recommend its use as a simple pragmatic tool for evaluating asthma morbidity in primary care in this region of Iran.

Keywords: Asthma; Iran; Jones Morbidity Index; Morbidity; PEFR

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INTRODUCTION

Asthma has been considered as the major chronic inflammatory disease of the respiratory system in all ages.¹ Validating and developing a simple pragmatic tool for predicting asthma morbidity has been the subject of quite large number of studies during last decades.²⁻⁴ The prevalence of asthma has increased worldwide and imposes high costs to most countries' health care systems,⁵ and there is discrepancy in its official figures in Iran but is assumed to be about 3% in adults up to 11% in children.^{6,7} Asthma has higher mortality in developing countries compared to western societies⁸ and it has been shown that having a better prediction of asthma morbidity could decrease its mortality and also prevent unnecessary health-care costs.⁹ Despite of introducing some relatively précised predictive indices and questionnaires for evaluation asthma morbidity, they are not easy to use and there is lack of required pragmatism as a gold standard predictive method.¹⁰⁻¹² Structured review systems such as the Royal College of Physicians "Three Key Questions", the Tayside Asthma Stamp, and Jones Morbidity Index (JMI) are well recognized among these measures.² The modified JMI is a predictive method based on few simple straightforward questions which has shown a good validity in asthma morbidity prediction in UK's patients.¹³ The validity of this predictive tool has not been evaluated in Iranian patients yet. Therefore, considering cultural and social differences between Iran population and previously tested nations (e.g.: UK), this one-year-follow-up study was designed to evaluate JMI predictive validity in northern Iranian patients. As far as our bibliographic searches show, this is the first study of this kind in Iran.

PATIENTS AND METHODS

This cross sectional/follow up study was conducted in two stages from March 2008 till June 2009. At first stage, 210 adult asthmatic patients from all over Mazandaran province (northern Iran), who had been referred to Shahid-Beheshti asthma clinic during a 3-month period and consented for cooperation, were included in this study. These patients had no background diseases other than asthma. Three JMI questions were revised and translated to be psychosocially suited for the selected Iranian population and were included in a questionnaire. This questionnaire

which also contained patient's medical history was filled for every patient, while individual data were collected directly from patients, medical history information were obtained by reviewing patients' medical records in the clinic/hospital and by double checking patients health insurance records. In addition to the routine medical observations, "Peak Expiratory Flow Rate" (PEFR) was measured for all patients at the beginning of study. At the second stage, after one year, all patients came to the same clinic for a medical visit and a similar questionnaire filled for every patient and PEFR was measured again. During this one year, patients' medical conditions and/or any treatments for their asthma were recorded. Data from these two questionnaires were used for statistical analysis by SPSS^(R) software for Windows^(R). The ANOVA and Scheffe Post-Hoc tests were used to analyse the correlation between patients' relative PEFR values and their morbidity index (table 1). To obtain the relative risk for each morbidity criteria, the odd ratio of corresponding group against low morbidity group was calculated using Chi-Square test (table 3). Descriptive statistics were used to present the rest of obtained results in tables 1-3. The reliability of the questionnaires were calculated using Cronbach's alpha coefficient (which was more than 0.85), however for limitations in patients cooperation it was not feasible to calculate the validity.

RESULTS

Out of 210 patients who took part in the study, 170 patients completed the last stage and their asthma conditions were evaluated after one year. From these patients, 141 (83%) were female and 29 (17%) patients were male. Patients were categorized into Low (55 patients; 32.4%), Medium (88 patients; 51.8%), and High risk (27 patients; 15.8%) groups, based on modified JMI included in the questionnaire. The mean relative PEFR values as percentage of predicted ones were significantly different between three morbidity categories which shows a good correlation between PEFR values and asthma morbidity index ($p < 0.001$) (Table 1).

Only 8 patients (14.7%) with low morbidity at the beginning of the study categorized as high morbidity after one year, while all patients (100%) with high morbidity remained in medium/high categories after one year (Table 2). The relative risks for two characteristic

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morbidity criteria (hospitalization for asthmatic condition and steroids administration) were significantly higher in patients with high morbidity group (Table 3). The frequency percentage of having acute asthma

attacks during sleep and having more than 4 asthma attacks during last year were higher for high morbidity group compared to the other two groups (low and medium) (Table 3).

Table 1. Correlation between revised Jones Morbidity Index (JMI) and lung function (PEFR values) at the beginning of the study

Morbidity index category of patients	Number of patients	Mean PEFR as percentage of predicted (%)	Standard deviation	CI** 95%
Low	55	90.8*	21.0	85.2 - 96.5
Medium	88	74.7*	15.2	71.4 - 77.9
High	27	55.3*	14.4	49.6 - 61.0

* All three categories were significantly different in terms of their relative PEFR (P<0.001)

** Confidence Interval

Table 2. Concordance in revised Jones Morbidity Index (JMI) categories after one year

Morbidity category at beginning of study	Morbidity category of patients after one year			
	Low	Medium	High	Total
Low	21 12.4%	26 15.3%	8 4.7%	55 32.4%
Medium	22 12.9%	33 19.4%	33 19.4%	88 51.8%
High	0 0%	16 9.4%	11 6.5%	27 15.9%
Total	43 25.3%	75 44.1%	52 30.6%	170 100.0%

Table 3. Relationship between the morbidity index at the beginning of the study, four adverse events and morbidity at the end of one year

