

**IMPACT OF COUNSELLING IN INHALATION TECHNIQUE (ROTAHALER) IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS**Sweta Shrestha\*<sup>1</sup>, Binaya Sapkota<sup>1</sup>, Anurodh Ghimirey<sup>1</sup>, Rajani Shakya<sup>2</sup>

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**ABSTRACT**

Though inhaled medications are mainstay of therapy for COPD patients, assessment and training on rotahaler technique is lacking. Aim of study was to evaluate effect of counseling in inhalation technique of COPD patients focusing on essential items using combination of video and demonstration. 54 patients meeting inclusion criteria were included. On discharge day, baseline assessment of their technique was done using 8 item checklists. Training on rotahaler technique was given using video and demonstration. Immediate assessment of technique and necessary corrections were done. Final assessment was done after two weeks using same checklist. Comparison of scores at three time points was done. Average percentage of patients obtaining perfect score in essential checklist items prior instruction and after two weeks was 44.43% and 86.4% respectively. Relatively poor technique and best technique was seen at baseline and immediately after counseling respectively which slightly deteriorated after two weeks. Regular counseling and assessment with suitable teaching aids can improve inhalation technique of COPD patients.

**Keywords:** COPD, Counseling, Rotahaler, Video, Demonstration, Essential steps

**INTRODUCTION**

Chronic obstructive pulmonary disease (COPD) which is projected to emerge as the third leading cause of global death by the year 2030 has the highest burden in low and middle income countries.<sup>[1]</sup> Inhaled medications are regarded as the mainstay of treatment for both asthma and COPD patients since the drug directly reaches the site of action leading to rapid onset of action causing less systemic side effects.<sup>[2,3]</sup> Both inhaler device and technique of inhaler use are important to ensure proper drug delivery. Incorrect inhalation technique of Dry Powder Inhaler (DPI) in COPD significantly reduces the drug delivery and lung deposition<sup>[2]</sup> ultimately reducing the benefit the patient should receive from the inhaled therapy.<sup>[4]</sup> Omission of any non crucial steps in use of rotahaler produces reduced drug deposition in the lungs whereas omission of any essential steps results in null deposition of drugs in

the lungs.<sup>[2,5,6]</sup> Effective inhaler technique of the patient further depends on effective teaching and education to the patients.<sup>[4,7]</sup> Inhaler training should be a continuous process and repeated instructions with demonstration during each clinic visit is needed for the teaching to be effective.<sup>[4,8,9]</sup> Among the training tools both video and personal instruction have been found to be superior to no instruction as well as written information.<sup>[10]</sup> Studies done in Nepal addressing inhaler practice among COPD patients are only a pre and immediate post intervention studies<sup>[11]</sup> lacking follow up assessments. Further these studies have not distinguished the effect of educational intervention in essential steps of inhaler technique. Incorrect essential steps are said to cause null or insignificant deposition of drug in the lungs rather than reduced deposition.<sup>[2,5,6]</sup> A large proportion of Nepalese population are illiterate especially the elderly but effectiveness of video as a training tool in

this population has not been explored till date. Hence, our study aims were to determine the effect of counseling at different time points (immediately after counseling and two weeks after counseling) in use of rotahaler in COPD patients with focus on the essential items using a combination of video and demonstration. Specific objectives of our study were “To study the impact of counseling in rotahaler technique among COPD patients immediately after the intervention as well as in one time follow up.” “To study percentage of patients correctly completing each item on the checklist.” “To study change in mean score between three time points (baseline and post immediate, baseline and after two weeks score, immediately after counseling and after two weeks)” and “To study frequency of essential item errors.” Our null hypothesis is “Educational intervention has no impact in inhalation technique of rotahaler in COPD patients.” Our alternative hypothesis is “Educational intervention has impact in inhalation technique of rotahaler in COPD patients.”

## MATERIALS AND METHOD

The prospective pre-post interventional study was conducted for 4 months from May to August 2012 after the approval from Institutional Review Board (IRB) of the hospital. Intervention included counseling to patients on correct inhaler technique using a combination of video and physical demonstration. Effectiveness of intervention was determined by doing a pre-post comparison using the same rotahaler checklist.

