Assessment of Pressurised Metered Dose Inhaler Technique of Nursing Staff in Different Government Hospitals of Karachi

Sundeep Sahitia[1], Syed Imtiaz Ahmed Jafry[2], Syed Muhammad Zulfiqar Hyder Naqvi[3], Nargis Anjum[4], Adnan Anwar[5]

Abstract

Objective: To assess pressurised metered dose inhaler technique of the nursing staff in different government hospitals of Karachi.
Methods: A cross-sectional study was carried out in four randomly chosen government hospitals of Karachi. After checking for study criteria and obtaining written informed consent, a total of 120 nurses were interviewed and then given a placebo inhaler to demonstrate their inhaler technique. The reference for assessment was the 12-step inhalation technique suggested by the American College of Chest Physicians.
Results: The study results revealed that out of the 12 steps of the inhaler technique, only 3 steps were followed by a majority of the study participants i.e. taking the cap off (64.2%), putting the metered dose inhaler in mouth with lips sealed (59.2%) and breathing in slowly by pressing down the metered dose inhaler (62.5%). The mean inhaler technique score of the study participants was 3.18 ± 2.34 out of 12 and only 1 (0.8%) of them had correct inhaler technique. Furthermore, the mean inhaler technique score was significantly higher for higher education level (p=0.001) and greater experience (p<0.001).
Conclusion: The study results demonstrated the acute deficiency of knowledge about the correct inhaler technique among the study nurses. Appropriate resources should be directed towards educating nurses to make sure that their needed knowledge and skills stay updated.
Keywords: Respiratory tract disease, metered dose inhaler, placebo, asthma.
IRB: Approved by Baqai Medical University. Dated 30th March 2015.
Citation: Sahitia S, Jafry SIA, Naqvi SMZH, Anjum N, Anwar A. Assessment of pressurised metered dose inhaler technique of nursing staff in different government hospitals of Karachi [Online]. Annals ASH KM&DC 2018;23:.

(ASH & KMDC 23(2):105;2018)

Introduction

Asthma has been defined as a chronic disease characterised by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person, whose symptoms may occur several times in a day or week and may become worse during physical activity or at night[1]. According to World Health Organization, greater than 3 million people die each year from chronic obstructive pulmonary diseases, an estimated 6% of all death worldwide and greater than 90% of these deaths occur in low-income and middle-income countries where as asthma alone is responsible for affecting 235 million lives currently throughout the world[2]. According to the Global Initiative for Asthma, prevalence of clinical asthma in Pakistan is 2.5-5.0%, although updated data is still incomplete[3].

Although asthma cannot be cured, appropriate management can control the disease and improves the quality of life of the patients[4]. When it comes to asthma management, inhalational route is the preferred one for both corticosteroids and beta-2 ago-

[1] Polio Eradication Officer, World Health Organization
[2-3] Department of Community Medicine, Baqai Medical University, Karachi
[4] Department of Physiology, Karachi Medical and Dental College
[5] Department of Physiology, Al Tibri Medical College, Karachi

Correspondence: Dr. Adnan Anwar
Department of Physiology,
Al Tibri Medical College, Karachi
Email: anwaradnan32@gmail.com
Date of Submission: 17th March 2018
Date of Acceptance: 2nd May 2018

nists[5]. As per the recommendations of the American Thoracic Society, inhalational route is the preferential one for the management of chronic obstructive pulmonary diseases as well[6]. Pressurised metered dose inhalers are favoured as first-line treatment in all stable asthma patients[7]. To ensure that correct amount of drug is delivered, proper inhaler technique is highly desirable. Improper inhaler technique has been implicated in poor treatment compliance which in turn may affect asthma control[8]. In regional as well as local context, it has already been shown that majority of patients of chronic respiratory diseases are unable to demonstrate inhaler technique correctly[9-13].

The scenario turns worst when healthcare providers are also found to be lacking sufficient knowledge about proper use of metered dose inhalers[14-16]. Research suggests that continual education and training of healthcare providers is needed to increase their expertise in operating metered dose inhalers[17,18]. This is significant because instruction by healthcare providers i.e. doctors, nursing staff and pharmacists is the only modifiable factor which can minimise the employment of improper inhaler technique by the patients[19]. Nurses are an important part of this healthcare provider chain and their knowledge must remain updated and accurate in order to provide highest level of quality care to the patients.