Morbidity Variables	Low		Medium				High					
	Frequency	Percent	Frequency	Percent	Relative Risk	95% CI*	P value	Frequency	Percent	Relative Risk	95% CI*	P value
Hospitalization	5/55	9.1	19/88	21.6	2.37	0.84-6.73	0.072	10/27	37.0	4.1	1.27-13.1	0.015
Oral steroids	28/55	50.9	67/88	76.1	1.5	0.86-2.6	0.099	27/27	100.0	1.96	0.97-3.96	0.043
More than four attacks	35/55	67.3	60/88	68.2	1.07	0.63-1.83	0.455	21/27	77.8	1.22	0.60-2.49	0.354
Acute attack(s)	30/55	54.5	62/88	70.5	1.29	0.745-2.24	0.22	20/27	74.1	1.36	0.65-2.82	0.262
Medium/high morbidity index after one year	34/55	61.8	66/88	75	1.21	0.71-2.07	0.283	27/27	100.0	1.62	0.82-3.2	0.114

*Confidence Interval

Table 4. The questionnaire filled at the beginning and at the end of study (after 1 year)

Section 1 (patients demographic information)		
Filing code:	Sex:	Weight (Kg):
Name:	Age:	Height (cm):
Occupation:		
Section 2 (Revised JMI)*		
During the past four weeks:		
1. Have you been in a wheezy or asthmatic condition at least once a week?		
2. Has your asthma condition caused you to have time off work or interrupted doing your house works?		
3. Have you suffered from attacks of wheezing during the night?		
Section 3 (patients medical history and exams)		
PFER (% of predicted value)		
Patients medical history during one year of study (Hospitalization; Steroids use; More than four attacks; Any acute attack(s))		

* The Revised Jones Morbidity Index. Patients' responses are assessed as follows: (NO to all questions = LOW morbidity; One YES answer = MEDIUM morbidity; Two or three YES answers = HIGH morbidity)

DISCUSSION

The results of study show that the revised JMI has a good predictability and validity for lung function in our study population. Since this is the first predictability/validation study on asthma morbidity conducted in Iran, we are not able to compare our results with similar studies in this country. However, there are some other validating studies on JMI worldwide which have shown the same predictability and validity for prediction of asthma morbidity.^{13,14}

The study population is different from the populations of other studies with regard to sociocultural point of view which mostly fulfilled in western communities. Psychosocial differences between Iran and other countries might have some effects on patients' answers to JMI questions, hence we revised JMI second question.^{13,15} Most patients in this study were female (83% female versus 17% male patients) who were mostly housewives.

Previous studies in Iranian population had also shown greater asthma prevalence in females.⁶ The asthma attacks simply might lead to an interruption in daily house works and not work leave which is the subject of the second question of JMI (Table 4).

The significant differences between 3 categories' predicted PEFR indicate a good validity of this revised JMI among the patients. However, single measured PEFR is neither accurate nor relevant to the care of individual patient with asthma.¹⁶ In some parts of Iran specially in northern Iran rural regions, it is not feasible to get a valid PEFR, so the modified JMI might be of

benefits in the primary asthma monitoring and management.

Only less than 15% of patients categorized as low morbidity shifted to high morbidity class after one year (Table 2), therefore the revised JMI has shown a good predictive value in these patients. On the other hand all patients (100%) in high morbidity category remained in high/medium class after one year (Table 2). This shows reliable specificity of this morbidity index for severe asthmatic patients.

The percentage of missing values in our study is less than 19% of the whole sample which seems to be acceptable for a one year follow up study. Since there is not a predicting morbidity criterion as a gold standard to compare our results with, the only feasible comparison is against some previously studies conducted in this field in other countries.^{12,13,17}

The relative risk for "use of corticosteroid" in high risk, and to some extent in medium risk groups (Table 3), are lower than previously conducted study results.¹³ This might have arisen from easier access to inhaled corticosteroids for Iranian patients in low asthma category while prescribing corticosteroids in western countries are more restricted to severe asthmatic conditions.

Unfortunately, official figures show that the corticosteroids prescription and their use among Iranian patients including asthmatics are higher than most developed countries. The relative risk for hospitalization in high morbidity group is significantly higher than medium or low morbidity groups (Table 3).

Similarly in some other studies, the probability of hospitalization in patients with severe asthmatic

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condition has been found to be higher than medium or low morbidity groups.^{13,18} However, the relative risks for presence of acute attacks and more than 4 attacks are not significantly different among these three categories while in a previous study they had been significantly different.¹³

The poor management of asthma by the patients in low and medium categories or giving inaccurate information about the number of their asthma attacks or their definition of acute attacks might be the reasons for this difference, while hospitalization and recordings are more dependent to care giving staves which probably are more accurate. Drug therapy failure leading to an increase in the number of patients asthma attacks, simply could cause failing in asthma medication adherence and chronic health problem.^{19,20}

Since all patients in this study were adult (more than 16 years old), the validity of JMI in predicting children asthma morbidity could not be extrapolated using the results of this study, however there are some other measurements and methods for this purpose.^{17,21} Furthermore, because of limitations in patients cooperation, we were not able to statistically measure the questionnaire validity in this study, however by double checking patients answers to the questions with their medical history or hospital records, we tried to minimize this failure as much as possible.

Using a valid morbidity predicting index in addition to an effective educational system, the asthma morbidity could be alleviated and optimal health care can be given to high risk asthmatic patients with consequent decrease in costs and health care staff workload.²²

CONCLUSION

The revised JMI seems to be a pragmatic asthma morbidity tool for a valid prediction in northern Iran asthmatic patients. We recommend the use of this simple and practical index in asthma primary care centers which seems to be accurate enough for planning long term asthma management protocols in north of Iran.

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