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ORIGINAL ARTICLE

Knowledge, attitude and practice of physicians toward peak expiratory flow meter in primary health care centers in Kuwait

Haifaa Y. Jaffar [a], Tahani A. Alhaid [a], Nada A. Al-Hassan [b], Mohamed I. Kamel [c,d,*], Medhat K. El-Shazly [e,f]

[a] *Mishref Family Medicine Center, Ministry of Health, Kuwait*
[b] *Amiri Hospital, Ministry of Health, Kuwait*
[c] *Community Medicine Department, Faculty of Medicine, Alexandria University, Egypt*
[d] *Department of Occupational Medicine, Ministry of Health, Kuwait*
[e] *Department of Medical Statistics, Medical Research Institute, Alexandria University, Egypt*
[f] *Department of Health Information and Medical Records, Ministry of Health, Kuwait*

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KEYWORDS

Peak expiratory flow meter;
Knowledge;
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Abstract *Background:* Peak expiratory flow meter (PEFM) may reduce diagnostic delay and improve decision-making in asthma by providing an objective assessment of their flow and hence identify air flow variability that is essential for management of air way diseases.
Objectives: This study was designed to reveal extent of knowledge and perception of physicians about peak expiratory flow meter and factors affecting their knowledge.
Methods: Out of the total primary health care centers in Kuwait; only 50% were randomly selected. Out of 625 physicians working in the selected centers, 469 physicians were interviewed with an overall response rate of 75.0%.

* Corresponding author at: Department of Occupational Medicine, Ministry of Health, Kuwait. Mobile: +965 66337402.
E-mail address: kamelafm@yahoo.com (M.I. Kamel).

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Results: The results of this study showed that physicians had a relatively low total knowledge score percent of 66.2 ± 10.5%. The lowest individual mean percent score was that of procedures and steps of measuring peak expiratory flow rate (49.9 ± 29.3%). The highest percent knowledge score was that of instructions for learning of patients about PEF (76.2 ± 11.7%). Socio-demographic factors, receiving training, availability of PEF in the health center and being responsible about taking the measurements for patients showed inconsistent impact on the level of knowledge of physicians.

Conclusions: Further training of physicians about use of PEF and providing primary health care centers with PEF would play an important role to improve knowledge of physicians and hence improve domestic health care of patients with airway diseases.

1. Introduction

The increasing incidence of asthma and the subsequent need for devices to monitor peak expiratory flow (PEF) and other lung function indices have created an expanding use of monitoring devices.[1] Peak expiratory flow meter (PEFM) provides a simple, quantitative, reproducible, and objective measurement of large airway function. The purpose of using PEFMs is to monitor lung function, help identify asthma triggers, and help asthmatics recognize signs and symptoms of decreased lung function. Clinical studies have shown that the routine use of a PEFM, along with a self-management plan and education program, can lead to a better control of asthma.[2,3] Both the American Thoracic Society (ATS) and the European Respiratory Society (ERS) have developed guidelines defining performance criteria for the evaluation of spirometers.[4,5]

The importance of a full explanation to patients about when to use their PEFM, the correct technique for recording PEF and how to act on the results cannot be overstated and is key to their successful use. The new meters will give a better assessment of asthma severity for an important number of patients and this should lead to improved asthma care.[6–9]

The tendency toward more general practice consultations among those in possession of a meter could also be important. Evidence suggests that many avoidable deaths from asthma are caused by delay in seeking medical help.[10] Avery et al. found that 68% of asthmatic patients were not seeing a doctor regularly.[11] Guidelines that advise patients to seek medical help at a specified peak flow rate relieve them of a difficult decision and may result in an earlier treatment of an acute episode. The present study was designed to identify the prevailing knowledge and attitudes of physicians toward PEFM and to reveal factors affecting knowledge of physicians about the device.