**Study population and enrollment criteria:** A total of 54 patients meeting the inclusion criteria were enrolled after receiving verbal informed consent. COPD patients aged 45 years or older using rotahaler for at least 1 month and admitted in the ward were enrolled. Patients with poor eyesight, acute exacerbation, severe terminal illness or other respiratory illness and those using DPI other than rotahaler were excluded.

**Study tools:** A patient profile form was designed to collect the sociodemographic variables of the patients. Inhalation technique was assessed using a 8 item rotahaler checklist (Appendix 1).The checklist was adapted from Cipla leaflet and previously published literature by Palen et.al. A video in national language demonstrating correct sequential steps of rotahaler was used.

**Operational modality:** In-patients who met the inclusion criteria were enrolled in the study after

taking verbal consent. On the day of discharge the subjects were assessed for the inhalation technique with the use of placebo rotahaler provided by Ms. Cipla. Each step was assessed and scored as per the standard checklist. Each correct step was scored 1 and incorrect or missed step was scored zero. The demographic details of the patient were also collected. The patients were given a physical demonstration together with verbal counseling followed by video demonstration. Each intervention lasted 15 minutes. The subjects were made to repeat the steps till each step was performed correctly. At the end of the intervention the subjects were made to demonstrate the steps and subsequent scoring was done using the same checklist. After two weeks the inhalation technique was re-assessed using the same standard checklist. The scores of the patients at 3 time points were compared. The difference in percentage of patients achieving a perfect score on the essential items before counseling and after two weeks was also compared.

**Statistical Analysis:** Demographic variables including receipt of previous instruction, ease of use of rotahaler and patient perception of their technique were analyzed using descriptive statistics. The result was expressed as percentage. Percentage of patients performing each item in the checklist was calculated. Mc Nemar's test was used to test if significant difference existed between percentage of patients who got a perfect score (dichotomous variable) on essential items in the checklist before and two weeks after counseling. Friedman's test was used to analyse if significant difference existed between the median scores at the three timepoints (Baseline, Post immediate, after two weeks). Pairwise comparison between baseline score and Post immediate score; Post immediate and after 2 weeks score; baseline and after 2 weeks score were made using Wilcoxon's signed rank test. All the statistical analysis was carried out with SPSS version 19.0. P value of < 0.05 was considered statistically significant and the test was performed two sidedly.

## RESULT AND DISCUSSION

A total of 54 patients were enrolled in the study.

**Characteristics of study population:** Among the study population 61.1% had never received any previous instruction on use of rotahaler, 25.9% of them claimed to have received previous instruction but not a proper one. Only 13% of them claimed to have received proper instruction. This is in contrast to a study by Hammerlein et.al. who found only 12.3% (n=757) of the study population had never received

any instruction<sup>[12]</sup> and Khassawneh et.al. who found 98% (n=300) of the patients had received prior training in inhaler use.<sup>[13]</sup> Review study by Lavorini et.al. suggest that about 25% asthma and COPD patients never received any verbal instruction on use of inhaler and for those who received the instruction, the quality and duration of instruction was inadequate without reinforcement in follow ups.<sup>[14]</sup> The difference might indicate higher prevalence of lack of proper training to the patients in inhaler technique in Nepal.

Proper instruction included demonstration of the technique along with verbal instructions. But none of the patients reported to have received instruction via a visual aid like video as used in this study. Patients who received instruction but not proper one were provided with only one time verbal instruction of using the rotahaler without any demonstration. Patients who had learned to use rotahaler from other personnel except health care professionals (doctors, nurses, pharmacist, and health assistants) or had received no instruction at all were classified under the category of "Instruction not received". Mean baseline score for each group was calculated and was found to be the highest for the group who received instruction (6.92) followed by group who received instruction but not a proper one (3.92) and the least mean score was obtained by group who received no instruction at all (2.81). Other studies also show patients who never received any instructions committed more errors in inhaler use compared to patients who received instruction.<sup>[12]</sup> This result signifies the role of instruction in improving inhaler practice.