For the management of chronic respiratory diseases such as asthma, that are among the leading causes of morbidity and mortality globally, inhalational route is preferred with metered dose inhalers being the most usual mode of delivery. Their improper use by the patients has been associated with frequent exacerbations and worsening of chronic respiratory diseases. Educating patients becomes difficult if healthcare providers themselves are unable to properly operate metered dose inhalers.

This study, therefore, aimed to assess if pressurised metered dose inhalers were used with proper technique by nursing staff of different government hospitals of Karachi.

Subjects and Methods

A cross-sectional study was carried out among nurses from four randomly chosen government hospitals of Karachi namely National Institute of Cardiovascular Diseases, Sindh Institute of Urology and Transplantation, Jinnah Postgraduate Medical Centre and Civil Hospital Karachi. After seeking verbal permission from relevant hospital authorities, systematic random sampling was employed with a random start and then every alternative nurse was included in the study from each hospital on the basis of identity number issued to them by the hospital authorities. A total of 120 nurses were interviewed if they met the study criteria after obtaining their written informed consent. The inclusion criteria of the study were subjects having a permanent job and registered in their respective hospitals whereas the exclusion criterion was subject's refusal to participate in the study. Prior to interview, all relevant information pertaining to the study was provided to the subjects. Three data collectors were trained by the principal investigator in interview and assessment of inhalation techniques. All study subjects were interviewed using a questionnaire designed especially for the study, containing questions regarding their demographic profile, and given a placebo inhaler to demonstrate their inhaler technique. The reference for assessment was the 9-step inhaler technique suggested by the American College of Chest Physicians[20]. For ease of measurement, these 9 steps were broken down into 12 steps. Out of these 12 steps, 6 were labelled as essential due to their importance. These 6 steps were taking the cap off, shaking the metered dose inhaler well, breathing out all the way, putting the metered dose inhaler in the mouth with lips sealed and tongue well below the metered dose inhaler in flat position, pressing down the metered dose inhaler and breathing in simultaneously and holding the breath for at least 10 seconds or as long as the performer can. Each step was given a score of one and then total score was assessed out of 12. Those performers who demonstrated all six of the essential steps properly were declared as having the correct inhaler technique.

The data collection was completed in a period of 6 months. The data were coded, entered and then analysed using SPSS, version 16. Descriptive analysis was performed by calculating means and standard deviations for quantitative variables and frequencies and percentages for qualitative variables.

Results

The mean age of study participants was 27.98 ± 8.34 years whereas a majority of them were females (66.4%). Also a majority of them had either diploma (50.0%) or were bachelors (36.6%) in nursing. 106 (89.1%) of them had past history of inhaler use although only 30 (25.0%) of them had any prior relevant training (Table 1).

Out of the 12 steps of the inhaler technique, only 3 steps, all essential, were followed by a majority of the participants i.e. taking the cap off (64.2%), putting the metered dose inhaler in mouth with lips sealed (59.2%) and breathing in slowly by pressing down the metered dose inhaler (62.5%). All of the remaining 9 steps were followed by only a minority of the participants (Table 2).

The mean inhaler technique score of the study participants was 3.18 ± 2.34 out of 12. Out of total 120 participants, only 1 (0.8%) had correct inhaler technique, 88 (73.4%) had incorrect inhaler technique whereas 31 (25.8%) did not know about it at all (Table 3).

While making gender-based, education level-based and experience-based comparison of inhaler technique score it was seen that the mean inhaler technique score was significantly different among categories of education level ($p=0.001$) and experience ($p<0.001$) where participants with higher education level and experience were more likely to have a higher mean inhaler technique score than those with lower education level and experience (Table 4).

Table 1. Demographic information and profile of nurses participating in the study.

Variable (n= 120)	Frequency (%)/Mean ± S.D.
Age in years	27.98 ± 8.34
Gender1	
Male	40 (33.3)
Female	79 (65.8)
Education Level	
Matriculation	14 (11.7)
Diploma in Nursing	60 (50.0)
Bachelors in Nursing	44 (36.6)
Masters in Nursing	2 (1.7)
Experience in months	46.03 ± 37.45
Past history of inhaler use	
Yes	106 (89.1)
No	13 (10.9)
Prior training of inhaler use	
Yes	30 (25.0)
No	90 (75.0)

1 n = 119

Table 2. Inhaler technique steps performed by the nurses in using pressurised metered dose inhaler technique in government hospitals of Karachi

