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Practice and Barriers to Spirometry Usage among Healthcare Professionals in Karachi

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ABSTRACT

A spirometer is the most suitable technique for primary care because it is very convenient for healthcare professionals to use because it is very low cost, performs in a short time, and also it is a non-invasive technique patients can easily understand and perform. The usage of a spirometer is very beneficial and important to find out the stage and monitor the pulmonary conditions during performing therapies. **Objective:** To determine the knowledge, practice, and barriers regarding the usage of spirometry among healthcare professionals in Karachi. **Methods:** A cross-sectional survey was done from Nov 2023 to April 2024 in Karachi on healthcare professionals to explore the usage of spirometry among them. The sample size was 384 and the non-probability convenients sampling was used. Data were evaluated through a validated questionnaire and analization of data were done through SPSS version 23.0. **Results:** A total number of 384 research participants were included in this study. The results showed that knowledge related to spirometry usage was present in research participants around 319 (83.07%). The practice of spirometry by healthcare professionals was observed in 172 (58.9%) and the most common barrier observed in this study was the rate of unavailability of the equipment around 51 (13.28%) in the hospitals. **Conclusions:** It was concluded that the knowledge of spirometry was good among healthcare professionals but the practice was poor due to the unavailability of spirometry in the hospitals.

INTRODUCTION

The spirometer is the apparatus that is used to measure the capacity of the lungs for inhalation or exhalation of the air [1]. It is considered the best way to detect and diagnose a patient who suffers from chronic diseases of the lungs especially those patients who suffer from long-term obstruction of airflow [2]. A spirometer is the most suitable technique for primary care. because it is used for the measurement of the amount of air we breathe in and out of our lungs and also shows the blowing of the flow of air from our lungs towards the outside. It is very convenient for healthcare professionals to use because it is very low cost, performs in a short time, and also it is a non-invasive technique patients can easily understand and perform [3]. It is very helpful in diagnosing initial and prolonged respiratory issues or diseases. Most of the conditions of the lungs and surrounding structures can be used for the

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prevention of many diseases [4]. A study has shown that major pulmonary diseases can be easily managed when they can be diagnosed at an earlier stage and can be treated by physicians or respiratory experts. The detection of appropriate signs and symptoms of the condition is an essential part of finding better outcomes for treatment [5]. In some countries, due to low income, most of the services of X-ray imaging and endoscopic procedures are not available for the patients to diagnose the specific cause of the condition, and most of the specialists don't refer patients for radiographic assessment and spirometry in pulmonary conditions of patients [6]. The usage of a spirometer is very beneficial and important to find out the stage and monitor the pulmonary conditions during the process of management. Mostly spirometry is helpful for those patients who are planning for any type of surgery to assess the cardiopulmonary disease of a patient which can help in reducing the symptoms during or after the surgery [7]. Spirometry is used for screening and evaluation of issues related to the condition. of the people. The test of spirometry is widely used in the evaluation and management of a patient [8]. It depends on the country and its healthcare system that many healthcare professionals and consultants perform the spirometry test themselves, or otherwise, they only supervise the test, or in some clinical settings they only interpret the spirometry readings and results of the test [9]. In the U.S., it can be performed by healthcare professionals in which general practitioners and nurses are involved [10]. Compared to France, it can be performed by pulmonologists who are experts in this field after the approval of the registrar. Spirometry is a good and valuable piece of equipment, it requires the best and most well-trained trainer and the patient who easily understands the procedure and participates easily [11]. This can be performed by healthcare professionals which include general practitioners, physical therapists, pulmonologists, and nurses. They are well-trained staff for performing the spirometry on the patient [12].

This study aimed to determine the knowledge, practice, and barriers regarding the usage of spirometry in healthcare professionals.

METHODS

It was a cross-sectional study conducted from Nov 2023 to April 2024 in Karachi. The research participants were chosen through a non-probability convenient sampling. Healthcare professionals working in hospitals in seven districts of Karachi (East, West, South, North, Central, Malir, Korangi, Kemari) were recruited and a sample size of 384 was calculated through Raosoft.com software. According to the total number of healthcare professionals of Karachi and the confidence interval of 95%. In inclusion criteria, healthcare professionals like physicians, physical therapists, and nurses are those working in clinical settings with minimal experience of 1 year, age group between 20 years to more than 59 years. The exclusion criteria was students or interns working under supervision in hospital settings, and those who were not willing to participate in our study were excluded. In this study, a validated questionnaire was used which was already used by Desalu OO *et al.*, in the research done in 2009 in Nigeria [13]. This questionnaire comprises questions related to knowledge, practice, and barriers to the usage of spirometry among healthcare professionals. Consent was taken from the research participants before the collection of data. Data were analyzed by SPSS version 23.0 software. Through which frequencies and percentages of variables were calculated. The chi-square test was used to check the significance of the responses of research participants related to the knowledge, practice and barriers of spirometry usage among healthcare professionals at a p-value of < 0.05.

