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Assessment of Medical Student's Knowledge on Metered Dose Inhaler Technique and Asthma in a Tertiary Care Teaching Hospital.

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Abstract
Background*: The treatment failure in asthma patients may result from the incorrect use of metered-dose inhalers. This may be because of a lack of counselling by the health care professionals and most paradoxical fact that, lots of them are unknown with the correct technique and asthma management.*
Objective*: To determine knowledge of the M.B.B.S students regarding asthma and metered dose inhaler technique and to analyse the effect of a single educational intervention.*
Methods*: Cross sectional, single interventional study included 114 second year MBBS students to fill asthma questionnaire (17 questions) before and after educational session. Randomly 60 students were selected to demonstrate steps of Metered dose inhaler (MDI) in pre and post educational session on same day.*
Results*: There were 40.35% male and 59.65% female students in age group 18 to 21 years. All students answered ≥ 7 questions in pre-test and ≥14 in post- test session of asthma questionnaire. Statistically significant improvement was seen in post-test session of asthma questionnaire and MDI technique demonstration (p value <0.0001). Among the 6 essential steps, Breath out slowly and Hold breath for 10–20 sec were incorrectly performed steps by 90% and 87% subjects respectively, in pre-test session while 40% students failed to Hold breath for 10–20 sec in post-test.*
Conclusion*: The study reveals the poor status of knowledge of MDI and asthma among medical students. The educational session along with demonstration through audio-visual material has significant positive impact.*
Keywords*: Asthma, educational intervention, KAP study, MDI.*

I. Introduction

Asthma is one of the most common chronic disease globally and currently affects approximately 300 million people worldwide. India has an estimated 15-20 million asthmatics; rough estimates indicate a prevalence of between 10-15% in 5-11 year old children. [1, 2] Global Initiative for Asthma (GINA) report suggests that, by 2025, an additional 100 million people will suffer from asthma due to growing urbanization and pollution. [3]

Inhaled medications are commonly prescribed for the treatment of asthma. Variety of inhaler devices are available in market, one of the commonest delivery system for those inhalational drugs is Metered Dose Inhaler (MDI). [4] Regardless of the type of inhaler device used, the result of inhaler therapy principally be determined by appropriate use of the inhaler. Appropriate use predominantly involves the correct inhalation technique. Previous studies have shown the association between improper use of inhaler devices and reduced drug delivery, decreased adherence to treatment, uncontrolled asthma, and multiple emergency department visits. [5, 6, 7, 8]Thus effective delivery of medication leads to improvement the condition. Patient's knowledge of correct inhaler technique is essential in the treatment of pulmonary diseases; hence they require appropriate education in the correct self-administration of inhaled medication. [9, 10]The incorrect use of metered-dose inhaler is common and associated with noncompliance and treatment failure in asthma patients. This may be because of a lack of counselling by the health care professionals (doctors, nurses, pharmacists) and most paradoxical fact that, lots of them are unknown with the correct technique. [11, 12, 13] Hence knowledge of such delivery method is essential for all prescribers, dispensers and consumers.

Therefore this knowledge attitude and practice (KAP) study was conducted with an objective to determine the knowledge of the MBBS students with regard to asthma and proper metered dose inhaler technique also to analyse the effect of a single educational intervention on their knowledge.

II. Material & Methods

This cross sectional, KAP study was conducted in pharmacology department of B. J. Government Medical College and Sassoon General Hospital, Pune after getting an approval from Institutional Ethical Committee. Total 114 second year MBBS students willing to participate in the study were included. Written informed consent was obtained from each participant.

Pre-test questionnaire was administered to total 114 students. Out of these, 60 were randomly selected to demonstrate MDI technique also. This was followed by Class lecture on asthma along with physical and video demonstration of MDI technique to all 114 students. After the educational session; Post-test questionnaire was administered. Then previous 60 students were asked to demonstrate MDI technique again.

