Brief Report

Impact of Pharmacist-Led Intervention on Medication Adherence and Asthma Control Among Asthmatic Outpatients Attending Respiratory Clinic at National Hospital, Abuja, Nigeria

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Brief Report

Impact of Pharmacist-Led Intervention on Medication Adherence and Asthma Control Among Asthmatic Outpatients Attending Respiratory Clinic at National Hospital, Abuja, Nigeria

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Abstract

Title: Impact of Pharmacist-led Intervention on Medication Adherence and Asthma Control in Asthmatic Patients Attending Respiratory Clinic at National Hospital Abuja. **Background:** Asthma is a widespread disease affecting more than 300 million people globally. Adherence to management protocols, both pharmacotherapy and non-drug therapy is key to positive treatment outcomes. Pharmacists with their professional knowledge and skills play a vital role in educating the patients to improve treatment adherence and clinical outcomes. This study aimed to assess the impact of Pharmacist-led intervention on medication adherence and asthma control. **Objectives:** To assess symptoms and medication use among asthmatic patients, estimate the sample prevalence of medication non-adherence and its causes and evaluate the outcome of Pharmacist-led intervention on medication adherence and asthma control. **Methods:** It was a pre/post – interventional study carried out at the Medical Outpatient Clinic among 49 consented patients with primary diagnosis of asthma. Purposive sampling was used. Participants received targeted pharmacist-led intervention in form of asthma education, medication adherence counseling, how to use inhaler devices correctly and were monitored via mobile phone post-intervention. Descriptive statistics was used to summarise data. Chi square test was used to compare categorical variables while Wilcoxon signed rank and McNemar tests were used to compare differences in medication adherence and asthma control. Statistical significance was set at $p \leq 0.05$. **Results:** Majority of the patients were females (32; (65.3%)) and had family history of asthma (30; (61.2%)). Cough was the major symptom experienced before diagnosis (31; (35.2%)). Asthma exacerbations were more frequent in cold weather (35; (76.1%)), dust was the most common trigger (27; (34.2%)). Salbutamol inhaler was the commonly used asthma medication (31; (39.3%)). Pre intervention, most of the patients showed poor (21; (42.9%)) to medium adherence (26; (53.1%)) while 2 (4.1%) showed good adherence. Forgetfulness (17; (73.9%)), daily/continuous use of medication (18; (81.8%)) and use of herbal remedies (15; (68.2%)) were reasons for non-adherence ($p<0.05$). 44 (95.7%) patients were uncontrolled pre intervention. Post-intervention, patients with good adherence increased to 32, (76.2%) (p <0.05), the number of patients with controlled asthma increased to 25, (59.5%) ($p<0.001$). **Conclusions:** Pharmacist-led intervention improved medication adherence and symptoms control in asthmatic patients.

Keywords: asthma; medication adherence; pharmacist intervention; control

1. Background of the Study

Asthma is a common chronic disorder of the airways that involves a complex interaction of airflow obstruction, bronchial hyper responsiveness and an underlying inflammation. This interaction can be highly variable among patients and within patients over time. It is defined by the

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history of respiratory symptoms such as wheeze, shortness of breath, chest tightness, and cough that vary over time and in intensity, together with variable expiratory airflow limitation (Global Initiative for Asthma (GINA), 2022). It is caused by a combination of complex and incompletely understood environmental and genetic interactions. These influence both its severity and its responsiveness to treatment. The burden of asthma is of public health concern because asthma is a major cause of infirmity, depletes scarce health resources, and reduces the quality of life of affected individuals (WHO, 2022)

In 2019, it affected about 266 million people globally, up from 183 million in 1990 and caused 455,000 deaths, most of which occurred in the developing world (Lancet 2020). In 2019, 96% of Asthma deaths and 84% of disability adjusted life years are in low and middle-income countries (GINA 2022). It is estimated to rise to about 400 million by 2025 (Masoli *et al.*,2004). Although studies on the prevalence of asthma have consistently shown lower levels in rural areas, available data suggests an increase in prevalence in both urban and rural settings (Akhiwu *et al.*, 2016).