RESULTS

A total number of 384 healthcare professionals were extracted from different hospitals in Karachi of which 67 (17.44%) were general physicians, 148 (38.54%) were Physical therapists, 169 (44.01%)were nurses and 203 (52.86%) were male respondents, and 181 (47.13%) females who were participating in this study. The demographics of the participants and the details regarding the spirometer are shown in table 1.

Table 1: Demographical Data of Study Participants

Demographical Data	Frequency (%)
Age	
20-29	87 (22.65%)
30-39	103 (26.82%)
40-49	81 (21.09%)
50-59	74 (19.27%)
> 59	39 (10.15%)
Gender	
Male	203 (52.86%)
Female	181 (47.13%)
Years of Experience	
< 5 Years	217 (56.51%)
> 5 Years	167 (43.48%)
Hospital	
Government	74 (19.27%)
Semi-Government	113 (29.42%)
Private	197 (51.30 %)
Cases of Respiratory Issues in A Week	17 (4.42%)
Spirometer Availability in Setup	
Yes	249 (64.84%)
No	135 (35.15%)
Knowledge of Spirometer Interpretation	
Yes	319 (83.07%)

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No	65 (16.92%)
Healthcare Professionals	
Physicians	67 (17.44%)
Physical Therapists	148 (38.54%)
Nurses	169 (44.01%)

According to healthcare professionals, they face many barriers regarding the spirometer practice because it is depending on the private or public sector hospital. The rate of unavailability of the equipment was high about 51 (13.28%), lack of knowledge of how to use the spirometer was about 28 (7.29%), lack of time was about 42 (10.93%), the ratio of patient participation was about 29 (7.55%), and the spirometer is very expensive was about 37 (9.63%) as shown in figure 1.

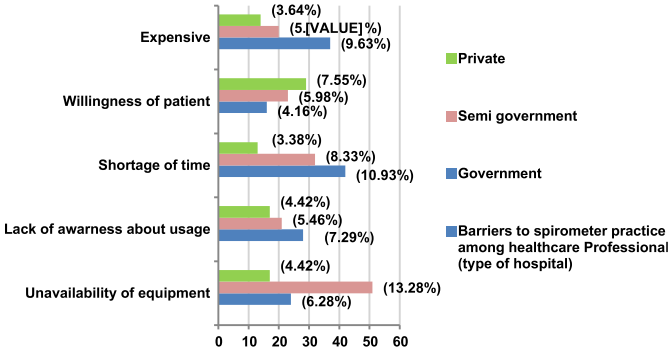

Figure 1: Barriers To Spirometer Practice Among Healthcare Professionals (Type of Hospital)

The response of questions related to the use of spirometry in their practice 172 (58.9%) responded yes that they used a spirometer sometimes. In the response to questions regarding monitoring the complaint of asthma by using the spirometer 94 (55.95%), participants responded never. When the questions related to the usage of a spirometer frequency to diagnose patients who suffered from COPD 62 (16.14%) responded to never. When questions regarding the pre-employment test through a spirometer 73 (51.40%) of the healthcare professionals replied sometimes that they used it. When the questions about the satisfaction level regarding the interpretation of the spirometer about 103 (56.90%) of the healthcare professionals responded yes that they were somewhat satisfied with their interpretations of the spirometer as shown in table 2.