2. Methods

An observational cross-sectional study design was adopted for this study. This design suits the objectives of this study. It is characterized by short duration, low cost, and less effort. It also allows for calculation of prevalence rates of the studied parameters. The study was carried out in the primary health care centers in Kuwait. A list of all primary health care centers of Kuwait (78 centers) was prepared and classified by health district (5 districts). Half the centers were randomly selected from each district. All physicians available in the centers during field work period of the study were asked for participation. All physicians on a long vacation were excluded from the study (16 physicians). The total number of physicians was 625. Out of these, only 469 agreed to share in the study with a response rate of 75.0%. The unit of observation of this study is a physician working in a primary health care center. The direct structured interview method was adopted for this study. This method allows for a direct interview of the target individuals and explaining any ambiguities of the questions. Although it is a time consuming method yet, it allows more interaction and better accuracy. The study covered the period from December 2009 to July 2010. Data were collected over three months starting from April to July 2010.

Data of this study were collected through a specially designed questionnaire. This questionnaire consisted of several sections. The first one dealt with socio-demographic characteristics, including age, sex, number of years in practice, educational qualification, current job, years at current work, and family history of bronchial asthma. Another section dealt with perception of physicians about prevalence of patients suffering from bronchial asthma or chronic obstructive pulmonary disease (COPD), proportion of those who need or own PEFM as well as the proportion of smokers among patients attending the center. Three questions dealt with advising patients to use PEFM and its ease of use at home as well as extent of need to PEFM in the health center. Another section dealt with practice on PEFM. This part includes receiving training about use of the device, taking measurements and availability of a device in the center. The knowledge section consisted of seven domains with a total of 41 questions scored as either zero or one covering benefits of PEF use (6 questions), instructions for using the equipment by patients (8 questions), defining normal level of PEF rate (5 questions), concepts of measurements (6 questions), indication of use of PEFM (4 questions), general concepts about PEFM (6 questions), and instructions for teaching patients about the device (6 questions).

A pilot study, before starting the field work, was carried out on 15 physicians (not included in the final study). This study was formulated with the following objectives: test the clarity, applicability of the study tools, accommodate the aim of the work to actual feasibility, identify the difficulties that may be faced during the application, as well as study all the procedures and activities of the administrative aspects. Also, the time of interviewing the physicians was estimated during this pilot study. The necessary modifications according to the results obtained were done, so some statements were reworded. The average interviewing time was 20 min.

All questions were coded before data collection. This facilitates both data entry and verification as well as reduces the

probability of errors during data entry. Data were fed to the computer directly from the questionnaire without an intermediate data transfer sheets. The Excel program was used for data entry. A file for data entry was prepared and structured according to the variables in the questionnaire. After data were fed to the Excel program; several methods were used to verify data entry. These methods included the following: simple frequency, cross-tabulation, as well as manual revision of entered data. Percent score was calculated for the total knowledge score as well as for each domain of knowledge. Before calculating the sum of score; the score of negative questions was reversed. The percent score was calculated as follows: ''sum of score multiplied by 100/number of items''. Each item was scored as either 0 or 1 value.

All the necessary approvals for carrying out the research were obtained. The Ethical Committee of the Kuwaiti Ministry of Health approved the research. A written format explaining the purpose of the research was prepared and signed by the nurse before starting the interview. In addition, the purpose and importance of the research were thoroughly discussed with those responsible for facilitating the research.

2.1. Statistical analysis

Before analysis, data were imported to the Statistical Package for Social Sciences (SPSS) which was used for both data analysis and tabular presentation. Descriptive measures (count, percentage, minimum, maximum, arithmetic mean, median, and standard deviation) as well as analytic ones (Mann Whitney Z test and Spearman correlation coefficient) were used. The level of significance selected for this study was $P \leqslant 0.05$.

3. Results

Table 1 demonstrates sociodemographic characteristics of the participating physicians. Age ranged from 20 to 67 years with a mean of 38.8 ± 8.9 years. The majority of physicians were females (52.9%). Kuwaitis constituted 46.9% of the total studied physicians. Married physicians formed 84.6%, while the rest were currently single (15.4%). Those holding a bachelor degree of medicine were 153 physicians (32.65%). Less than three quarters (73.8%) were registrars (senior and junior) while the rest (26.2%) were junior or senior specialists. On the average, physicians spent 12.7 ± 8.3 years in the current job. Those earning less than 1000 KD constituted 30.1%, while those earning more than 2000 KD per months constituted 29.4% of the studied sample. Physicians with salaries ranging between 1000 and 2000 KD formed 40.5% of the total physicians. One hundred and ninety-three (41.2%) physicians reported a positive personal or family history of bronchial asthma.