Variable (n= 120)	Frequency (%)
Taking the cap off*	77 (64.2)
Removing any dust or object	1 (0.8)
Shaking the MDI well*	34 (28.3)
Sittingup straight or standing up	7 (5.8)
Breathingout all the way*	22 (18.3)
Tilting the MDI up slightly	4 (3.3)
Putting in mouth with lips sealed*	71 (59.2)
Breathing in slowly by pressing Down the MDI*	75 (62.5)
Holding breath for 10 Seconds*	20(16.7)
Waiting for 1 minute for another puff	14 (11.7)
Rinsing the mouth	9 (7.5)
Recapping the MDI	47 (39.2)

* = Essential steps MDI = Metered dose inhalers

Table 3. Inhaler technique correctness and score, obtained by the nurses in using pressurised metered dose inhaler technique in government hospitals of Karachi

Variable (n= 120)	Frequency (%)/Mean ± S.D.
Inhaler Technique	
Correct	1 (0.8)
Incorrect	88 (73.4)
Did not know	31 (25.8)
Inhaler Technique Score	3.18 ± 2.34

Table 4. Inhaler technique score comparison

Variable (n= 120)	Mean ± S.D.	p-value
Gender		
Male	3.53 ± 2.36	0.183*
Female	3.04 ± 2.32	
Educational Level		
Matriculation	1.57 ± 1.86	0.001#
Diploma in Nursing	2.88 ± 2.23	
Bachelors in Nursing	4.05 ± 2.36	
Masters in Nursing	4.00 ± 0.00	
Experience		
<5 years	2.56 ± 2.37	<0.001#
5-10 years	4.38 ± 2.13	
>10 years	4.35 ± 1.34	

Mann-Whitney U Test # Kruskal Wallis Test

Discussion

The emergence of metered dose inhalers is like a transformation in the field of therapeutic management of many respiratory diseases like asthma and chronic obstructive pulmonary diseases. The advantage that these devices have got over other routes of drug administration is that these devices allow the direct delivery of the prescribed medications up to the respiratory system. By direct delivery, these devices manage to bypass the first pass effect and consequently minimise the side effects associated with systemic delivery.

However, in spite of this advantage, only a small percentage of the aerosolised dose reaches the minute alveoli and conducting airways even after proper use of the metered dose inhalers. It is therefore crucial that the patient has appropriate knowledge of the correct technique of metered dose inhaler usage. Healthcare professionals, of whom nurses are an important part, serve as the key medium to convey this knowledge to the patients. This study therefore was carried out with the aim of assessing pressurized metered dose inhaler technique of the nursing staff.

The study results revealed that only 3 steps of the 12 steps inhaler technique were followed by a majority of the participants i.e. taking the cap off (64.2%), putting the metered dose inhaler in mouth with lips sealed (59.2%) and breathing in slowly by pressing down the metered dose inhaler (62.5%). The study results further showed that the mean inhaler technique score of the study participants was 3.18 ± 2.34 out of 12. Moreover, only 1 (0.8%) study participant demonstrated correct inhaler technique, 88 (73.4%) had incorrect inhaler technique, whereas 31 (25.8%) did not know about it at all. Furthermore, the mean inhaler technique score was significantly greater for higher education level (p=0.001) and greater experience (p<0.001).

The three inhaler technique steps followed by a majority of study participants were taking the cap off (64.2%), putting the metered dose inhaler in mouth with lips sealed (59.2%) and breathing in slowly by pressing down the metered dose inhaler (62.5%). This finding was in line with published literature as comparable results havebeen reported in a number of earlier studies[10,12,19].

Furthermore, 88 (73.4%) participants were found to have incorrect inhaler technique. This finding also concurs well with the results of a number of earlier studies. De Tratto K et al., in 2014 reported the overall misuse rates to be high for both metered dose inhalers and Diskus devises among study nurses[16]. Similarly, Interiano B and Guntupalli K in 1993 reported the house staff and nursing staff to be less proficient in the proper use of metered dose inhalers[21]. Likewise, O'Donnell J et al., in 1997 reported a generally poor demonstration of inhaler technique by the accident and emergency personnel assessed in the study[22]. Jones JS et al., in 1995 also reported that only 41% of the health care providers assessed were able to perform at least five steps of inhaler technique correctly[23]. Similarly, Guidry GG et al., in 1992 reported that only 18% of the medical personnel studied followed recent recommendations for proper use of metered dose inhalers[24]. Likewise, Schammel LM and Ellingson AR in 2007 found the nursing home support staff assessed in the study to have incorrect metered dose inhaler technique[25]. Hanania NA et al., in 1994 also reported the registered nurses in the study to have a score of only 39% when assessed for knowledge of using inhaling devices[26]. Similarly, Baverstock M et al., in 2010 reported that only 7% of the health

care professionals assessed in the study could demonstrate all the recognized steps of metered dose inhaler technique[27].