The practice of "breaking the capsule by hands, taking off the upper part of rotahaler and pouring the powder inside the rotahaler" was seen among most patients who claimed to have received no instruction. Inserting the capsule upside down in the rotahaler, piercing the capsule, accumulating the empty capsule shells in the rotahaler and cleaning the rotahaler with cloth instead of washing with water were some of the wrong practices seen among the study population. Complete lack of instruction or delivery of inadequate information to the patients maybe the prominent factors responsible for these wrong practices.

Entire study population (100%) stated rotahaler as an easy device to use. Shrestha and Shakya found 98% of the patients on rotahaler were satisfied with their device.<sup>[15]</sup> The reason that most patients find rotahaler

easy to use maybe the reason why it is one of the most popularly prescribed inhalers in Nepal.

Concerning the preference of teaching aids 40.7% stated video was more effective, 35.2% stated demonstration was more effective and 24.1% stated both teaching aids to be equally effective. Both video and personal instruction have been found superior to no instruction as well as written information.<sup>[10]</sup> Van der Palen et.al suggests a combination of video and personal counseling to be used for training the patients<sup>[16]</sup> whereas Self et.al recommends pharmacist based training to patients using either personal counseling or video.<sup>[10]</sup> Videotapes can be a good alternative for children or people unable to read manufacturers leaflet.<sup>[17]</sup> The reason most patients voted for video maybe because it draws extra attention and creates an interest in them to watch and listen to the instruction given via video.

Among the study population 75.9% believed their technique was correct whereas 24.1% were not sure about their technique. None of the patients believed that their technique was incorrect. But the mean percentage of patients performing the checklist items correctly was only 44% during the baseline assessment in contrary to 75.9% of the patients who claimed their technique to be correct. Basheti et.al. found in his study 74% patients believed their inhaler technique (diskus and turbuhaler) to be correct but only 10% could demonstrate their technique correctly during baseline assessment.<sup>[18]</sup> So, even the patients who claim to know the technique<sup>[19]</sup> may commit errors. This difference in patients perception and practice maybe because rotahalers or DPI are perceived as an easy device to use by both patients and health professionals due to which the need for proper training on the device use may be underestimated. The other reason maybe the patients after long term use of their inhaler tend to develop a firm belief regarding the correctness of their technique though it may not be fully correct. The details of these characteristics are presented in table I.

**Essential and non essential item errors prior instruction:** Most frequently performed essential item error was failure to make deep inhalation (step 7) followed by failure to hold the rotahaler vertically (step 1) and least frequently committed error was failure to rotate the base of rotahaler for capsule separation (step 4). Percentages of patients committing these errors were 81.48%, 64.81% and 22.22% respectively.

The first three most frequently committed errors were:

1<sup>st</sup> most frequent error: Failure to exhale prior inhaling (98.14%).

2<sup>nd</sup> most frequent error: Failure to inhale deeply (81.48%).

3<sup>rd</sup> most frequent error: Failure to hold breath for adequate period (77.77%)

The percentage of patients performing checklist items incorrectly are presented in table II

Van der Palen et.al found the most frequently performed essential item error was failure to hold rotahaler vertically followed by failure to make deep inhalation and 100% patients were able to perform step 4.<sup>[5]</sup> Similar results have been listed by Rau in his review.<sup>[3]</sup> The results are consistent with other studies showing similar results, the most frequent errors being failure to exhale prior inhaling and failure to hold breath for adequate period.<sup>[5,6,20]</sup> Beerendonk et.al. also found failure to exhale prior inhaling to be the most frequent nonskill item error.<sup>[21]</sup>

Various studies conducted on adult asthma and COPD patients show that the percentage of patients with incorrect inhalation technique in use of rotahaler lies in the range of 21% to 67%<sup>[14]</sup> whereas Hesselink et.al report prevalence of incorrect inhalation technique in general to be in the range of 27% to 89%.<sup>[22]</sup> In this study the average percentage of patients showing incorrect inhalation technique was 56% which is in agreement to the results obtained from the above studies. A significant difference in percentage of patients obtaining a perfect score on essential items before counseling and after two weeks was found when compared with Mc Nemar's test ( $p < 0.05$ ).