Table 2 shows opinion and practice of physicians toward PEFM. Physicians reported that, on the average, 40.9 ± 23.0% of the patients attending the health center were suffering from either bronchial asthma or COPD. They also stated that 35.8 ± 30.4% of patients are in need of PEFM. They also stated that 7.9 ± 11.4% are having and using the device at home. Enquiring physicians about the percent of smokers among their patients, they stated that on the average 40.2 ± 22.2% of them are smokers. Only 47.3% of physicians advised their patients to use PEFM, while 70.4% stated that the device can be easily used at home. Less than two thirds (61.8%) of physicians stated that there is a bad need for a device in the health care center. Those having PEFM available in their center constituted 43.1% of the studied physicians and 64.0% received training about it. The majority (80.8%) of physicians were responsible for taking the measurements of PEF for patients attending the health center.

Table 1 Socio-demographic characteristics of physicians.

Character	Number (n = 469)	%
Age		
Min–Max	20–67	
Mean + SD	38.8 ± 8.9	
Sex		
Male	221	47.1
Female	248	52.9
Nationality		
Kuwaiti	220	46.9
Non Kuwaiti	249	53.1
Marital status		
Single	52	11.1
Married	397	84.6
Divorced/Widowed	20	4.3
Qualification		
Bachelor	153	32.6
Master/PhD	316	67.4
Job		
Registrar	346	73.8
Specialist	123	26.2
Years at work		
Min–Max	1–40	
Mean + SD	12.7 ± 8.3	
Income		
< 1000 KD	141	30.1
1000–2000 KD	190	40.5
> 2000 KD	138	29.4
Family history of asthma		
Yes	193	41.2
No	276	58.8

Table 3 depicts knowledge of physicians about PEFM. Physicians have got an overall mean percent score of 66.2 ± 10.5%. The highest mean percent knowledge domain score was that dealing with instructing patients for use of PEFM (76.2 ± 11.7%) while the lowest score was that dealing with steps of using it (49.9 ± 29.3%). Benefits of using the device and knowledge about indications for its use had similar mean percent score (73.6 ± 23.1% and 73.9 ± 26.9%, respectively). Defining the normal level of PEF rate (61.3 ± 19.5%) and knowledge about the general concepts of PEFM (65.6 ± 18.3%) occupied intermediate ranks among the individual knowledge domains of physicians about the device.

Table 4 shows factors affecting domains of knowledge about PEFM among physicians. Generally speaking, there was not a specific pattern that reflects trend of outcome. Males had significantly higher scores for knowledge domains one (benefit of use, 78.9 ± 17.5 compared with 68.9 ± 26.4, $P < 0.001$) and five (indicators of use, 77.0 ± 25.0 compared with 71.2, $P = 0.0$) while females had a significantly higher

Table 2 Opinion and practice of physicians toward peak expiratory flowmetry.

Opinion and practice	Number	%
Opinion		
Approximate% of suffering from asthma or COPD		
Min–Max	1–95	
Mean + SD	40.9 ± 23.0	
Median	40	
Percent of those in need of PEFM		
Min–Max	0–100	
Mean + SD	35.8 ± 30.4	
Median	25.0	
Percent of those having PEFM at home		
Min–Max	0–50	
Mean + SD	7.9 ± 11.4	
Median	5.0	
Approximate% of smokers		
Min–Max	0 – 90	
Mean ± SD	40.2 ± 22.2	
Median	40.0	
Advising patients to use PEFM	222	47.3
There is a bad need for PEFM in the health center	290	61.8
It is easy to use PEFM correctly at home	330	70.4
Practice		
There is a PEFM in the center	202	43.1
Receiving training about use of PEFM	300	64.0
Measuring PEF of patients at the health center	379	80.8

