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

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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. Knowledge of nurses and physicians in primary health care can play an essential role to enhance the response of patients about the measurements of peak expiratory flow (PEF).
Objective: The aim of the study was to reveal the extent and pattern of knowledge and perception of physicians and nurses about PEFM.
Methods: Out of the total primary health care centers in Kuwait; only 50% were randomly selected. A total of 895 physicians and nurses were interviewed out of 1324 individuals currently

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working in the selected centers for this study with an overall response rate of 74.4%. The questionnaire contained a knowledge section consisted of seven domains with a total of 41 questions.

Results: The results of this study showed that physicians had a relatively higher total knowledge score percent than nurses (66.2 ± 10.5% compared with 64.7 ± 7.3%, $P = 0.004$). Physicians tended to have higher knowledge score for steps of use, defining normal values, and concepts of measurements domains of knowledge, while nurses had significantly higher score values for benefits of use, indicators of use, general concepts, and instructions for learning patients' knowledge domains of PEFM.

Conclusion: Due to different patterns of knowledge and practice of nurses and physicians, training programs should be specifically tailored for each group to bridge the gap of knowledge and improve deficient practices.

1. Introduction

Peak expiratory flow (PEF) measurements may reduce diagnostic delay and improve decision-making in asthma as well as other obstructive lung diseases by providing an objective assessment of air flow and hence an opportunity to identify the airflow variability which is pathognomonic of asthma and to objectively assess its severity. 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 subjects were unable to sense the presence of marked obstruction.[1] 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.[2,3] Although the role of PEF measurements in the management of asthma has long been discussed, there is little objective evidence to support the adoption of widespread peak flow monitoring by patients but monitoring may have a role to play in its diagnosis.[4–7]

The majority of acute asthmatic exacerbations will occur outside routine general practice consulting hours.[8] It is, therefore, important that patients have the peak expiratory flow meter (PEFM) available so that they can objectively assess the severity of acute asthma exacerbations.

The high rates of bronchial asthma in Kuwait and other chronic obstructive lung diseases (COLD) necessitate proper management of the disease with special emphasis on proper management of acute attacks or exacerbation of the disease.[9] This could clarify the importance of use of PEFM and high level of quality knowledge of the primary health care staff about it and its uses, benefits, concepts, indications of use and proper interpretation of the findings of the test. However, literature review did not reveal any available papers dealing with this topic in Kuwait. Thus, the following study was formulated to reveal the extent of knowledge and perceptions of physicians and nurses toward PEFM, and compare the pattern of knowledge domains among them.

2. Methods

An observational cross-sectional study design was adopted for this study. This design suits the objective 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 (five districts). Half the centers were randomly selected from each district. All physicians and nurses available during the field work of the study in the selected centers were the target population of this study. Those on long vacation were excluded from the study (16 physicians and 11 nurses). The total number selected was 1324. Out of these, only 985 agreed to share in the study with a response rate of 74.4%. The unit of observation of this study is a physician or a nurse 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 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 section dealt with sociodemographic 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 about the prevalence of patients suffering from bronchial asthma or 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 the extent of need of PEFM in the health center. Another section dealt with the practice on PEFM. This part includes receiving training about use of device, taking measurements and its availability in the center. The knowledge section consisted of seven domains with a total of 41 questions covering benefits of PEFM use (six questions), instructions for using the device by patients (eight questions), defining normal level of PEFR (five questions), concepts of measurements (six questions), indication of use of PEFM (four questions), general concepts about the device (six questions), and instructions for learning patients about it (six questions).

A pilot study, before starting the field work, was carried out on 25 individuals (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 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 the sum of score multiplied by 100 and divided by the 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 physician or nurse before starting the interview. In addition, the purpose and importance of the research were thoroughly discussed with those responsible about 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 Chi square test) were utilized. The level of significance selected for this study was $P \leqslant 0.05$.

3. Results

Table 1 shows sociodemographic characteristics of studied physicians and nurses. Physicians tended to be elder than nurses (38.8 ± 8.9 years compared with 35.2 ± 7.8 years, $P < 0.001$) and have a longer duration at work (12.7 ± 8.3 compared with 11.0 ± 7.5, $P = 0.002$). Females (78.7% compared with 52.9%, $P < 0.001$) and non-Kuwaitis (92.4% compared with 53.1%, $P < 0.001$) were more likely encountered among nurses than physicians. Also physicians held a higher

Table 1 Sociodemographic characteristics of nurses and physicians.