In Nigeria, the prevalence of clinical asthma is 6.0-6.4% (about 13 million) in the general population therefore this calls for better understanding of treatment practices and patient perception (Ozoh *et al.*, 2019).

Generally, the goal of treatment is to achieve and maintain control of clinical manifestations of the disease for prolonged periods (GINA 2019). The attainment of asthma control correlates with improved quality of life (QoL) and reduced health care use (Chotirmall *et al.*, 2009).

Adherence to asthma treatment is affected by factors such as the different medications prescribed, duration of treatment, patient's daily schedule, costs of medications, existence of co-existing disease states, forgetfulness/underestimation of severity, dissatisfaction with health care professionals (Bauman *et al.*, 2005). Other medication related factors affecting adherence to asthma therapy are difficulties with inhaler devices, complex regimen and side effects of the medication (Bender *et al.*, 2005).

Adherence to prescribed medication is important for effective medical therapy. There is increasing evidence that many patients with severe asthma do not adhere to their treatment (Barnes and Ulrik, 2015; Mes *et al.*, 2018; Jeminiwa *et al.*, 2019; Amin, 2020). The use of inhalational drugs is the cornerstone in the management of asthma (GINA, 2022). Poor handling technique and use of inhalational drugs contribute immensely to poor delivery of medications to the required site of action, poor asthma control and resultant increase in the health resource utilization (Morton *et al.*, 2020).

A Pharmacist intervention is any activity that a pharmacist performs to benefit a patient. These can help improve patient health outcomes by preventing drug related problems and optimizing drug therapy. (Farhat et al., 2021). A study carried out by Ponnusankar *et al.*, in 2012 established that Pharmacists with their professional knowledge irrespective of their working place either in hospital or in community can play a vital role in educating the patients and can improve medication adherence and clinical outcome.

Objectives

The objectives of this study were to:

i. Assess experience of signs and symptoms of asthma among asthmatic patients receiving care at Respiratory Clinic at National Hospital Abuja
ii. Assess medication use among asthmatic patients receiving care at Respiratory Clinic at National Hospital Abuja
iii. Determine the prevalence of medication non-adherence among asthmatic patients receiving care at Respiratory Clinic at National Hospital Abuja.
iv. Identify the causes of medication non-adherence among asthmatic patients receiving care at Respiratory Clinic at National Hospital Abuja.

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v. Evaluate the impact of Pharmacist-led intervention on medication adherence among asthmatic patients receiving care at Respiratory Clinic at National Hospital Abuja

vi. Evaluate the impact of pharmacist-led intervention on symptoms control among asthmatic patients receiving care at Respiratory Clinic at National Hospital Abuja

2. Methods

2.1. Research Design

This study was a prospective questionnaire guided pre/post interventional study on asthmatic patients attending the Respiratory Clinic of the MOPD at NHA, Nigeria. It was conducted within sixteen consecutive weeks between June and September, 2019. Patients were followed up from one month after receiving Pharmacist-led intervention on medication adherence through phone calls.

2.2. Ethical Approval

Ethical approval was obtained from the National Hospital, Abuja Ethics Committee prior to the commencement of this study, reference number NHA/EC/079/2018 (Appendix I). Written informed consent was sought from the participants before enrolment in the study (Appendix II). Participation was voluntary and participants' information was kept confidential.

Description of Study Site and Population

This study was carried out at the Medical Outpatient Department (MOPD) clinic of National Hospital, Abuja (NHA). Abuja is the cosmopolitan capital city of Nigeria, located at the centre of the country. It is a modern city with a mixed and very diverse community, a multicultural and educated society. The NHA is a 440-bed tertiary hospital sited at the metropolitan area of the Federal Capital Territory (FCT). It is the major medical referral centre not only in the FCT but also in Northern Nigeria. The NHA has up to sixteen (16) medical and surgical specialties including a Respiratory Diseases Unit involved in treating chest-related diseases as well as Pharmacy Department that provides round the clock pharmaceutical care services through its 16 satellite pharmacy units that run alongside the medical and surgical specialties. The study population comprised patients attending Respiratory Clinic at the NHA with primary diagnosis of asthma for not less than 3 months.