2.1) Questionnaire: A specially designed asthma questionnaire was given to the participants in the class to fill in 20 minutes and was monitored by the investigator to ensure and prevent interactions among the participants. Pretest asthma questionnaire consisted of demographic data and 17 multiple choice questions, among which 5 questions were knowledge based (site of involvement, symptoms, risk factors, pathological changes, complication etc.) 6 were to assess attitude (severity, best form and advice regarding medication, smoking habit) and 6 were for practice assessment. At the end of the educational session the students were again requested to complete the post-test questionnaire. Each correct answer received score of 1, wrong or 'don't know' option were allotted 0 score. In the questionnaire there were some questions with multiple answers, if participant marked multiple answers with at least one correct option then that was considered partially correct and 0.5 score was given to that answer.

2.2) Educational session: The educational interventions involved class lecture on general knowledge of asthma aetiology, pathophysiology, investigations, asthma medications and use of inhaler devices, treatments, and prognosis. In addition, the students also had a physical and video demonstration of MDI technique.

2.3) Demonstration of MDI: Among 114 students, 60 were selected randomly and asked to demonstrate the steps of MDI use on inhaler, before and after an educational session. Three different evaluators observed the steps of MDI demonstration, 20 students by each evaluator. Maximum 5 min time was given to each student to recall and perform the steps. MDI Technique evaluation score chart (Table 1) was prepared as per the National Asthma Education and Prevention Program (NAEPP) criteria. [14] Every omitted or wrongly stated step received a score of 0 while every correct step was given a score of 1. Total scores were computed for all subjects based on a maximum of 11 (100%).

2.4) Data analysis: The data was recorded, scored and entered into Microsoft Excel 2013, checked for accuracy. Inferential statistics was done using Graph Pad Prism Software version 6.07. Student's paired t-test was used to compare pre and post intervention practice assessment scores.

Table 1: Metered Dose Inhaler technique steps

No.	Steps	Score (0 / 1)
1	* Remove the cap	
2	* Shake the contents well	
3	Hold the inhaler upright	
4	Tilt the head back slightly	
5	* Breath out slowly & completely	
6	* Open mouth with inhaler 1 to 2 inches away or in the mouth with the lips tightly sealed around it	
7	* Begin breath in slowly and deeply through the mouth and actuate the canister once	
8	* Hold breath for 10–20 sec	
9	Exhale & wait one minute before the second dose, if needed	
10	Shake again before the second dose	
11	After use, replace the mouth piece cover	
	*Essential steps. Total score	

III. Results

3.1) Demography and Analysis of KAP questionnaire

Out of 200 second year MBBS students, 114 consented to participate in study. Total 40.35% male and 59.65% female students of age group 18 to 21 years were analysed. Only 14% students demonstrated MDI technique previously to at least one patient while majority (86%) had never taught MDI technique to anyone. All students answered ≥ 7 questions in pre-test and ≥14 in post- test session of asthma questionnaire. Table 2 shows assessment of knowledge part of questionnaire pre and post intervention. There was statistically significant improvement in knowledge score after educational session.

Table 2: Knowledge Assessment in pre and post-test sessions (n=114)

		Pre				**Post**
Sr. No	Questions	Correct (%)	Partially correct (%)	Wrong (%)	Don't know (%)	Correct (%)
1	Which part of the body is affected when a person is affected with Asthma?	98.25	1.75	--	--	100
2	What are the common symptoms of Asthma?	65.79	34.21	--	--	100
3	What are the risk factors for Asthma?	73.68	26.32	--	--	100
4	What changes takes place in body when person has Asthma?	39.47	58.77	1.75	--	100
5	What complications can Asthma lead to?	56.14	24.76	19.30	8.77	100

Attitude assessment of pre and post educational intervention is shown in Table 3. In pre-test assessment, only 55% participants were aware about the best form to take medications i.e. inhaler. Status athmaticus is life threatening form of asthma, 7% students answered this question wrong in post-test.