Characteristics	Nurses (n = 516)		Physicians (n = 469)		P value
	No.	%	No.	%	
Age					
Min-Max	20–60		20–67		<0.001*
Mean ± SD	35.2 ± 7.8		38.8 ± 8.9		
Sex					
Male	110	21.3	221	47.1	<0.001*
Female	406	78.7	248	52.9	
Nationality					
Kuwaiti	39	7.6	220	46.9	<0.001*
Non-Kuwaiti	477	92.4	249	53.1	
Marital status					
Single	58	11.2	52	11.1	0.952
Married	438	84.9	397	84.6	
Divorced/Widowed	20	3.9	20	4.3	
Qualification					
Bachelor degree	462	89.5	153	32.6	<0.001*
Master/PhD	54	10.5	316	67.4	
Years at work					
Min–Max	1–33		1–40		0.002*
Mean ± SD	11.0 ± 7.5		12.7 ± 8.3		
Income					
<1000KD	479	92.8	141	30.1	<0.001*
1000–1499	31	6.0	119	25.4	
1500–1999	6	1.2	71	15.1	
2000–2499	0	0.0	39	8.3	
⩾2500	0	0.0	99	21.1	
Family history of asthma					
Yes	80	15.5	193	41.2	<0.001*
No	436	84.6	276	59.8	

* Significant $P < 0.05$.

Table 2 Opinion and practice of physicians and nurses about PEF.

Opinion and practice	Nurses (n = 516)		Physicians (n = 469)		P value
Opinion					
Approximate% of suffering from COPD/asthma					
Min–Max	6–95		1–95		<0.001*
Mean ± SD	55.36 ± 21.844		40.92 ± 22.998		
Median	57.5		40		
Percent of those in need of PEFM					
Min–Max	0–100		0–100		<0.001*
Mean ± SD	45.26 ± 26.703		35.76 ± 30.412		
Median	40.0		25.0		
Percent of those having PEFM at home					
Min–Max	0–90		0–50		<0.001*
Mean ± SD	14.82 ± 16.624		7.85 ± 11.391		
Median	10.0		5.0		
Approximate% of smokers					
Min–Max	0–100		0–90		<0.001*
Mean ± SD	60.86 ± 25.801		40.21 ± 22.225		
Median	70.0		40.0		
Advising patients to use PEFM	114	22.1	222	47.3%	<0.001*
There is a bad need for PEFM in the health center	204	39.1	290	61.8%	<0.001*
It is easy to use PEFM correctly at home	384	74.4	330	70.4%	0.155
Practice					
There is a PEFM in the center	117	22.7	202	43.1%	<0.001*
Receiving training about use of PEFM	109	21.1	300	64.0%	<0.001*
Measuring PEF of patients at the health center	71	13.8	379	80.8%	0.021*

* Significant $P < 0.05$.

educational qualification than nurses (67.4% compared with 10.5%, $P < 0.001$) and were earning higher salaries ($P < 0.001$). Physicians and nurses were similarly distributed over the categories of marital status with no significant difference.

Table 2 portrays opinion and practice of physicians and nurses about PEFM. Nurses tended to have higher estimations of percentage of patients suffering from either bronchial asthma or COPD (55.4 ± 21.8% compared with 40.9 ± 23.0%, $P < 0.001$), those in need of PEFM (45.3 ± 26.7% compared with 35.8 ± 30.4%, $P < 0.001$), those having PEFM at home (14.8 ± 16.6% compared with 7.9 ± 11.4%, $P < 0.001$), and approximate percentage of smokers among attending patients (60.9 ± 25.8% compared with 40.2 ± 22.2%, $P < 0.001$). More physicians tended to advise patients to use PEFM (47.3% compared with 22.1%, $P < 0.001$) and feel an urgent need of the device at the health centers (61.8% compared with 39.1%, $P < 0.001$). Also more physicians tended to receive training (64.0% compared with 21.1%, $P < 0.001$) and practice measurement of PEFM for patients (80.8% compared with 13.8%, $P = 0.021$). Physicians were also more aware about the availability of PEFM at the primary health care center they are working in (43.1% compared with 22.7%, $P < 0.001$).