Table 2: Questions Related To Spirometry

S No.	Questions (Spirometry Access & Knowledge)	Yes N (%)	No N (%)	Total
In your practice do you use the spirometer?				
1	Frequently	57 (19.52)	21 (22.82)	78 (20.31)
	Sometimes	172 (58.9)	44 (47.82)	216 (56.25)
	Rarely	38 (13.01)	15 (16.30)	53 (13.80)
	Never	25 (8.56)	12 (13.04)	37 (9.63)
To monitor the asthma you request the patient to use the spirometer.				
2	Frequently	39 (23.21)	53 (24.53)	92 (23.95)
	Once in a year	18 (10.71)	11 (5.09)	29 (7.55)
	Every follow up	17 (10.11)	29 (13.42)	46 (11.97)
	Never	94 (55.95)	123 (56.94)	217 (56.51)
To diagnose copd how frequently use the spirometer?				
3	Frequently	12 (10.08)	29 (10.94)	41 (10.67)
	Sometimes	22 (5.72)	67 (17.44)	89 (23.17)
	Rarely	23 (5.98)	38 (9.89)	61 (15.88)
	Never	62 (16.14)	131 (34.11)	193 (50.26)
Do you use the spirometer for pre-employment				
4	Frequently	18 (12.67)	29 (11.98)	47 (12.23)
	Sometimes	22 (15.49)	39 (16.11)	61 (15.88)
	Rarely	73 (51.40)	136 (56.19)	209 (54.42)
	Never	29 (20.42)	38 (15.70)	67 (17.44)
How much are you satisfied with interpreting the readings of the spirometer?				
5	Not Satisfied	29 (16.02)	42 (20.68)	71 (18.48)
	Somewhat Satisfied	103 (56.90)	129 (63.54)	232 (60.41)
	Satisfied	40 (22.09)	13 (6.40)	53 (13.80)
	Don't know	9 (4.97)	19 (9.35)	28 (7.29)

DISCUSSION

This study showed the majority of healthcare professionals i.e: 319 (83.07%) were aware of the role of spirometry in the diagnosis and management of respiratory issues however a study done in Nigeria reported, that utilization of spirometry was low and poorly practised by the healthcare professionals which was due to the unavailability of spirometry instrument in the hospitals and lack of reference from the primary physicians of patients [14]. Another study done in the USA shows similar results to Nigerians' study that the use of spirometry was poorly practiced by the doctors in their practice [15]. There are many barriers to the usage of spirometry out of three types of hospitals: government, semi-government, and private 42 (10.93%) of healthcare professionals thought the use of spirometer is limited in government hospitals due to lack of time. 51 (13.28%) thought unavailability of equipment and 29 (7.55%) of healthcare professionals thought that the measure barrier in the usage of spirometry is the unwillingness of patients. A study reported that, according to doctors spirometers also work as a preventive measure for lung diseases, especially for people whose work environment makes them susceptible to the diseases [16]. As spirometry is an instrument that is commonly used by post-surgical and ICU patients [17]. So, the results of our research showed the use of spirometry is sometimes used by 172 (58.9%) healthcare professionals. For the evaluation of asthmatic patients, the use of spirometry was never used by 94 (55.95%) of the research participants of our study. Although the study showed the role of spirometry in the evaluation process of lung parameters in patients before surgery [18]. Spirometry used by healthcare

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professionals for the diagnosis of COPD (Chronic Obstructive Pulmonary Disease) was frequently used by only 12 (10.08%) of the research participants of our study. These results may be due to the shortage of awareness sessions through workshops, training programs, and also during the studies between the period of learning of healthcare professionals medical colleges. The use of spirometry was poor in the USA and Nigeria [19]. The use of spirometry for the pre-employment test was rarely used by 73 (51.40%) of the research participants of our study. However, a study reported that attendance at workshops organized by the National Respiratory Society was low for the past five years so it is necessary to reduce the factors that cause the low attendance in workshops related to spirometry [20]. Another study revealed that knowledge regarding spirometry usage was increased through attending seminars and workshops [21]. The use of spirometry was not prioritized by the healthcare professionals because it does not give a return on investment and is unable to generate profits for the hospitals so they were not satisfied with use the of spirometry in daily practice [22]. Although it can determine the strong relationship between lung function and clinical outcomes in our study most common answer about the level of satisfaction among the healthcare professionals of our study regarding the usage of spirometry for patients was sometimes satisfied in 103 (56.90%) which showed the preference of spirometry was good in our Pakistan and it also provides better outcomes in post-surgical and lung disease patients.

CONCLUSIONS

It was concluded that most healthcare professionals know the benefits and usage of spirometry, and they practice the equipment sometimes in clinical settings but some barriers hinder the use of spirometers like: expenses, shortage of time, willingness of patients, lack of awareness regarding the usage, and unavailability of spirometry in the hospitals. We should address the barriers that limit the use of spirometry in clinical settings and take a step forward to increase the knowledge of healthcare professionals and the general public to enhance the knowledge related to the use and benefits of spirometry through the organization of seminars, workshops, and training sessions. These steps will enhance the quality of life of patients related to respiratory illnesses.

Authors Contribution

Conceptualization: SRB
Methodology: SRB
Formal analysis: SRB, ZSP
Writing-review and editing: ZSP, BMZ, SAA, AI, ARB

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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