The detail is presented in table III (a) and III (b). The average percentage of patients who obtained a perfect score in essential checklist items prior instruction was 44.43% which increased to 86.4% after two weeks of instruction. There was 50%, 18.5% and 57.4% increase in percentage of patients performing essential steps 1, 2 and 3 respectively in this study. The result is consistent with the data obtained by Van der Palen et.al. He found that 60% of the patients had a perfect score on the essential items which increased to 83% after counseling.<sup>[16]</sup> Similar results were obtained in another study conducted among 166 older asthmatics by Van der Palen et.al.<sup>[6]</sup>

**Comparison of median scores at 3 time points:** Friedman's test was conducted to evaluate

differences in median scores obtained by the same patients at three time points i.e., at baseline (median = 4), immediately after intervention/ counselling (median = 8) and after 2 weeks (median = 6). The test was significant ( $p = 0.00$ )  $p < 0.05$ . Pairwise comparisons were done using Wilcoxon Signed Rank Tests (Table IV).

A significant increase in patients' rotahaler technique score from prior counseling (median score = 4) to immediately after counseling (median score = 8) was found. Similarly, significant increase in score from prior to counseling stage (median score = 4) to two weeks after counseling (median score = 6) was found. A significant decrease in score or deterioration in patients' rotahaler technique was found during the gap from after immediate counseling (median score = 8) to two weeks after the counseling (median score = 6) was found. Least score, highest score and medium score was obtained prior counseling, immediately after counseling and two weeks after counselling respectively.

The average percentage of patients performing each step in the checklist correctly prior instruction was 44.20% which increased to 77.77% after two weeks. The details are presented in table V. Study by Wright et.al shows an increase in percentage of patients with correct inhaler (DPI) technique from 59% prior instruction to 65% after instruction.<sup>[7]</sup> Counseling did improve the score or inhaler (rotahaler) technique among the COPD patients but deterioration of the technique to certain extent was seen after two weeks. This maybe because elderly people are less likely to retain perfect inhalation technique in follow up visits though effect of age still needs confirmation.<sup>[6]</sup> Previous studies done in Nepal are based on evaluation of results obtained immediately after counselling and requirement of any follow up or regular assessments has not been studied.<sup>[11]</sup> Result obtained in study by Shrestha and Shakya shows significant rise in score immediately after counselling (increase in mean score from 4.78 to 9.23). Result of this study is consistent with this finding. But in the same study by Shrestha and Shakya et.al. the score obtained after 2 weeks was found to be almost equal to immediate intervention score (mean score 9.47 versus mean score 9.23) in contrary to result obtained in this study.<sup>[15]</sup> In study by Basheti et.al. assessment and education on inhaler technique was done on 1,2,3 and 6 months. The fact that decrease in score was seen between three to six months when no education was received by the patients show the need of regular assessment and education in inhaler technique.<sup>[18]</sup> Many studies that suggest inhaler training should be a

continuous process stress the need of repeated instructions and demonstration during each clinic visit for the teaching to be effective .<sup>[4,8,9,13,23,24]</sup> since studies have found the technique deteriorates with time.<sup>[7,9,13,14,17,21,22,25]</sup>

## CONCLUSION

Incorrect use of rotahaler is highly prevalent among COPD patients but significant improvement in their technique can be made with proper instruction using a combination of video and demonstration. But equally important is to assess the technique at regular

intervals in each follow up visits since deterioration of technique is highly possible with passage of time. It is important to distinguish between essential and non essential items in the checklist and instruct patients with special focus on essential items.