score of domain two (steps of use, 52.3 ± 30.0 compared with 47.1 ± 28.3, $P = 0.048$). Non-Kuwaitis had a significantly higher score for knowledge domains one (benefit of use, 79.5 ± 16.8 compared with 67.0 ± 27.3, $P < 0.001$), five (indicators of use, 80.8 ± 24.1 compared with 66.1 ± 27.9, $P < 0.001$), and six (general concepts, 68.1 ± 18.6 compared with 62.7 ± 17.7, $P = 0.002$), while Kuwaitis have a significantly higher score of knowledge domain 2 (steps of use, 53.1 ± 29.5 compared with 47.0 ± 28.8, $P = 0.021$). Those holding a bachelor degree of medicine had a significantly higher score for knowledge domains one (79.2 ± 18.5 compared with 70.9 ± 24.7%, $P = 0.001$) and five (84.2 ± 20.4 compared with 69.0 ± 28.3%, $P < 0.001$) while those holding a higher qualification degree had a significantly higher score for domain four (concepts of measurements, 71.5 ± 20.0 compared with 67.0 ± 16.9, $P = 0.007$). No significant differences were found between job from one side and knowledge domains on the other side except for knowledge domain five where registrars had a significantly higher mean percent score than the specialists (76.2 ± 25.8 compared with 67.5 ± 3.15%, $P = 0.004$). Physicians working in a health center with a PEFM available had a significantly higher knowledge score for domain one (76.6 ± 20.5 compared with 69.5 ± 25.7, $P = 0.003$) and seven (78.1 ± 11.2 compared with 74.8 ± 11.8%, $P = 0.002$) while the other physicians had a significantly higher score for domain two (53.0 ± 29.6 compared with 47.5 ± 28.8%, $P = 0.044$) and five (76.9 ± 26.0 compared with 70.1 ± 27.7%, $P = 0.006$). Physicians receiving training about PEFM had a significantly higher score for domain four (71.3 ± 18.4 compared with 67.7 ± 20.3%, $P = 0.04$), while they had a significantly lower score for domain one (71.4 ± 27.9 compared with 77.5 ± 19.0%, $P = 0.014$) and six (63.3 ± 16.9 compared with 69.6 ± 20.0%, $P < 0.001$). Physicians carrying out PEF for patients attending the primary health care center had a significantly higher mean percent score for knowledge domain one (82.6 ± 15.4 compared with 71.5 ± 24.2%, $P < 0.001$) and three (65.8 ± 21.9 compared with 60.3 ± 18.8%, $P = 0.027$) while they had a lower score on domain two (42.2 ± 23.1 compared with 51.7 ± 30.3%, $P = 0.010$).

4. Discussion

Patients with large air obstruction have a fluctuating symptomatology as well as a varying degree of obstruction (and/or hyper-responsiveness).[12] Spirometry, physical examination and PEF measurements, and a recorded diary of PEF values or symptoms are currently the most widely used means of assessment of this condition. Physical examination by a trained physician is not superior to the subject's own perception of symptoms with regard to the degree of airways obstruction as determined by PEF measurements.[13] The subject's perception of symptoms does have its limits. One study demonstrated that airway resistance had to increase substantially before symptoms appear, and that 15% of the subjects were unable to sense the presence of marked obstruction.[14] Several authors have also found that the presence and intensity of symptoms in certain subjects did not satisfactorily correlate with the degree of airway obstruction.[15,16] These findings support the use of PEFM as a valuable tool for managing of attacks of bronchial asthma that necessitates close coordination between the patient and the examining physician.

The results of the study revealed that primary health care physicians were aware about the extent of the obstructive lung diseases. They stated that bronchial asthma and or COPD were prevalent among 40.9 ± 23.0% of their patients and almost one third (35.7 ± 30.4%) were in need of a PEFM. Although, 47.3% of the physicians advised their patients to use PEFM yet, only 7.9 ± 11.4% owned a device at home. Physicians felt the need for PEFM in their centers as 61.8% of them admitted that there is an urgent need for such equipment. This might be attributed to the high proportion that received training about the device (64.0%) and being the staff responsible for measuring the pulmonary function test at the health center (80.8%).