Table 3 illustrates knowledge of physicians and nurses about PEFM. Although physicians had a significantly higher overall mean percent of PEFM knowledge than nurses (66.2 ± 10.5% compared with 64.7 ± 7.3%, $P = 0.004$). Yet, the individual domains of knowledge showed a varying pattern. Nurses had significantly higher mean percent score of general domains of knowledge namely, benefits of use of PEFM (78.3 ± 19.5% compared with 73.6 ± 23.1%, $P = 0.006$), indicators of its use (82.1 ± 20.5% compared with 73.9 + 26.9%, $P < 0.001$), General concepts about PEF (74.4 ± 17.3% compared with 65.6 ± 18.3%, $P < 0.001$), and instructions for patient learning (78.1 ± 12.3% compared with 76.2 ± 11.7%, $P < 0.001$), while physicians had significantly higher scores for knowledge domains dealing with practical aspects of PEFM namely, steps of use (49.9 ± 29.3% compared with 39.0 ± 24.4%, $P < 0.001$), defining normal levels of PEFR (61.3 ± 19.5% compared with 58.9 ± 17.3%, $P = 0.02$), and concepts of measurements (70.0 ± 19.1% compared with 55.6 ± 15.4%, $P < 0.001$).

4. Discussion

Variation in lung function from day to day, spontaneously or in response to treatment, is characteristic of bronchial asthma but the ability of the patient to recognize the changes is often limited and objective evaluation is desirable. Because of its practicability and the generally accepted belief that it improves management, it is now common to recommend that patients with asthma monitor their lung function on a day-to-day basis by measuring their PEFR with a simple device such as PEFR. As Sly and his colleagues found no correlation between symptoms recorded in the diary of asthmatic children and rescue bronchodilator use, they stated that ''rational management of troublesome asthma requires the use of an inexpensive

Table 3 Comparison of knowledge of physicians and nurses about peak expiratory flowmetry.

Knowledge	Nurses		Physicians		*P* value
	No.	%	No.	%	
Benefits of PEFM use					0.006*
Indicates degree of treatment success	465	90.1	437	93.2	
Indicates when to add or stop a medicine	365	70.7	401	85.5	
Indicates the urgent need to go to a hospital	392	76.0	323	68.9	
It can diagnose precipitating factors	313	60.7	176	37.5	
Helps spread knowledge about BA	420	81.4	332	70.8	
Helps to diagnose exercise asthma	468	90.7	402	85.7	
Mean ± SD (Median)	78.3 ± 19.5 (83.3)		73.6 ± 23.1 (83.3)		
Steps of use					
Put the indicator at the base of the scale	65	12.6	224	47.8	< 0.001*
Stand up	16	3.1	95	20.3	
Take a deep breath	173	33.5	82	17.5	
Tightly encircle your lips around the equipment	185	35.9	327	69.7	
Expire air as fast and deep as you can	362	70.2	228	48.6	
Write down the reading	315	61.0	346	73.8	
Repeat the previous steps twice	225	43.6	273	58.2	
Register the largest reading you got of the here trials	269	52.1	296	63.1	
Mean ± SD (Median)	39.0 ± 24.4 (25.0)		49.9 ± 29.3 (50.0)		
Defining normal level of PEFR					
It is better to define PEFR using age, height and sex	58	11.2	62	13.2	0.02*
It is better to define PEFR for each person in particular	486	94.2	379	80.8	
Take measurements for two weeks	253	49.0	241	51.4	
Take measurements for day and night	272	52.7	314	67.0	
Take measurements before and after bronchodilator	451	87.4	442	94.2	
Mean ± SD (Median)	58.9 ± 17.3 (60.0)		61.3 ± 19.5 (60.0)		
Concepts of measurements					
100% of normal there is no need to change treatment	428	82.9	431	91.9	< 0.001*
90% of normal; treatment may be insufficient	284	55.0	328	69.9	
< 90%, consult your physician immediately	204	39.5	279	59.5	
The equipment can be used during an asthma attack	160	31.0	284	60.6	
There should be a registration board	479	92.8	443	94.5	
Registration chart is graded from 5 to 300	351	68.0	205	43.7	
Mean ± SD (Median)	55.6 ± 15.4 (50.0)		70.0 ± 19.1 (66.7)		
Indicators for use of PEFM					
Bronchial asthma	514	99.6	459	97.9	< 0.001*
COPD	479	92.8	403	85.9	
Chronic bronchitis	417	80.8	262	55.9	
Emphysema	284	55.0	263	56.1	
Mean ± SD (Median)	82.1 ± 20.5 (75.0)		73.9 ± 26.9 (75.0)		
General concepts about PEF					
Proper management is better than the reading itself	476	92.2	413	88.1	< 0.001*
Plan of therapy according to the registered reading	443	85.9	339	72.3	
Wash the equipment with water to clean it	287	55.6	273	58.2	
Generally speaking, it is very easy to use PEFM	423	82.0	374	79.7	
There is no contraindications to use PEFM	272	52.7	188	40.1	
Adults and children use the same PEFM	402	77.9	258	55.0	
Mean ± SD (Median)	74.4 ± 17.3 (66.7)		65.6 ± 18.3 (66.7)		
Instructions for learning of patients about PEFM					
Using the equipment	513	99.4	465	99.1	< 0.001*
Cleaning and storing the equipment	502	97.3	457	97.4	
Recording in the registration chart	487	94.4	454	96.8	
Contraindications of use of the equipment	462	89.5	318	67.8	
Changing plan of therapy	388	75.2	366	78.0	
Advising others about the equipment	451	87.4	85	18.1	
Mean ± SD (Median)	78.1 ± 12.0 (83.3)		76.2 ± 11.7 (83.3)		
Total Mean ± SD (Median)	64.7 ± 7.3 (65.9)		66.2 ± 10.5 (65.9)		0.004*

