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Effects of Ramadan Fasting on Spirometric Values and Clinical Symptoms in Asthmatic Patients

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ABSTRACT

Introduction: Ramadan is the 9th Islamic lunar month during which Muslims avoid eating and drinking from sunrise to sunset. The effect of Ramadan intermittent fasting on asthma control is controversial. The aim of this study was to investigate the effects of Ramadan fasting on the spirometric variables and clinical symptoms on well-controlled asthmatic patients during Ramadan.

Material and Methods: a cohort study was conducted in Mashhad, Khorasan Razavi, Iran.

Twenty-nine (19 females and 10 males) well-controlled asthmatic patients aged 47 (12) years completed the study. The average duration of fasting was 26.5 days. Assessment of spirometric variables (daily peak expiratory flow, peak expiratory flow variability, peak expiratory flow home monitoring) as well as asthma clinical symptoms including dyspnea, cough, wheezing, and chest tightness were carried out.

Results: No significant changes in clinical symptoms were reported in asthmatic patients at the end of Ramadan fasting. Among spirometric variables, only peak expiratory flow improved after Ramadan (p<0.05). There was a reduction in the mean peak expiratory flow variability from 13% at the first week of fasting to 10% at the fourth week (p<0.05).

Conclusion: In well-controlled asthmatic patients, Ramadan fasting resulted in improvement in peak expiratory flow and peak expiratory flow variability.

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Introduction

Ramadan, the 9th month of the lunar Islamic year lasting for 29-30 days, is the holiest month in Islamic calendar during which Muslims all over the world abstain from eating, drinking, conjugal relationships, and smoking from sunrise till sunset as a sign of restraint and introspection. Depending on season and geographical location of a country, the length of fasting day varies from 11 to 18 hours; being longer in the summer and in temperate regions. (1) All healthy Muslims are allowed to fast, except children, frail elderly, those

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who are traveling, (2) women during menstruation, pregnancy, and breast feeding. (2, 3)

In Iran, prevalence of asthma has increased during the recent years. (4) The Iranian Asthma Society has announced that the prevalence of asthma has stood at around 8-12% for the whole country, (5) while estimated prevalence of asthma in two large cities was reported to be 2.8% for total population of Mashhad and 7.3% for junior high school children in Isfahan. (6, 7)

Although many studies were carried out on the effects of Ramadan intermittent fasting on chronic diseases such as rheumatoid arthritis, (8,9) diabetes, (10, 11) congestive heart failure, (12) and chronic fatigue syndrome, (13) the number of studies on the effects of Ramadan fasting on asthma were very limited. (14, 15, 16) Moreover, most of the studies focused on spirometric changes during Ramadan were performed on healthy subjects. (17-19)

The aim of present study was to investigate the changes in clinical and spirometric variables before and after Ramadan as well as peak expiratory flow (PEF) home monitoring as an accurate method in well-controlled asthmatic patients. (20)

Material and Methods

Study Design

The study was conducted in the Islamic month of Ramadan 1429 A.H (Hijri Muslim calendar) (September, 2008). The average length of fasting day was 14 hours. The study was approved by the Research Ethics Committee of Mashhad University of Medical Sciences (approval number 87224), and an informed written consent was obtained from the subjects prior to participatioan. Patients were enrolled via local advertisement in respiratory clinics of Mashhad in Iran.

A prospective cohort study was performed in a group of well-controlled asthmatic patients who fasted more than 16 days. Subjects were asked to complete the questionnaire whether or not they have fasted, and the number of fasted days.

Patients

Thirty-three well-controlled asthmatic patients whose symptoms and pharmacotherapy were stable during 3 months prior to the study were recruited. Their asthma were diagnosed by a physician based on Global Initiative on Asthma (GINA) criteria. (21)

Patients with exacerbation of asthma within last three months, those with concomitant cardiopulmonary disease, pregnant and lactating women, and those who fasted fewer than 16 days were excluded from the study.

Subjects' weight and height were measured with light clothing and without shoes. A brief medical assessment including past medical history, duration of asthma, use of medication, and smoking was carried out.

