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EVALUATION OF KNOWLEDGE AND COUNSELING ON METERED-DOSE INHALERS AND NEBULISERS AMONG COMMUNITY PHARMACISTS IN IBADAN - AN INTERVENTION STUDY

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ABSTRACT

This study evaluated the impact of an educational intervention on knowledge and counseling on metered-dose inhalers (MDIs) and nebulisers among community pharmacists in Ibadan, Nigeria. A validated semi-structured questionnaire was utilised for data collection on study participants' baseline knowledge and counseling on the selected asthma medication devices. The community pharmacists were randomised into control and intervention groups. An online educational intervention was carried out among pharmacists in the intervention group. The intervention comprised updates on basic information vis-à-vis knowledge and patient counseling on MDIs and nebulisers. A post-intervention assessment was carried out a month later to evaluate the impact of the intervention. Data was summarised using descriptive and inferential statistics, with level of significance set as $p < 0.05$. Response rate was 77.2% (112/145). Study findings showed significant improvement on knowledge and counseling among the community pharmacists in the intervention group, postintervention. Pharmacists' knowledge of MDIs and nebulisers (control versus intervention) was comparable at baseline (5.83 ± 2.46 versus 6.34 ± 2.16) but significantly different postintervention (5.87 ± 2.34 versus 7.10 ± 2.21). Similarly, pharmacists' counselling on asthma medication devices was comparable at baseline (3.59 ± 2.54 versus 3.63 ± 1.83) but significantly different post-intervention (3.35 ± 3.13 versus 7.93 ± 2.58). Work experience as community pharmacists did not influence participants' knowledge and counseling on MDIs and nebulisers. The educational intervention significantly improved knowledge and counseling on MDIs and nebulisers among community pharmacists in Ibadan, Nigeria. There is need for regular educational updates to improve the quality of care offered by community pharmacists.

***Keywords*:** Intervention, Pharmacist, Metered-dose inhaler, Knowledge, Counseling

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INTRODUCTION

The prevalence of asthma in Nigeria ranges from 6.4%–10.2% (Musa and Aliyu, 2014; Ozoh *et al.* 2018). Poor asthma inhalation medication device technique may be responsible for inadequate asthma control (Basheti *et al*. 2011). Inappropriate use of asthma medication devices has been related to higher risk of avoidable hospital visits, hospital admission, and systemic administration of steroids and antibiotics (Al-Jahdali *et al.* 2013). Three major types of devices used for asthma inhaled medication deliver are: pressurised metered-dose inhalers (pMDIs), dry powder inhalers (DPIs) and a soft mist inhaler (SMI) (Schreiber, Sonnenburg and Luecke 2020). Globally, asthma medications are preferably administered through the inhalational route, owing to the advantage localised delivery with negligible side effects (Broeders *et al.* 2009). Even though inhalation medication devices are the mainstay of asthma therapy, several patients do not use their inhalers effectively (Sanchis, Gich and Pedersen 2016). Effective inhaler technique also wanes in the absence of consistent reinstruction (Onyedum *et al.* 2013). Community pharmacists occupy a vantage position for regular review of patients' inhaler technique as they refill their medications in their premises. Studies in Jordan (Basheti *et al.* 2019) and Australia (Bosnic-Anticevich *et al*. 2010) have shown the value of pharmacists-led intervention to improvement in asthma patients' inhaler techniques and asthma management.

However, many studies have shown inadequate asthma medication device technique by pharmacists (Osman, Hassan and Ibrahim 2012; Khan and Azhar 2013; Ali *et al.* 2014; Adnan *et al.* 2015; Nduka *et al*. 2016; Belachew *et al.* 2017; Jahedi *et al*. 2017; Abdulameer 2018; Plaza *et al*. 2018; Amorha *et al.* 2019; Aje and Aina 2020; Hussain and Paravattil 2020). These studies showed pharmacists' inadequacies in the stepwise administration procedures for the medication delivery device. If pharmacists are not able to correctly demonstrate the use of these devices, they would be ineffective at educating patients. A sub-optimal asthma inhalational medication device use may result in reduced medication delivery and potentially lead to decreased efficacy (Roy *et al*. 2011). Regular educational updates for community pharmacists are vital to sustain improved patient outcomes.

This study aimed to evaluate the knowledge and counseling on asthma inhalation medication devices among community pharmacists. An educational intervention was meant to address the gaps discovered and the impact of the intervention assessed.