The results of this study showed that, primary health care physicians have got an overall mean percent score of 66.2 ± 10.5% with a median of 65.9%. In view of the important role of physicians in diagnosis and management of obstructive lung diseases; the level of knowledge is relatively low. What supports this view is the low mean percent knowledge score (49.9 ± 29.3% and a media of 50%) of the steps required by the patients for measuring their lung function by using PEFM. Physicians see most patients at their initial presentation, provide total care for the majority and make decisions on both acute and elective referral to secondary services.[17] In view of the subjective assessment of asthma and the possible delay in diagnosis and management; PEFM use could play a key role to improve management and hence mortality or severe morbidity of cases with asthma or COPD.[18–22]

No consistent relationship could be revealed between the availability of PEFM and training from one side and either

Table 3 Knowledge of physicians about peak expiratory flow meter.

Knowledge	Number (n = 469)	%
Benefits of PEFM use		
Indicates degree of treatment success	437	93.2
Indicates when to add or stop a medicine	401	85.5
Indicates the urgent need to go to a hospital	323	68.9
It can diagnose precipitating factors	176	37.5
Helps spread knowledge about BA	332	70.8
Helps to diagnose exercise asthma	402	85.7
Mean ± SD (Median)	73.6 ± 23.1 (83.3)	
Steps of use		
Put the indicator at the base of the scale	224	47.8
Stand up	95	20.3
Take a deep breath	82	17.5
Tightly encircle your lips around the equipment	327	69.7
Expire air as fast and deep as you can	228	48.6
Write down the reading	346	73.8
Repeat the previous steps twice	273	58.2
Register the largest reading you got of the here trials	296	63.1
Mean ± SD (Median)	49.9 ± 29.3 (50.0)	
Defining normal level of PEF rate		
It is better to define PEFR using age, height and sex	62	13.2
It is better to define PEFR for each person in particular	379	80.8
To estimate PEFR, take measurements for two weeks	241	51.4
To estimate PEFR, take measurements for day and night	314	67.0
To estimate PEFR, take measurements before and after bronchodilator	442	94.2
Mean ± SD (Median)	61.3 ± 19.5 (60.0)	
Concepts of measurements		
If reading to = 100% of normal there is no need to change treatment	431	91.9
If reading = 90% of normal; treatment may be insufficient	328	69.9
If reading less than 90%, consult your physician immediately	279	59.5
The equipment can be used during an asthma attack	284	60.6
There should be a registration board	443	94.5
Registration chart is graded from 5 – 300	205	43.7
Mean ± SD (Median)	70.0 ± 19.1 (66.7)	
Indicators for use of PEFM		
Bronchial asthma	459	97.9
COPD	403	85.9
Chronic bronchitis	262	55.9
Emphysema	263	56.1
Mean ± SD (Median)	73.9 ± 26.9 (75.0)	
General concepts about PEFM		
Proper management is better than the reading itself	413	88.1
Plan of therapy is directly defined according to the registered reading	339	72.3
It is enough to wash the equipment with water to clean it	273	58.2
Generally speaking, it is very easy to use PEFM	374	79.7
There is no contraindications to use PEFM	188	40.1
Adults and children use the same PEFM	258	55.0
Mean ± SD (Median)	65.6 ± 18.3 (66.7)	
Instructions for teaching of patients about PEFM		
Using the equipment	465	99.1
Cleaning and storing the equipment	457	97.4
Recording in the registration chart	454	96.8
Contraindications of use of the equipment	318	67.8
Changing plan of therapy	366	78.0
Advising others about the equipment	85	18.1
Mean ± SD (Median)	76.2 ± 11.7 (83.3)	
Total Mean ± SD (Median)	66.2 ± 10.5 (65.9)	

Table 4 Factors affecting domains of knowledge (mean and standard deviation) about PEF among physicians.