With regard to the study finding of higher mean inhaler technique score for higher education level and greater experience of study nurses, a comparison could not be made as literature search did not reveal any relevant published data.

In précis, this study confirmed the results of earlier studies regarding the improper use of metered dose inhalers by the medical staff. These consistent findings of lack of proper usage of metered dose inhalers by medical personnel as shown by published literature clearly demonstrates that there is an urgent need of giving appropriate relevant training to the medical staff. This should be done in order to enable them to effectively guide the patients of chronic respiratory diseases on how to properly use metered dose inhalers for the management of their illness.

Due to resource limitation, this study could not be conducted with a larger sample size which could have resulted in better generalisability of the study findings. In light of the study results, it is recommended that interventions like seminars, workshops, and hands on practice and training sessions should be held periodically to address the serious lack of adequate knowledge among nurses regarding the proper use of metered dose inhalers. This way they will be able to play their due role in enhancing the relevant knowledge and skills of patients with chronic respiratory illnesses.

Conclusion

The study results demonstrated the acute deficiency of knowledge about the correct inhaler technique that existed among the study nurses. The direness of the current situation as revealed by the study findings should serve as an eye opener for all concerned. In order to adequately address this serious issue, appropriate resources should be directed towards educating and training nursing staff to make sure that their relevant knowledge and skills stay updated.

Acknowledgements

The authors are thankful to Mr. Taha Abidi, Dr. Khushbu Marvi, Dr. Kousar Magsi, Mr. Yashwant Rai, Dr. Kashif Shafique, Mr. Abdul Rasheed, Mr. Muhammad Muzammil Altaf, Mr. Vishal Sahitia and Mr. Rashid Ali Siddiqui for their utmost cooperation and kind support.

Conflict of Interests

Authors have no conflict of interests and no grant/funding from any organisation.

References

1. World Health Organization. Chronic respiratory diseases: Asthma [Online]. Geneva: World Health Organization. Available from: http://www.who.int/respiratory/asthma/en/. Accessed on May 4, 2018.
2. World Health Organization. Chronic respiratory diseases [Online]. Geneva: World Health Organization; 2016. Available from: http://www.who.int/respiratory/en/. Accessed on May 4, 2018.
3. Masoli M, Fabian D, Holt S, Beasley R. The global burden of asthma: executive summary of the GINA Dissemination Committee report. Allergy 2004;59:469-78. [DOI: 10.1111/j.1398-9995.2004.00526.x].
4. World Health Organization. Chronic respiratory diseases: Management of asthma [Online]. Geneva: World Health Organization. Available from: http://www.who.int/respiratory/asthma/burden/en/. Accessed on May 4, 2018.
5. Guidelines for the diagnosis and management of asthma [Online]. Bethesda: National Institutes of Health; 2002. Available from: https://www.nhlbi.nih.gov/files/docs/guidelines/asthsumm.pdf. Accessed on April 14, 2018.
6. Standards for the diagnosis and care of patients with chronic obstructive pulmonary disease. American Thoracic Society. Am J Respir Crit Care Med 1995;152:S78-121.
7. Brocklebank D, Ram F, Wright J, Barry P, Cates C, Davies L, et al. Comparison of the effectiveness of inhaler devices in asthma and chronic obstructive airways disease: a systematic review of the literature. Health Technol Assess 2001;5:1-149.
8. Crompton GK, Barnes PJ, Broeders ME, Corrigan C, Corbetta L, Dekhuijzen R, et al. The need to improve inhalation technique in Europe: a report from the Aerosol Drug Management Improvement Team. Respir Med 2006;100:1479-94.

9. Barthwal MS, Deoskar RB, Rajan KE. Status of inhalation therapy in bronchial asthma in adults above twelve years of age in armed forces. J Assoc Physicians India 2005;53:681-4. Available from: http://japi.org/august2005/O-681.pdf. Accessed on April 8, 2018.

10. Baqai HZ, Saleem MA, Abair-ul-Haq M. Assessment of metered dose inhaler technique in patients with chronic lung disease at government hospitals of Rawalpindi. J Ayub Med Coll Abbottabad 2011;23:37-9.

11. Ahmad H, Farooqi R, Ashraf S, Afridi MZ. Assessment of inhaler technique of patients admitted with acute exacerbation of chronic obstructive pulmonary disease at pulmonology unit Khyber Teaching Hospital, Peshawar [Online]. Khyber Journal of Medical Sciences 2013;6:230-55. Available from: http://kjms.com.pk/sites/default/files/82-246-1-PB.pdf. Accessed on April 8, 2018.