Sample Size and Sampling Technique

The sample size for the study was determined using (Yamane, 1967) sample size formula and adjusted for 10% attrition rate to 56 and purposive sampling method was used to select all consenting patients within 16 consecutive weeks from June to September 2019 on a continuous basis.

Eligibility Criteria

i. Patients who attended the NHA Respiratory Clinic with primary diagnosis of asthma for not less than 3 months

ii. Patients that are 18 years and above

iii. Patients who have been on anti- asthmatic medication for at least three months

iv. Patients who met all the criteria above

v. Patients who consented to be part of the study

Description of the Data Collection Instruments

Data collection involved the use of interviewer administered questionnaire which collected relevant information such as sociodemographic characteristics and duration since asthma diagnosis in section A. Section B assessed prescribed and non-prescribed antiasthmatic medications used by patients. Patients' experience of signs/symptoms of asthmatic condition as well as their opinions on history of allergy including specific allergen was evaluated with questions adopted from Adisa *et al.*, 2017. Adherence was measured based on a four-item Medication Adherence Predictor Scale adapted from Adisa *et al*., 2017. Section E assessed general control of asthma and asthma symptoms based on the Royal College of Physicians Three Questions for quick review of asthma control.

Sociodemographic Information, Experience of Asthma Symptoms and Medication Use

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These were assessed by modified questions adapted from Adisa *et al*.,(2017). (see Appendix III)

Medication Adherence Predictor Scale as Adapted from Adisa et al., 2017

A four-item modified Medication Adherence Predictor Scale (MAS-4) was used to assess patient adherence to prescribed medicines. The following MAS-4 questions adapted from Adisa *et al*.,2017 (Appendix III) were asked and participants that responded to all the questions were assessed based on their responses.

Scoring scheme for response to questions:

NO=1

YES =0

Total score = 4 (GOOD ADHERENCE)

Total score = 2-3 (MEDIUM ADHERENCE)

Total score = 0-1 (POOR ADHERENCE)

Royal College of Physicians 3 Questions for Asthma Control Test

Royal College of Physicians three questions (RCP-3Qs, Appendix III) for quick review of asthma control was used to assess the level of asthma control pre intervention and a month following Pharmacist intervention.

Scoring scheme for response to questions:

"YES" response to any of the questions = UNCONTROLLED

"NO" response to the three questions = CONTROLLED

2.3. Intervention Provided

Patients were approached for participation while waiting to see the physician on the Respiratory clinic days (Tuesdays, morning clinic). The objectives and procedure of the study was clearly explained to them after which written informed consent was sought and voluntarily given by individual patients (Appendix II). They were assured of the confidentiality of their responses. Patients recruited into the study were all assessed for medication knowledge and adherence at the beginning. All the participants received structured Pharmacist-led asthma education that lasted about ten minutes at the beginning, which was first generalized and afterwards individualized, covering description of the disease, signs and symptoms, triggers and their avoidance, different medications used in management of the disease, different types of asthma medication devices, (Appendices IV, V, VI and VII), how to administer the medication with different devices, with particular emphasis on the critical steps in correct use of the devices. Questions and request for further clarifications from the participants were answered accordingly. Their level of medication adherence and symptoms control were then monitored via phone calls from one month after the intervention. Seven patients were lost to follow up as they did not respond to phone calls despite several attempts to call them on mobile phone.

3. Results

Table 1. Sociodemographic Characteristics of Asthmatic Outpatients Attending Respiratory Clinic at National Hospital Abuja (n=49).