Character	K1	K2	K3	K4	K5	K6	K7	Total
Sex								
Male	78.9 + 17.5	47.1 + 28.3	61.4 + 19.9	68.9 + 19.5	77.0 + 25.0	66.3 + 18.8	75.8 + 13.0	66.6 + 9.6
Female	68.9 + 26.4	52.3 + 29.9	61.3 + 19.2	71.0 + 18.8	71.2 + 28.3	64.9 + 18.0	76.4 + 11.9	65.8 + 11.3
P	<0.001*	0.048*	0.771	0.213	0.032*	0.574	0.959	0.992
Nationality								
Kuwaiti	67.0 + 27.3	53.1 + 29.5	61.1 + 19.0	74.2 + 20.2	66.1 + 27.9	62.7 + 17.7	76.4 + 11.9	65.3 + 11.6
Non Kuwaiti	79.5 + 16.8	47.0 + 28.8	61.5 + 20.0	66.3 + 17.4	80.8 + 24.1	68.1 + 18.6	76.0 + 11.6	67.0 + 9.4
P	<0.001*	0.021*	0.865	<0.001*	<0.001*	0.002*	0.422	0.256
Qualification								
Bachelor	79.2 + 18.5	46.6 + 26.6	59.1 + 19.7	67.0 + 16.9	84.2 + 20.4	66.1 + 17.5	77.6 + 9.8	66.9 + 8.4
Higher	70.9 + 24.7	51.5 + 30.4	62.4 + 19.4	71.5 + 20.0	69.0 + 28.3	65.3 + 18.8	75.6 + 12.5	65.8 + 11.4
P	0.001*	0.160	0.089	0.007*	<0.001*	0.517	0.125	0.540
Job								
Registrar	74.2 + 22.8	49.6 + 28.3	61.6 + 19.2	69.2 + 18.8	76.2 + 25.8	65.9 + 18.6	76.0 + 12.2	66.4 + 9.9
Specialist	72.0 + 24.0	50.6 + 31.9	60.7 + 20.5	72.2 + 20.0	67.5 + 29.2	64.5 + 17.6	77.0 + 10.1	65.7 + 12.1
P	0.308	0.897	0.457	0.087	0.004*	0.221	0.399	0.866
PEFM in center								
Yes	76.6 + 20.5	47.5 + 28.8	62.6 + 19.1	71.1 + 20.2	70.1 + 27.7	65.5 + 18.7	78.1 + 11.2	66.3 + 10.2
No	69.5 + 25.7	53.0 + 29.6	59.7 + 20.0	69.2 + 18.3	76.9 + 26.0	65.6 + 17.9	74.8 + 11.9	66.1 + 10.9
P	0.003*	0.044*	0.218	0.221	0.006*	0.889	0.002*	0.759
Training								
Yes	71.4 + 27.9	50.9 + 29.1	60.3 + 18.5	71.3 + 18.4	72.3 + 29.4	63.3 + 16.9	76.4 + 10.3	65.7 + 10.9
No	77.5 + 19.0	48.1 + 29.6	63.1 + 21.0	67.7 + 20.3	76.8 + 21.8	69.6 + 20.0	75.8 + 13.8	67.1 + 9.9
P	0.014*	0.386	0.123	0.036*	0.410	<0.001*	0.948	0.190
Measuring								
Yes	82.6 + 15.4	42.2 + 23.1	65.8 + 21.9	68.7 + 18.8	78.3 + 20.3	68.9 + 17.2	74.8 + 14.8	67.1 + 9.2
No	71.5 + 24.2	51.7 + 30.3	60.3 + 18.8	70.3 + 19.2	72.9 + 28.2	64.8 + 18.6	76.6 + 10.8	66.0 + 10.8
P	<0.001*	0.010*	0.027*	0.372	0.303	0.099	0.673	0.552

* Significant, *P*: of Mann Whitney $Z < 0.05$; K1 to K7, Knowledge domains.

the PEFM total knowledge or individual scores in this study. This could be attributed to the unavailability of the device in more than half the centers (56.9%). The same factor could have undermined the expected outcome of training that was received by the majority of physicians (64.0%).

In view of the results of this study, it can be concluded that, although physicians received training about PEFM, yet their knowledge still needs improving. The topics to be stressed in the specifically tailored training program should include: steps of using, defining normal level, and the general concepts of PEF measurement. A survey about the need for assessment of PEFM in all the health centers in Kuwait is required to determine the number of devices needed and guidelines for use whether for physicians or patients.

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