12. Anwar ul Haq, Khan Y, Idrees M. Assessment of metered dose inhaler technique in COPD patients in tertiary care hospital [Online]. Khyber Journal Medical Sciences 2013;6:204-9. Available from: http://kjms.com.pk/sites/default/files/75-221-1-PB.pdf. Accessed on April 8, 2018.

13. Hashmi A, Soomro JA, Memon A, Soomro TK. Incorrect inhaler technique compromising quality of life of asthmatic patients [Online]. JOM 2012;13:16-21. Available from: https://www.banglajol.info/index.php/JOM/article/view/7980. Accessed on April 8, 2018. [DOI: http://dx.doi.org/10.3329/jom.v13i1.7980].

14. Kishore PV, Palaian S, Alam K, Shankar PR, Bajracharya B, Van den Ende J. Correct use of a metered dose inhaler: A prospective interventional study among healthcare professionals in a Nepalese Teaching Hospital [Online]. Journal of Clinical and Diagnostic Research 2008;2:720-5. Available from: http://www.jcdr.net/articles/PDF/224/196_E(C)_F(H)_Pf_p.pdf. Accessed on April 8, 2018.

15. Fink JB, Rubin BK. Problems with inhaler use: a call for improved clinician and patient education. Respir Care 2005;50:1360-75.

16. De Tratto K, Gomez C, Ryan CJ, Bracken N, Steffen A, Corbridge SJ. Nurses' knowledge of inhaler technique in the inpatient hospital setting. Clin Nurse Spec 2014;28:156-60. [DOI: 10.1097/NUR.0000000000000047].

17. Lee-Wong M, Mayo PH. Results of a programme to improve house staff use of metered dose inhalers and spacers. Postgrad Med J 2003;79:221-5. [DOI: 10.1136/pmj.79.930.221].

18. Lalani NS. A study of knowledge assessment and competence in asthma and inhaler technique of nurses employed at university teaching hospital [Online]. The Health 2012;3:16-18. Available from: https://pdfs.semanticscholar.org/5e5d/a316a4291ebb81296c796e8e2c8ee02958ab.pdf. Accessed on April 8, 2018.

19. Melani AS, Bonavia M, Cilenti V, Cinti C, Lodi M, Martucci P, et al. Inhaler mishandling remains common in real life and is associated with reduced disease control. Respir Med 2011;105:930-8. [DOI: 10.1016/j.rmed.2011.01.005].

20. Using Your Diskus: Patient Education Guide [Online]. Northbrook: American College of Chest Physicians; 2006. Available from: http://cmamaine.com/_pdf/patient_education/UsingYourDiskus.pdf. Accessed on April 14, 2018.

21. Interiano B, Guntupalli KK. Metered-dose inhalers. Do health care providers know what to teach? Arch Intern Med 1993;153:81-5.

22. O'Donnell J, Birkinshaw R, Burke V, Driscoll PA. The ability of A&E personnel to demonstrate inhaler technique. J Accid Emerg Med 1997;14:163-4.

23. Jones JS, Holstege CP, Riekse R, White L, Bergquist T. Metered-dose inhalers: do emergency health care providers know what to teach? [Online]. Ann Emerg Med 1995;26:308-11. Available from: https://www.annemergmed.com/article/S0196-0644(95)70078-1/abstract. Accessed on May 4, 2018.

24. Guidry GG, Brown WD, Stogner SW, George RB.Incorrect use of metered dose inhalers by medical personnel. Chest 1992;101:31-3.

25. Schammel LM, Ellingson AR. MDI inhalers: do nursing home support staff have correct technique. J Asthma 2007;44:403-5. [DOI: 10.1080/02770900701364312].

26. Hanania NA, Wittman R, Kesten S, Chapman KR. Medical personnel's knowledge of and ability to use inhaling devices: metered-dose inhalers, spacing chambers, and breath-actuated dry powder inhalers. Chest 1994;105:111-6.

27. Baverstock M, Woodhall N, Maarman V. P94 Do healthcare professionals have sufficient knowledge of inhaler techniques in order to educate their patients effectively in their use? [Online]. Thorax 2010;65:A117-8. Available from: http://thorax.bmj.com/content/65/Suppl_4/A117.3. Accessed on May 4, 2018.

ANSWER OF PICTURE QUIZ: Adenomatoid odontogenic tumor