Demographic Information	N (%)
Gender	
Male	17(34.7)
Female	32(65.3)
Age group (years)	
15-29	13(26.5)
30-44	19(38.8)
45-59	11 (22.4)

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60-74	4 (8.2)
75-89	2 (4.1)
Mean ± SD =37.31±16.43	
Marital status	
Single	16 (32.7)
Married	31 (63.3)
Divorced	1 (2.0)
Widowed	1 (2.0)
Occupation	
Self Employed	18 (36.7)
Civil servant	21 (42.9)
Housewife	2 (4.1)
Student	2(4.1)
Retiree	6 (12.2)

Table 2. Family History, Symptoms, Duration since Diagnosis and Triggers of Asthma among Asthmatic Patients Attending Respiratory Clinic at National Hospital Abuja.

Variable	**N(%)**
Symptoms experienced before diagnosis	
Cough	31 (35.2)
Shortness of breath	30 (34.1)
Wheezing	19 (21.6)
Chest pain	2 (2.3)
Others	6 (6.6)
Family history of asthma	
Yes	30 (61.2)
No	19 (38.8)
Relationship with family member	
Father	10 (28.6)
Mother	8 (22.9)
Sibling	9 (25.7)
Grandparent	8 (22.9)
History of allergies triggering symptoms	
Yes	38 (84.4)
No	7 (15.6)
Specific allergies	
Dust	27 (34.2)
Cold air	22 (27.8)
Perfumes	17 (21.5)
Smoke	4 (5.1)
Others	9 (11.4)

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Table 3. Assessment of Patients' Experience of Asthma among Asthmatic Outpatients Attending Respiratory Clinic at National Hospital Abuja.

Statements	SA N (%)	A N (%)	D N (%)	SD N (%)
I experience more attacks during cold seasons/weather	26 (56.5)	9 (19.6)	9 (19.6)	2 (4.3)
I experience an attack when frightened or after a shock	8 (19.5)	4 (9.8)	22 (53.7)	7 (17.1)
My asthma symptom occurs after a particular food	5 (12.8)	4 (10.3)	19 (48.7)	11 (28.2)
I get an attack after physical exertion	8 (18.6)	15 (34.9)	16 (37.2)	4 (9.3)
I get an attack from excessive laughter	5 (12.5)	16 (40.0)	11 (27.5)	8 (20.0)
I begin to experience asthma symptoms after smell of food cooking	8 (19.0)	11 (26.2)	17 (40.5)	6 (14.3)

Key: SA (stongly disagree); A (agree); D (disagree); SD (strongly disagree).

Table 4. Medication Use Among Asthmatic Outpatients Attending Respiratory Clinic at National Hospital Abuja.

Variables	N (%)
OTC/Prescribed	31(39.3)
Salbutamol inhaler	20(25.3)
***Seretide® inhaler**	16(20.3)
Salbutamol tablets	6(7.6)
Montelukast®tablets	3(3.8)
+Symbicort® inhaler	1(2.3)
Loratadine tablets	1(2.3)
Bisoprolol tablets	1(2.3)
Prednisolone tablets	N=79

Table 5. Comparison of Pre- and Post- Intervention Medication Adherence of Asthmatic Outpatients Attending Respiratory Clinic.

at National Hospital Abuja

	Adherence					
	PreIntervention		PostIntervention			
Medication Adherence Question	Yes (%)	No (%)	Yes (%)	No (%)	Z	P value
Do you ever forget to take your medicine?	28 (57.1)	21 (42.9)	10 (23.8)	**32 (76.2)**	**-3.357**	**0.001**
	20 (40.8)	24 (49.0)	9 (21.4)	**33 (78.6)**	**-2.496**	**0.013**

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Are you not being careful at times about taking your medicine?						
Do you sometimes stop taking your medicines when you feel better?	35 (72.9)	13 (27.1)	6 (14.3)	**36 (85.7)**	**-4.6**	**0.001**
Do you sometimes stop taking your medicines if they make you feel worse?	20 (40.8)	25 (51.0)	10 (23.8)	**32 (76.2)**	**-2.673**	**0.008**

Wilcoxon signed rank used to compare pre and post intervention adherence. (Level of significance $p < 0.0$.

Table 6. Self-reported Causes of Nonadherence to Medication among Asthmatic .