METHODS

A cross-sectional study design involving a pre-post-intervention assessment of knowledge and counseling on metered-dose inhalers (MDIs) and nebulisers was carried out among community pharmacists in Ibadan, Nigeria. Community pharmacists were recruited for the study after securing their informed consent. Pharmacy students on experiential rotations were excluded from the study.

A questionnaire earlier validated among pharmacists in Ibadan by Aje and Aina (2020) was utilised for data garnering. It consisted of three sections. Section A had five questions that addressed the socio-demographic characteristics. Section B had 12 questions that addressed the knowledge of pharmacists on MDIs and nebulisers. Section C had a question that addressed the counseling points of pharmacists on the technique for MDIs. The community pharmacists' responses to questions on MDIs and nebulisers were assigned a score for each correct response. The expected maximum score was 12 points for the knowledge and 10 points for the counseling. The assessment scores were converted

to percentages by dividing it with the expected maximum score and multiplying by 100. The percentage scores were categorised as poor (0%–49.9%), fair (50%–69.9%), good (70%–89.9%) and excellent (90%–100%) based on categories used in an earlier publication (Aje and Aina 2020).

A sample size of 132 was calculated using Raosoft online sample size determination with a margin of error of 5% and a confidence level of 95% with an estimated population size of 200 community pharmacists in Ibadan metropolis. Pharmacists working in registered community pharmacies in Ibadan were approached for inclusion in the study. Pharmacy students on an experiential rotation to community pharmacies were excluded from the study. Consecutive sampling was done for every consented community pharmacist in Ibadan. The community pharmacists were randomised into control and intervention groups using computer-generated random numbers for the community pharmacies. Even numbers were assigned to the intervention group while odd numbers were assigned to control group. The questionnaire was administered to the pharmacists in their respective pharmacies and retrieved after completion. An online educational intervention was carried out for the community pharmacists in the intervention group after the baseline data collection. The intervention material was developed by one of the authors, who is an expert in asthma medication devices and a faculty in the Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan. The online interaction, involving a detailed power point material written in English language comprising basic knowledge and counseling points on the use of asthma medication devices was shared with the intervention pharmacists. Precautions to be taken with the use of asthma medication devices were explained to the intervention pharmacists. The stepwise administration of MDIs was explained to facilitate patient counseling on proper use. Post-intervention assessment was carried out one month later. The study period was between June 2021 and November 2021.

Descriptive data was summarised with frequency counts, percentages, mean (standard deviation) using SPSS version 20.0 (SPSS Inc. Chicago, IL). Kolmogorov-Smirnov test was carried out to ascertain the normality of data distribution. Independent-samples *t*-test and One-Way Analysis of Variance were carried out to compare the knowledge and patient counseling scores of the pharmacists in the control and intervention groups, and the years of work experience, respectively. Paired-samples *t*-test was done to compare the pre-intervention and post-intervention knowledge and patient counseling of the pharmacists in the control and intervention group. Independent-samples *t*-test was also done to find out if gender affected the assessment scores of the community pharmacists. Level of significance was set at $p < 0.05$.

Ethical approval for the study was obtained from the Ethical Approval Committee, Oyo State Ministry of Health with reference number AD 13/479/4205b.

RESULTS

Out of a total of 198 community pharmacists approached for the study, only 113 (intervention: $n = 41$ and control: $n = 72$) community pharmacists completed the study. There were 39 (42.3%) and 16 (39.0%) females in the control and intervention groups, respectively. In the control group, 67 (94.4%) participants had only Bachelor of Pharmacy while 4 (5.6%) had postgraduate educational qualification, respectively. In the intervention group, 32 (78.0%) had only Bachelor of Pharmacy while 9 (22.0%) had postgraduate educational qualifications. Findings on work experience as community pharmacists (control versus intervention) showed that 52 (73.2%) versus 29 (70.7%) had 1 year–5 years, 9 (12.7%)

versus 8 (19.5%) had 6 years–10 years and 10 (14.1%) versus 4 (9.8%) had greater than 10 years of work experiences.

Majority of the pharmacists, 32 (41.5%) in the control group and 17 (41.5%) in the intervention group had poor knowledge of asthma medication devices pre-intervention. Post-intervention, majority of the pharmacists in the control group, 31 (43.7%) still had poor knowledge while majority of the pharmacists in the intervention, 18 (43.8%) had fair knowledge. Details are as shown in Table 1. Among the community pharmacists in the control group, 54 (76.1%) and 50 (70.4%) knew the right counseling to offer patients to prevent oral thrush in relation to MDI administration at baseline and post-intervention, respectively. In the intervention group, 34 (82.9%) and 36 (87.7%) knew the right counseling pre- and post-intervention, respectively.