Table 3: Attitude Assessment in pre and post-test sessions (n=114)

		Pre				**Post**	
Sr. No	Questions	Correct (%)	Partially correct (%)	Wrong (%)	Don't know (%)	Correct (%)	Wrong (%)
6	Is Asthma a life threatening disease?	76.32	--	21.05	2.63	92.98	7.02
7	Is Asthma contagious?	97.37	--	2.63	--	100	--
8	Can Asthma be completely cured?	70.18	--	16.67	13.16	100	--
9	Which is the best form to take medications in Asthma?	55.26	25.44	18.42	0.88	100	--
10	How often do you advise your patient to take medication?	65.79	34.21	--	--	100	--
11	What actions should a patient with Asthma take with regard to smoking?	92.98	5.26	--	1.75	100	--

In Table 4, analysis of practice part of assessment is depicted. During pre-test, 78% student didn't know the position of the mask while using nebulizer that was reduced to 26 % after educational session.

Table 4: Practice Assessment in pre and post-testsessions (n=114)

		Pre				**Post**	
Sr. No	Questions	Correct (%)	Partially correct (%)	Wrong (%)	Don't know (%)	Correct (%)	Wrong (%)
12	While using a metered dose inhaler, how frequently the canister should be shaken just before taking a puff?	99.12	--	0.88	--	100	--
13	Where on the face should the mask of nebulizer be placed?	21.93	--	78.07	--	73.68	26.32
14	If patients are using steroids by inhalation, do you advice to rinse mouth before and after inhalation?	75.44	--	24.56	--	100	--
15	At what speed does child need to breathe through the inhaler / the spacer?	35.96	--	64.04	--	81.58	18.42
16	When in need of multiple doses, how are these doses applied?	81.58	--	18.42	--	100	--

3.2) Assessment of MDI demonstration technique

Out of 114 study population, 60 students were randomly selected for MDI demonstration session practically. Female participants were more (60%). Figure 1: showed the MDI demonstration before and after educational session. Among the 6 essential steps, Breath out slowly and Hold breath for 10–20 sec were incorrectly performed steps by 90% and 87% subjects respectively, while 93% students failed to hold inhaler in upright position in pre-test session. None of the student demonstrated all steps correctly before educational session. There was statistically significant improvement MDI use after educational session.

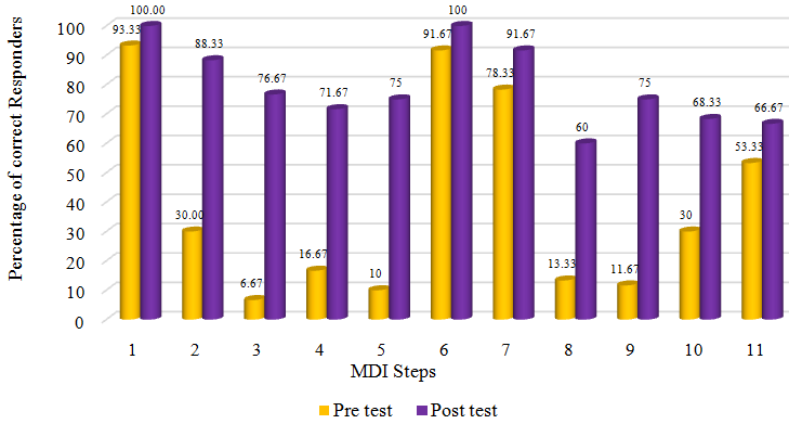

Figure 1: MDI demonstration before and after educational session

3.3) Impact of educational intervention

As shown in table 5, there was statistically significant improvement seen after educational in asthma questionnaire and MDI use techniques also.