Outpatients Attending Respiratory Clinic at National Hospital Abuja

Variables	**Strongly agree N (%)**	**Agree N (%)**	**Disagree N (%)**	**Strongly disagree N (%)**	**50th percentile**	**P-Value**
Concern about side effect(s)	6 (27.3)	9 (40.9)	6 (27.3)	1(4.5)	1.00	0.360
Cost of prescribed medications unaffordable	4 (18.2)	6 (27.3)	10 (45.5)	2 (9.1)	2.00	0.234
Forgetfulness	6 (26.1)	11 (47.8)	5 (21.7)	1 (4.3)	3.00	0.003*
Physician mode of approach during treatment	2 (9.1)	7 (31.8)	10 (45.5)	3(13.6)	2.00	0.933
Pharmacist mode of approach during medication delivery and counseling	3 (13.6)	5 (22.7)	10 (45.5)	4 (18.2)	2.00	0.670
Daily/continuous use of medication	6 (27.3)	12 (54.5)	4 (18.2)	0 (0.0)	2.00	0.026*
Complex dosage regimen	3 (13.6)	10 (45.5)	4 (18.2)	5 (22.7)	1.00	0.040*
	5 (22.7)	8 (36.4)	7 (31.8)	2 (9.1)	1.00	0.479

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Complicated technique of handling inhaler						
Physical inability to use the inhaler	4(18.2)	8(36.4)	6(27.3)	4(18.2)	1.00	0.788
Use of multiple medications to control symptoms	3(13.6)	14(63.6)	3(13.6)	2(9.1)	1.00	0.247
Lack of understanding of reasons for taking medications	2(9.1)	9 (40.9)	8(36.4)	3(13.6)	1.00	0.709
Interference of regimen with lifestyle	4 (18.2)	11 (50.0)	3 (13.6)	4 (18.2)	1.00	0.084
Personal/religious beliefs	2 (9.1)	3 (13.6)	11 (50.0)	6 (27.3)	1.00	0.617
Belief in herbal remedies	4(18.2)	11 (50.0)	4 (18.2)	3 (13.6)	1.00	0.037*
Co-existing disease states	4(18.2)	9 (40.9)	6 (27.3)	2 (9.1)	1.00	0.177

Table 7. Assessment of Impact of Pharmacist-led Intervention on General.

Control of Asthma among Asthmatic Outpatients Attending Respiratory Clinic at National Hospital Abuja

ROYAL COLLEGE OF PHYSICIANS QUESTIONS	N (%)				P-value
	PRE-INTERVENTION		POST- INTERVENTION		
	Yes	No	Yes	No	
Have you had difficulty in sleeping because of your asthma symptoms, especially coughing?	41 (89.1)	5 (10.9)	9 (19.6)	33 (71.7)	<0.001*
Have you had your usual asthma symptoms during the day? (coughing, wheeze, or breathlessness)	39 (84.8)	7 (15.2)	15 (32.6)	27 (58.7)	0.001*
Has your asthma interfered with your usual routine activities	31 (67.4)	13 (28.2)	11 (26.2)	31 (73.8)	<0.001*
Uncontrolled					

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Controlled	44 (95.7)	2 (4.3)	17 (36.9)	25 (54.3)	<0.001*
	2 (4.3)	44 (95.7)	25 (54.3)	17 (36.9)	<0.001*

46 patients completed the pre intervention asthma control test. 42 patients responded to post intervention follow up calls.4 patients did not respond and could not be followed up post intervention.

McNemar test Significance level: $p<0.05$.

4. Discussion

The long term goal of asthma therapy is to achieve good symptom control, and to minimize the future risk of asthma- related mortality, exacerbations, persistent airflow limitation and side effects of treatment.(GINA, 2022).