Table 1: Pharmacist's knowledge on the use of asthma medication devices.

Questions	Frequency (%)			
	Pre-intervention		Post-intervention	
	Control (*n* = 71)	Intervention (*n* = 41)	Control (*n* = 71)	Intervention (*n* = 41)
Can a nebuliser be used for unconscious patients?	40 (56.3)	25 (61.0)	34 (47.9)	35 (85.4)
Can a MDI be used for patients who are ill and without proper breath coordination?	33 (46.5)	15 (36.6)	33 (46.5)	26 (63.4)
Please explain your answer to question	38 (53.5)	22 (53.7)	37 (52.1)	27 (65.9)
A patient is expected to take a deep breath, release the puff and immediately hold his breath for a while in a MDI administration.	8 (11.3)	6 (14.6)	8 (11.3)	8 (19.5)
How many puff(s) can be administered at once, after placing the inhaler in the mouth, with a MDI?	27 (48.2)	23 (56.1)	21 (37.5)	30 (73.2)
Administration of medication using a nebuliser has a faster onset of action than using a MDI	24 (42.9)	19 (33.9)	17 (30.4)	35 (62.5)
How long is the waiting time before administration of the second dose using a MDI?	29 (40.8)	24 (58.5)	28 (39.4)	32 (78.1)
MDIs deliver the medication through the nostrils	60 (84.5)	35 (85.4)	57 (80.3)	37 (90.2)
Nebulisers can deliver the medication through the nostrils	49 (69.0)	33 (80.5)	65 (91.5)	37 (90.2)
Nebulisers are only used on emergency cases to administer acute relief medications	21 (29.6)	16 (39.0)	24 (33.8)	20 (48.8)
Mention a disadvantage of using a MDI in asthma management	45 (63.4)	28 (68.3)	44 (62.0)	37 (90.2)
Knowledge categories				
Poor knowledge (0%–49.9%)	32 (41.5)	17 (41.5)	31 (43.7)	11 (26.8)
Fair knowledge (50%–69.9%)	27 (38.0)	17 (41.5)	30 (42.3)	18 (43.8)
Good knowledge (70%–89.9%)	11 (15.5)	6 (14.6)	10 (14.1)	9 (22.0)
Excellent knowledge (90%–100%)	1 (1.4)	1 (2.4)	0 (0)	3 (7.3)

The average number of accurate steps for MDI administration stated by the pharmacists (control versus intervention) were 3.2 ± 2.59 versus 4.5 ± 2.41 at baseline and 2.6 ± 2.96 versus 6.5 ± 2.87 post-intervention. Pre-intervention, 2 (2.8%) and 2 (4.9%) of community pharmacists in the control and intervention groups, respectively, could not state any step for the administration of MDI correctly. Only 1 (1.4%) of the control group and 1 (2.4%) of the intervention group could state nine steps of the administration steps correctly. Post-intervention, 1 (1.4%) of the pharmacists in the control group could not state any of the metered-dose inhale administration steps correctly while none of the pharmacist in the intervention group failed to state at least two steps correctly. As much as 6 (14.6%) and 7 (17.1%) of the pharmacists in the intervention group stated 9 and 10 steps, respectively, but none of those in the control group did so (Figure 1).

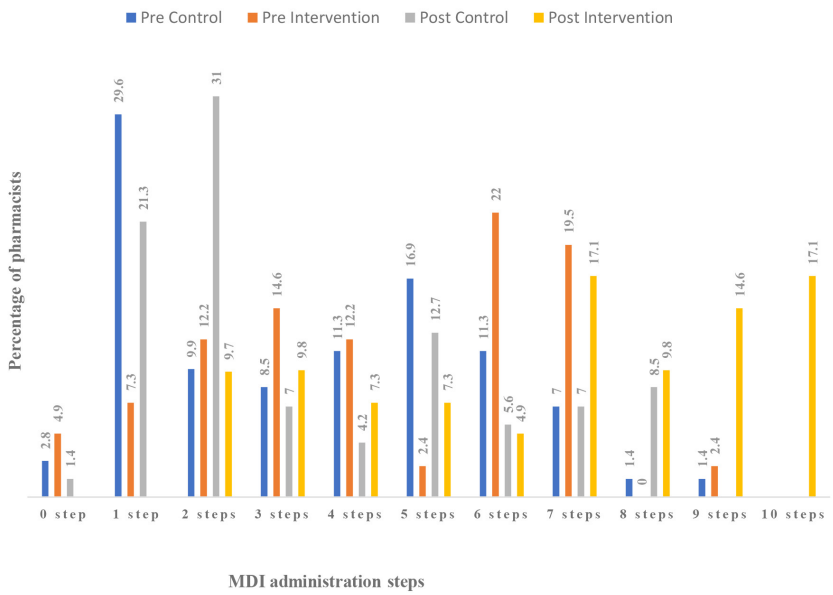

Figure 1: Assessment of pharmacists' MDI administration steps.