Table 5: Impact of educational intervention

KAP Questionnaire (n=114)			
	Pre-test	Post-test	p-value
Knowledge score	4.06 ± 0.65	5 ± 0.0	< 0.0001
Attitude score	4.90 ± 0.82	5.96 ± 0.12	< 0.0001
Practice score	3.14 ± 0.82	4.55 ± 0.59	< 0.0001
MDI technique demonstration (n=60)			
	Pre-test	Post-test	p-value
MDI demonstration score	4.35 ± 1.32	8.73 ± 1.35	< 0.0001
p-value ≤ 0.05 – considered as statistically significant			
Mean ± SD, Paired t test applied			

IV. Discussion

A "Knowledge, Attitudes, and Practices (KAP)" survey is a representative study of a specific population that aims to collect data on what is known, believed and done in relation to a particular topic. [15] This study tried to cover the knowledge of asthma and MDI use among MBBS students as students are most important member of healthcare system. After completing their MBBS, they are going to become practicing doctors or part of healthcare system. If they are properly educated regarding asthma and MDI technique during their MBBS tenure, they will deliver best to patients and community.

Present study revealed the knowledge gap regarding asthma disease and proper use of MDI. The KAP findings initially showed less understanding of some of the basic areas in bronchial asthma with the least score in questions like 'Where on the face should the mask of nebulizer be placed?' (25 score), At what speed does child need to breathe through the inhaler / the spacer? (41 score), Which is the best form to take medications in Asthma? (77.5 score). It is very bothersome as understanding of such questions is crucial while managing the patient of asthma. There was remarkable improvement in asthma knowledge after educational intervention especially in those core areas which could be a result of an exposure to asthma lecture followed by post-test. Several studies have shown that medical personnel may have insufficient knowledge of asthma. [16, 17, 18] One study showed better performance of specialist nurses compared to general practitioners while answering the web based asthma questionnaire. [19]

Various studies have been there to analyse the correct inhaler techniques demonstrations. Some authors were included either health care professionals, [4, 13] or pharmacists, [11] or patients, [7, 8, 9, 20] or nurses, [21]or parents [22] etc. In present study none of the student could correctly demonstrated all the steps before educational session. This finding was almost similar to study by Kishore et al, [4] Valarmathi et al, [21]Desalu et al [17] where medical personnel were included. The improper use of asthma inhaler devices was observed in 45% and 40% of the patients in Hamdan et al [23] and Rootmensen et al[24] respectively. Another study showed that only 22.1% of MDI users and 37.3% of Dry Powder Inhaler users were able to complete all the steps in their demonstration techniques. [20]

Current study showed that 'Breath out slowly and hold breath for 10-20 sec' were the most incorrectly performed steps. Study by Dudyala et al [13]also showed same findings where 'Continue slow inhalation and Breathe out gently' was demonstrated incorrectly by 70% of the junior doctors and 23% of practising doctors

respectively. This finding was in contrary to Ali et al [25] which reported 'Begin breath in slowly and actuate the canister once' was most incorrectly demonstrated step. In line with previous research, these errors may be due to inability to synchronise with breathing and hand lung co-ordination. [13]

In this study 40% improvement was seen among students after post educational session in MDI demonstration score, while Ansari et al [26] has found 63.3% improvement among patients after counselling.

Limitations of study: Single educational intervention, immediately followed by post-test may lead to bias in the study. This study included only MBBS students, large scale study including interns, practicing doctors, nurses and pharmacists should be conducted to know the outcome. The ultimate aim i.e. improvement in patient education and compliance was not evaluated in the present study.

V. Conclusion

This KAP study was conducted to determine the knowledge of the MBBS students with regard to asthma and proper metered dose inhaler technique, also to analyse the effect of a single educational intervention on their knowledge.

Overall, this study showed lack of knowledge of asthma and incorrect MDI technique before educational session. After educating to students there was definitely improvement in their knowledge. Thus, study created awareness of asthma and MDI among students. Repeated educational sessions along with demonstration through audio-visual materials are very crucial for all health care providers regarding new updates of asthma disease and management. Also promotional material with graphic presentations of inhaler technique demonstrations in local language may be distributed to asthma patients for better compliance to treatment.

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