* Significant, $P < 0.05$.

PEFM to provide objective measurements of lung function".[10] For many years now, it has been accepted that asthmatics also have a much larger diurnal variation of lung function than normal subjects, and that this diurnal variation is greater in those with more severe bronchial hyperreactivity.[11,12] In the international consensus guidelines for the management of chronic asthma in adults and the subsequent British version of the recommendations, the self measurement of PEF is encouraged as a valuable guide to the severity of asthma.[13,14]

This study was conducted to fill the gap in the knowledge and perception of the medical staff in primary health care centers about PEFM and illustrating the pattern of different domains of knowledge. The results of the study revealed that primary health care physicians had a significantly higher mean percent overall score of knowledge about PEFM than nurses ($66.2 \pm 10.5\%$ compared with $64.7 \pm 7.3\%$, $P = 0.004$). However, individual knowledge domains showed varying results. Physicians were knowledgeable about steps of use, defining normal values and concepts of measurements (measures related to practice), while nurses had significantly higher scores on benefits of use, indicators of use, general concepts, and instructions for learning patients domains which are intimately related to theoretical knowledge about PEFM. These differences are mainly attributed to the higher proportions of physicians receiving training (64.0% compared with 21.1%) and taking measurements of PEF at the centers they are working in (80.8% compared with 21.1%).

Nurses tended to overestimate frequency of asthmatics attending the primary health care center, their need for PEFM or taking PEF measurements at their home by their own PEFM. This is also clear with the frequency of smokers attending the center. The results of a recent community survey in Kuwait during 2008 revealed that 23.4% of the population are currently smokers.[9] Although, the general population are expected to have a better health behavior than those attending the health centers as they may be suffering from obstructive lung diseases as a result of being smokers. This can also be attributed to lack of both epidemiological and statistical reports that should be freely circulated to all the health staff of these centers.

In view of the results of this study, it can be concluded that, a specifically tailored program should be planned for physicians and nurses with special emphasis on the deficient domains for each group. Free circulation of the epidemiologic and statistical reports should be made available to every member of the working staff in the primary health care center to provide valid rates of measures related to COPD. In addition, a survey about need assessment of PEFMs in all the health centers in Kuwait is required to determine the number of devices needed and guidelines for use whether for the physicians or patients.

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