No significantly different assessment score for knowledge and patient counseling was observed in relation to the community pharmacists' work experience, as shown in Table 2. The difference between the pre-intervention and post-intervention knowledge and patient counseling was not statistically significant among the control group unlike with the intervention group. The assessment scores on knowledge and patient counseling on asthma medication devices in the control and intervention groups were comparable at baseline but significantly different post-intervention (Table 3).

Table 2: Comparison of pharmacists' knowledge and counseling on MDI device with years of community pharmacy practice experience.

Community pharmacy work experience (years)	Frequency (%)					
	Pre-intervention		*p*-value	Post-intervention		*p*-value
	Control (*n* = 71)	Intervention (*n* = 41)		Control (*n* = 71)	Intervention (*n* = 41)	
Knowledge	Mean ± SD			Mean ± SD		
1–5	5.8 (2.53)	6.3 (2.29)	0.625	6.1 (2.31)	7.3 (2.19)	0.931
6–10	5.9 (1.27)	7.0 (2.00)		5.6 (2.19)	6.7 (2.43)	
> 10	5.9 (3.04)	5.3 (1.26)		5.0 (2.89)	5.5 (2.12)	
Counseling						
1–5	3.9 (2.51)	3.8 (1.99)	0.175	3.6 (3.15)	7.9 (2.62)	0.892
6–10	3.2 (2.68)	3.5 (1.51)		2.8 (3.60)	8.3 (2.93)	
> 10	2.3 (2.41)	2.8 (.96)		2.9 (2.12)	7.5 (.71)	

Note: Test statistics = One-way Analysis of Variance.

Table 3: Comparison of pharmacists' asthma medication devices knowledge and counseling between the control and intervention study groups.

Variables	Pre-intervention Mean ± SD	*p*-value[a]	Post-intervention Mean ± SD	*p*-value[a]	*p*-value[b]
Knowledge					
Control (*n* = 71)	5.83 ± 2.46	0.271	5.87 ± 2.34	0.008*	0.813
Intervention (*n* = 41)	6.34 ± 2.16		7.10 ± 2.21		0.041*
Counseling					
Control (*n* = 71)	3.59 ± 2.54	0.919	3.35 ± 3.13	< 0.001*	0.714*
Intervention (*n* = 41)	3.63 ± 1.83		7.93 ± 2.58		< 0.001*

Notes: [a] Test statistics = Independent-samples *t*-test; [b] Test statistics = Paired-samples *t*-test; * Statistically significant.

The community pharmacists' gender did not influence their knowledge and patient counseling on MDIs and nebulisers at the pre-intervention and post-intervention stages of the study. For the control group (male versus female; *p*-value), pre-intervention knowledge assessment scores were (5.49 ± 2.42 versus 6.30 ± 2.47; $p = 0.170$) and post-intervention knowledge assessment scores were (5.82 ± 2.37 versus 5.96 ± 2.35; $p = 0.802$); Pre-intervention patient counseling assessment scores were (3.13 ± 2.89 versus 3.98 ± 2.72; $p = 0.080$) and (3.05 ± 3.12 versus 3.85 ± 3.13; $p = 0.295$) post-intervention. For the intervention group, knowledge assessment scores were (6.36 ± 2.20 versus 6.31 ± 2.18; $p = 0.946$) and 7.05 ± 2.55 versus 7.16 ± 1.80; $p = 0.873$) pre-intervention and post-intervention, respectively. Patient counseling assessment scores were 5.49 ± 3.45 versus 6.17 ± 2.55; $p = 0.306$) and 8.23 ± 2.78 versus 7.58 ± 2.36; $p = 0.430$) pre-intervention and post-intervention, respectively.

DISCUSSION

Inhaled medication remains the mainstay of asthma pharmacotherapy, considering the reduction in the systemic side effects, when compared with oral medications and injectables (Broeders *et al*. 2009). Community pharmacists are the first port-of-call for outpatients and are therefore strategically located to assist patients with the appropriate use on asthma inhalation medication devices. This is because they are readily accessible to patients (Amorha *et al*. 2019).