The socio- demographic characteristics of the participants in this study showed that more than half of patients enrolled were females which was consistent with the result of the study done in the United Kingdom in 2009 by Bush *et al.,* which found that among adults, asthma was twice as common in women as men. Also, Benedicte *et al.,* in their 2012 population based cohort study on gender differences in prevalence, diagnosis and incidence of allergic and non allergic asthma found that asthma was 20% more frequent in women than in men over the age of 35 years. The major symptoms experienced before diagnosis was cough, as reported by 35.2% of the respondents. This observation confers with the results of the study done by Idani, *et al.,* (2018) which found that the most common symptoms of asthma were nocturnal cough.

Recurrent exacerbations in patients with moderate or severe asthma are the major causes of morbidity, mortality and medical expenditure. (Belachew *et al.,* 2018). Hence, identifying predictors of frequent asthma attack could help in management. In this study, majority of the respondents were reported to have more frequent attacks in cold weather/seasons. Other reported triggers of asthma attacks were physical exertion, excessive laughter and food aroma. According to WHO in its 2020 report on chronic respiratory diseases, exposure to an allergen such as dust, weed pollen, mites, cockroaches or animal dander; irritants in the air such as smoke or chemical fumes; perfume, respiratory illnesses such as the flu; upper respiratory tract infection, strenuous exercise, extreme weather conditions as well as strong emotions that can change normal breathing patterns are all implicated in triggering acute asthma exacerbations.

Salbutamol inhaler was the most used medication among the respondents. Inhalational route is the choice for asthmatic patients as it delivers the maximum quantity of drugs with minimal systemic side effects. (GINA, 2020). This assertion was supported by a 2015 study in India by Prasad and co-workers, titled "Drug prescription pattern for bronchial asthma in a tertiary care hospital in Eastern India" which showed that most patients received a combination of beta-2 agonists and glucocorticoids via inhalational routes. However, medication by other routes such as oral or nebulisation becomes essential in case of inability to use the inhaler efficiently in an appropriate manner, especially in elderly population (Melani, 2013). These classes of patients may not be able to coordinate the inspiration timing with inhaler puff. The choice of inhalational route as the preferred route of administration for the patients in this study is justifiable, considering the fact that the age group with the highest number is 30-44 years. Salbutamol inhaler was found to be the preferred choice for asthma management in this study. This correlates to the work by Rafeeq and Murad (2017) that bronchodilators were the most prescribed drugs of which salbutamol inhaler was the most frequently prescribed (78.9%). This finding was further reinforced in some previous studies by Thamby *et al.,* (2012); and Sayadeda *et al.,* (2013) and suggests an increased experience of in-between acute exacerbations and likelihood of sub optimal asthma control (Desalu *et al.,* 2009). Its choice may also be due to the fact that it has rapid onset of action and it is cheaper compared to other drugs in its class. It also provides instant symptomatic relief. In this study, Four-item Modified Adherence Predictor Scale (MAS) adapted from Adisa *et al.,* 2017 was used to assess the level of medication

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adherence among patients. Overall, majority of the patients (53.1%) showed medium adherence, 42.9% showed poor adherence while only 2 (4.1%) patients showed good adherence. This is almost similar to the study by Adisa and co – researchers in 2017 that only 24.1% of the participants in that study were adherent to their prescribed medications. Similarly, in a United States (US) retrospective observational study on anti-inflammatory medication adherence among Medicaid and Children's health insurance enrollees with asthma done by Herdon *et al*.,(2012),it was reported that overall treatment adherence was low in paediatric and adult patients. In children, adherence measured as medication possession ratio (MPR) was only 20% (very low) for inhaled corticosteroids and 28% (very low) for leukotriene inhibitors. In a similar study (Makhinova *et al*.,2015) it was found that adherence to long term controller medications was sub optimal among patients with asthma (32.2%±19.7%).