Asthma Clinical Symptoms

Severity of asthma was assessed by a validated Asthma Control Test (ACT) questionnaire. (22) Frequency of respiratory symptoms during day and night such as dyspnea, cough, wheezing, and chest tightness were recorded pre- and post-Ramadan.

Lung Function Tests

A Spirometric test was performed in all subjects. Spirometry was carried out twice (one week before, and at the end of Ramadan) using an electronic spirometer (Spirolab II, MIR, Italy) in the sitting position using a nose clip. Pre- and post-Ramadan measures of five lung function parameters (FVC, FEV1, FEV1/FVC, PEF, and MMFR) were performed. Standardization of bronchodilators was performed prior to lung function measurements. The patients were instructed to avoid using short-acting bronchodilators [including Short Acting Beta Agonist (SABA) and short-acting anticholinergics] 6-8 hours prior to the test.

Peak Expiratory Flow (PEF)

All subjects were provided with a PEF device (Micro Peak, Micromedical, UK), and appropriate training for doing PEF home monitoring was performed. Patients were asked to measure their PEF three times a day at 6:00 a.m., 12:00 p.m., and 6:00 p.m. throughout Ramadan fasting period. Patients were advised to take a deep breath and then blow as fast and forcefully as they could do into the device. The highest value of the three attempts was recorded. PEF

Table 1. Medications Used By the Study Subjects.

Medication	Percentage using
SABA	4.3%
LABA+ICs	82.6%
ICs	8.3%
Theophylline	12.5%

SABA: Short Acting Beta Agonist, LABA: Long Acting Beta Agonist, ICs: inhaled corticosteroid.

variability was defined using the following equation"(Maximum PEF- Minimum PEF)/ Maximum PEF" and calculated daily for each patient during the Ramadan. (23)

Statistical Analysis

Statistical analyses were performed using SPSS statistical software (version 11.5, SPSS Inc. Chicago, IL, USA). Results were expressed as mean and standard deviation (Mean (SD)). Paired t-tests were performed to compare spirometric variables before and after Ramadan. Repeated Measures of ANOVA was done to compare mean values of PEF variability in four weeks of Ramadan. McNemar Test was used to test the qualitative parameters. The level of statistical significance was considered as p-value <0.05.

Results

Twenty-nine patients (19 females and 10 males) aged 47 (12) years (range: 23 to 70 years) with mean FEV_1 of 82.3 (26.1) and 86.9 (28.2) pre- and post- Ramadan, respectively, completed the study. Four patients were excluded; one patient exhibited asthma exacerbation during the study and three patients withdrew their consent for personal reasons. Fasting time was on average 14 hours (range: 13.3 to 14.4 hours) a day, and subjects fasted for 26.5 days out of 29 Ramadan days. There was not outlying data.

Asthma Clinical Symptoms

The changes in all daily and nocturnal symptoms such as dyspnea, cough, wheezing, and chest tightness were not statistically significant. (Table 2)

Table 2. Comparison of ACT Before and After Ramadan in Well-Controlled Asthmatic Patients.

			ACT.A			Total
			a	b	C	
ACT.B		Count	8	1	0	9
		% of Total	27.6%	3.4%	.0%	31.0%
	b	Count	0	13	0	13
		% of Total	.0%	44.8%	.0%	44.8%
	c	Count	1	2	4	7
		% of Total	3.4%	6.9%	13.8 %	24.1%
Total		Count	9	16	4	29
		% of Total	31.0%	55.2%	13.8 %	100.0%

ACT.A: Asthma control test after Ramadan. ACT.B: Asthma control test before Ramadan.
a: asthma seems to be well controlled (score=25). b: asthma seems to be controlled (score=20-24). c: asthma may not be controlled as well as it could be. (score<20)

Spirometry

Table 3 shows five spirometric variables before and after Ramadan. PEF was the only parameter with significant increase at the end of Ramadan. (p<0.05)

Table 3. Subjects' Spirometric Variables Pre- and Post-Ramadan.

Variable	Pre-Ramadan Mean (SD	Post- Ramadan Mean (SD)
FVC (% predicted)	81.2 (19.8)	84.7 (21.5)
FEV1 (% predicted)	82.3 (26.1)	86.9 (28.2)
FEV1/FVC (%)	78.1 (11.7)	80.7 (8.9)
PEF * (L/s)	70.04 (24.6)	87.7 (32.4)
MMFR (L/s)	75.2 (38.5)	83.2 (44.3)

*p<0.001.