Baseline knowledge and counseling on asthma medication devices was poor among the community pharmacists in the control and intervention groups. There was significant improvement in the knowledge and counseling on asthma medication devices of study participants in the intervention group after the educational intervention. Work experience did not affect their knowledge and counseling on asthma medication devices, unlike what was reported in a similar study among pharmacists in a Nigerian tertiary hospital (Aje and Aina 2020). Pharmacists working in tertiary are rotated through different units which make them to get exposed to patients using asthma inhalational medication devices. First-time users of the medication users are most likely to be counseled at hospitals. They may only refill at community pharmacies. However, considering the need for regular counseling on asthma and appropriate use of the device, community pharmacists ought to counsel patients too.

Baseline study finding is comparable with what was reported by Belachew and colleagues (2017), where only 35.4% of pharmacists knew at least 50% of MDI steps. Also, Amorha and colleagues' study (2019) reported that only 22 (26.5%) knew more than 50% of the MDI steps. Prior to the educational intervention, none of the study participants was able to state all the MDI administration steps correctly. This is like the finding from a study by Ali *et al*. (2014) where none could state all the steps too. However, contrary to the findings of this study, Adnan *et al*. (2015) reported that 7.3% of the pharmacists completely stated the MDI administration steps, and Osman *et al*. (2012) reported 1%. The fact that none of the community pharmacists who participated in this study could state all the MDI administration steps shows that there is inadequate practice-based knowledge update for the community pharmacists. This also calls for specialisation. There are lots of areas of practice in community pharmacy which should make community pharmacists choose areas of specialisation. The International Pharmaceutical Federation (FIP) in 2015 stated the need for specialisation. It is also important to critically consider incentivising community pharmacists for specialised services as obtainable in developed countries. This could arouse their interest in going the extra mile for knowledge update.

The increment observed in the number of MDI administration steps stated by intervention group pharmacists postintervention was comparable to a study by Kishore *et al.* (2008) but not as high as that reported by Basheti *et al*. (2011). This study reported an increment from 4.5 (SD = 2.41) at baseline to 6.5 (SD = 2.87) post-intervention while Basheti *et al.* reported an increment from 3.49 (SD = 2.75) to 6.33 (SD = 3.38), and Kishore *et al*. reported increment from 5.8 to 7.1.

Inability of the pharmacists to state the MDI administration procedures correctly is a pointer to poor counseling of asthma patients who procure their asthma medication devices at their pharmacies. Various factors could explain this, including inadequate or no training on MDI administration procedures, lack of updates on MDIs to refresh their knowledge. We cannot also rule out the possibility of the commercial aspect of community pharmacy setup being a distraction from this pharmaceutical care activity. Update courses on MDIs should be organised regularly for community pharmacists to equip them for adequate pharmaceutical care to benefit the patients.

Globally, there is an increasing demand for pharmacists to take up more clinical roles. This has led to specialised service demand on pharmacists (FIP 2015). Community pharmacists should consider specialisation in their practice. This will improve proficiency in their area of specialisation, rather than a mere sketchy and unpersuasive information in several areas of practice. Reduced acuity may be experienced in infrequently utilised skills among pharmacists, just like it has been reported among asthma patients using MDIs (Onyedum *et al*. 2013). Community pharmacists who specialise on pulmonology will become fully exposed to lots of such cases and will build a better competence during discharge of duty.

The years of practice as community pharmacists did not influence the asthma inhalation device knowledge and patient counseling assessment scores of the study participants. It is expected that with years of practice, community pharmacists should learn and improve their practice on the job. Update courses are very vital to improving the quality of pharmaceutical care services delivered by community pharmacists.

The study has some limitations. The results cannot be generalised to community pharmacists in Nigeria since it was carried out in Ibadan. Hawthorne effect is a limitation based on the repeated questionnaire administration to the same set of study participants. The fact that the same questionnaire was readministered among the intervention and control community pharmacists could have affected their responses. The study focused on MDI and nebuliser, but other asthma inhalation medication devices, such as dry powder inhalers, were not assessed.

CONCLUSION

Educational intervention on asthma medication devices had a positive impact on knowledge and patient counseling among community pharmacists in Ibadan, Nigeria. Work experience did not affect the knowledge and counseling on asthma medication devices of the study participants. There is need for regular educational updates to improve the quality of pharmaceutical care services offered by community pharmacists.

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