An assessment of reasons for treatment non adherence among patients showed that forgetfulness, daily continuous use of medication, complex dosage regimen and belief in herbal remedies were all statistically significant (p<0.05) reasons for non adherence. Hence, it is pertinent to scale up measures that could help improve medication adherence in asthma patients. In a study on Adherence and Health care costs by Iuga and McGuire (2014), it was reported that forgetfulness was the most often-cited reason for sub optimal adherence. Also, Omole and Ilesanmi (2010) in a study on patient medication knowledge governing adherence to asthma pharmacotherapy: a survey in rural Lagos, Nigeria reported that forgetfulness accounted for non-adherence to medication therapy in 58.5% of respondents in that study. Measures to improve this could include use of alarm clock or smart technology as reminder or follow up calls from health care providers. Medication use could also be timed to certain constant daily activities of the patient. Complex dosage regimen is an important factor that contributes to low or sub optimal adherence. (Bender and Bender, 2005). The use of inhalers adds to the complexity of the medication regimen, especially when there are comorbidities such as arthritis or cognitive impairment (Sandzzi *et al.,* 2014). Correct inhaler technique can be challenging for patients and is vital to optimal therapy delivery. It may be difficult to establish and sustain the correct technique when inhalers require different administration techniques. Dry powder inhalers (DPIs) require rapid and forceful inspiration to properly deliver the drug, whereas this type of inhalation is not recommended for metered-dose inhalers (MDIs) (Ibrahim *et al.,* 2015). Some patients may have difficulty coordinating actuation and inspiration to correctly use a pressurized MDI, whereas other patients have difficulty inhaling forcefully enough to actuate a DPI (Usmani *et al.,* 2018). For patients with reduced cognitive function, DPIs are easier to use than MDIs (Baird *et al.,* 2017). It is helpful for patients to have device types that match for both controller and reliever therapy, avoiding complications that might arise from needing to distinguish and use more than one technique (Kaplan and Price ,2018). Errors in inhaler use can be reduced by proper instructions and checks on inhaler techniques at follow up appointments (Melani *et al.,* 2011).

In this study, most of the participants were uncontrolled pre-intervention, most had difficulty in sleeping because of asthma symptoms the past month and had their usual asthma symptoms during the day which also interfered with their usual activities such as school, work and house chores.

However, a month after a Pharmacist-led intervention, there was a statistically significant (p<0.001) improvement in the number of participants whose asthma was controlled. Four patients did not respond to follow up calls hence could not be scored post intervention.

The Royal College of Physicians three Questions (RCP -3Qs) is the most commonly used tool in the United Kingdom primary care for the assessment of asthma control. It is a practical clinical tool that makes sense to both clinician and patient and improves standards of care (Pearson and Bucknall, 1999).

McNemar test was used to analyse this result and it showed that the difference between the pre intervention and post intervention scores were statistically significant (p<0.0001). Hence this study showed that the Pharmacist-led intervention had significantly improved asthma control and asthma control. This result agrees with the findings of Hsu *et al.,* (2018), which reported that the mean asthma test score of 24 patients who completed the study, ACT® (p=0.0001), as well as their knowledge of

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asthma (p=0.0001), inhaler technique (p=0.0001) and peak expiratory flow rate measurements (p<0.050) were significantly improved after intervention by the Pharmacist.

5. Conclusions

It could be concluded from this study that pharmacist-led intervention that covered an education session on recognition and avoidance of triggers, adherence to prescribed medication and steps to correct use of inhaler devices led to improved medication adherence and treatment outcomes among asthmatic outpatients at National Hospital Abuja.

6. Recommendations

Pharmacists that are involved in the management of asthmatic patients should provide structured education on medication adherence to the patients and demonstrate critical steps in use of inhaler devices to these patients during therapy initiation as well as on follow up appointments as this could increase the number of patients with good adherence as well as improve treatment outcomes.