PEF

Mean values of PEF variability is presented in Table 4. Mean peak expiratory flow variability decreased from 13% in the first week to 10% in the fourth week of fasting. (p<0.05) (Figure1)

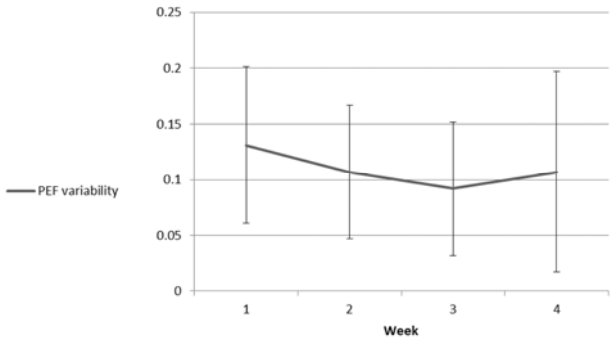

Figure 1. Subjects' PEF Variability Changes During Ramadan. (n=29)

Discussion

To the best of our knowledge, this was the first time that PEF variability home monitoring, spirometry, and clinical symptoms were collectively measured in a group of patients with stable asthma. It is important to note that the measured PEF home monitoring is an index for severity of asthma.

It was shown that among the spirometric values assessed, PEF was the only parameter with a significant improvement after Ramadan. Bener and colleagues showed no significant changes in all measured spirometric variables (FVC, FEV1, FEF 25-75, FEV1/FVC, and PEF), (16) while studies evaluating lung function measures of healthy subjects during Ramadan showed variable results. (17-19) Subhan *et al* mentioned significant increase in the amounts of FEF 75% and FEF 75-85% after Ramadan in healthy persons. (18) Moosavi *et al.* showed an increase in lung volumes

Table 4. Comparison of Peak Expiratory Flow Variability during 4 Weeks of Ramadan (n=29).

	1st Week Mean (SD)	2nd Week Mean (SD)	3 rd Week Mean (SD)	4th Week Mean (SD)
PEF variability*	0.131 (0.07)	0.107 (0.06)	0.092 (0.06)	0.107 (0.09)

** p <0.05*

in healthy subjects after fasting (FEV_1%, PEF, FEF 50%, FEF 75%). (19) On the other hand, Siddiqui showed that FVC decreased significantly post-Ramadan with no significant changes in lung function in healthy persons. (17)

Results of our study showed no significant changes in dyspnea, cough, wheezing, and chest tightness. This is consistent with previous studies. (14-16) Erkekol and colleagues showed that many Muslim asthmatic patients did not consider asthma as a drawback to fasting, and thus they continued fasting. (14) Indeed, study of Abhari *et al*. did not show any major effect of Ramadan fasting on the control of asthma. (15) Hospitalization rate in asthmatic subjects also did not change compared to other months. (16)

Finding of this study might be relevant weight changing during Ramadan. Various cytokines and mediators such as Interleukin-6, TNF-alpha, eotaxin, leptin, and reduction of anti-inflammatory adipokines in obese subjects may possibly contribute to the development or increased clinical expression of asthma in promoting airway inflammation. Therefore, weight loss may improve asthma. (24) However, after Ramadan, the weight loss was quickly regained. (25)

It appears that fasting does not worsen clinical symptoms. Although sufficient water drinking is needed for remodeling of endothelial airways cells, there might be a redistribution of extracellular water to the bronchial airways to prevent dehydration.

Our study had many limitations; the sample size was not large, however we observed significant changes in PEF home monitoring and its variability. PEF home monitoring was only performed during Ramadan, although spirometric variables were measured before and after Ramadan. It would be better to study our findings in a larger sample with a comparison of PEF home monitoring for at least a complete month prior and after Ramadan. Another important limitation of study was the lack of a control group, as it was difficult to find people not on fasting during this month.

Future research with a larger sample size, recording weight changes, and evaluating food intake and patterns is warranted.

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