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Table I: Characteristics distribution of patients

| Characteristics                       | Category                | Percentage of Patients | Average score |
|---------------------------------------|-------------------------|------------------------|---------------|
| Patient instruction                   | Received                | 13                     | 6.42          |
|                                       | Not Received            | 61.1                   | 3.92          |
|                                       | Received but not proper | 25.9                   | 2.81          |
| Ease of use of Rotahaler              | Easy                    | 100                    |               |
|                                       | Difficult               | 0                      |               |
| Preference of teaching aids           | Video                   | 40.7                   |               |
|                                       | Demonstration           | 35.2                   |               |
|                                       | Both                    | 24.1                   |               |
| Patient Perception of their technique | Correct                 | 75.9                   |               |
|                                       | Incorrect               | 24.1                   |               |
|                                       | No idea                 | 0                      |               |

Table II: Percentage of patients committing errors before intervention

| Items in Checklist   | % of patients committing errors prior instruction |
|--|---|
| Take the Rotahaler capsule, insert transparent end first into the raised square hole of the Rotahaler.         | 22.22   |
| Press the rotacap firmly such the top of the capsule comes to same level of raised square hole of Rotahaler    | 22.22   |
| Hold the mouthpiece firmly with one hand and rotate the base with the other.*                                  | 22.22   |
| Breathe out fully.   | 98.14   |
| Grip the mouthpiece between your teeth and seal your lips around it.   | 55.55   |
| Breathe in through your mouth as deeply as you can*  | 81.48   |
| Remove the rotahaler from mouth and hold your breath for as long as comfortable (10 sec) before breathing out. | 77.77   |

\* Essential items in rotahaler checklist

Table III(a): Difference in percentage of patients obtaining a perfect score on essential items before counseling and after 2 weeks

| Essential steps   | Pre-instruction | Post instruction | Difference | P value              |
|---|-----------------|------------------|------------|----------------------|
| Essential step 1: Hold rotahaler vertically   | 37%             | 87%              | 50%        | P=0.000<br>P < 0.05  |
| Essential step 2: Hold the mouthpiece firmly with one hand and rotate the base with the other | 77.8%           | 96.3%            | 18.5%      | P=0.002<br>P < 0.05  |
| Essential step 3: Breathe in through your mouth as deeply as you can                          | 18.5%           | 75.9%            | 57.4%      | P=0.000.<br>P < 0.05 |

Table III (b): Pairwise Comparision

| Score Difference   | P value |
|--|---------|
| Total post immediate score - Total baseline score of each individual | 0.000   |
| Total score after 2 weeks - Total baseline score                     | 0.000   |
| Total score after 2 weeks - Total post immediate score               | 0.000   |

Table IV: Comparision of median scores at 3 time points

| Time Points    | Median Score Value |
|----------------|--------------------|
| Baseline       | 4                  |
| Post Immediate | 8                  |
| After 2weeks   | 6                  |

Table V: Percentage of patients performing each step correctly

| Steps | Pre-intervention score | Score after 2 weeks |
|-------|------------------------|---------------------|
| 1     | 35.18%                 | 87.03%              |
| 2     | 77.77%                 | 94.44%              |
| 3     | 77.77%                 | 92.59%              |
| 4     | 77.77%                 | 96.29%              |
| 5     | 1.81%                  | 24.07%              |
| 6     | 44.44%                 | 88.88%              |
| 7     | 18.51%                 | 75.92%              |
| 8     | 20.37%                 | 62.96%              |

## Appendix 1: Rotahaler technique score charts

| Checklist steps   | Baseline score | Post immediate score | Score after 2 weeks |
|---|----------------|----------------------|---------------------|
| 1. Hold the Rotahaler vertically  |                |                      |                     |
| 2. Take the Rotahaler capsule, insert transparent end first into the raised square hole of the Rotahaler.         |                |                      |                     |
| 3. Press the rotacap firmly such the top of the capsule comes to same level of raised square hole of Rotahaler    |                |                      |                     |
| 4. Hold the mouthpiece firmly with one hand and rotate the base with the other.                                   |                |                      |                     |
| 5. Breathe out fully.   |                |                      |                     |
| 6. Grip the mouthpiece between your teeth and seal your lips around it.   |                |                      |                     |
| 7. Breathe in through your mouth as deeply as you can*  |                |                      |                     |
| 8. Remove the rotahaler from mouth and hold your breath for as long as comfortable (10 sec) before breathing out. |                |                      |                     |
| Score No.   |                |                      |                     |

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