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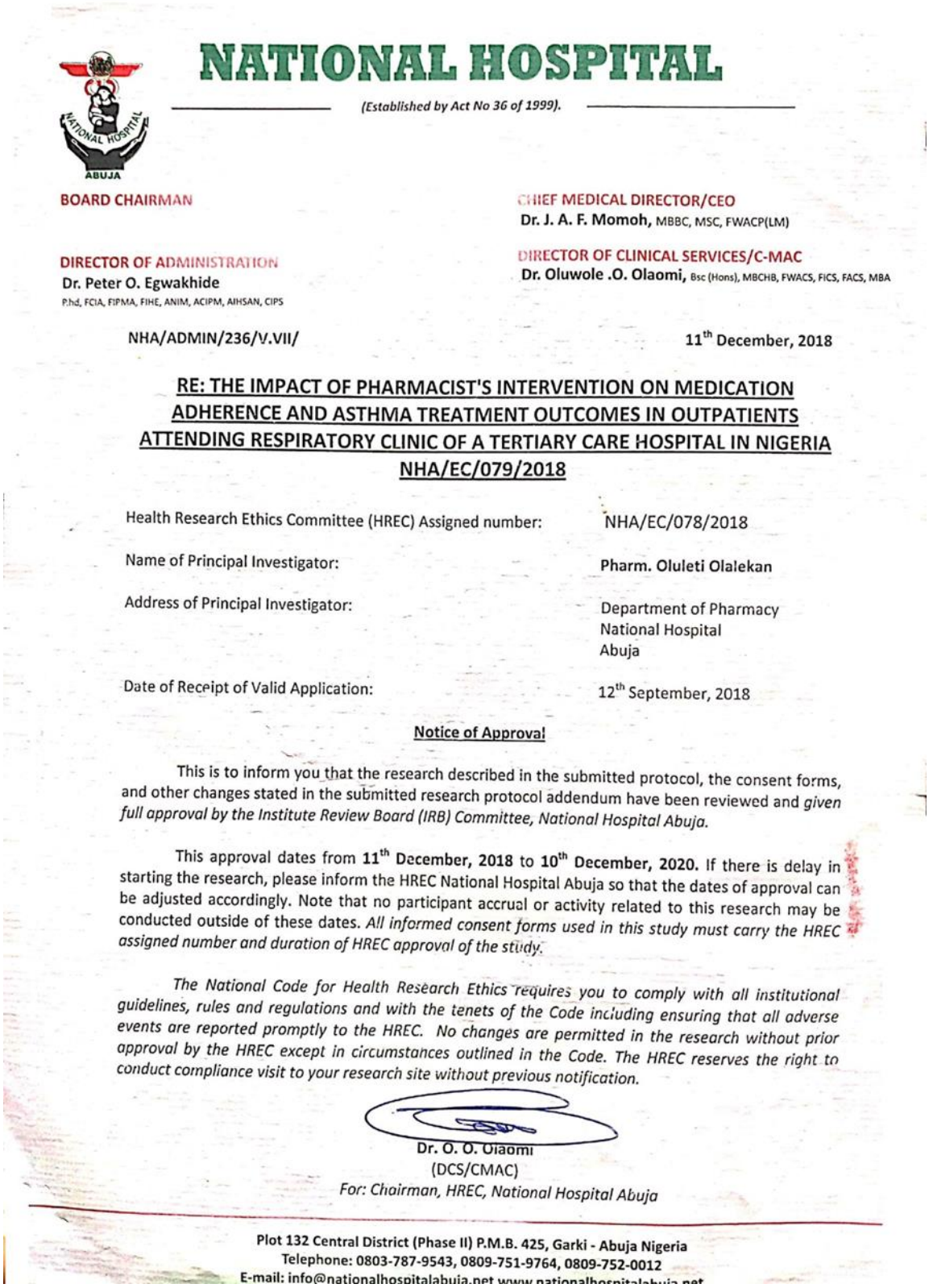
Appendix A



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11th December, 2018

RE: THE IMPACT OF PHARMACIST'S INTERVENTION ON MEDICATION ADHERENCE AND ASTHMA TREATMENT OUTCOMES IN OUTPATIENTS ATTENDING RESPIRATORY CLINIC OF A TERTIARY CARE HOSPITAL IN NIGERIA
NHA/EC/079/2018

Health Research Ethics Committee (HREC) Assigned number: NHA/EC/078/2018

Name of Principal Investigator: Pharm. Oluleti Olalekan

Address of Principal Investigator: Department of Pharmacy
National Hospital
Abuja

Date of Receipt of Valid Application: 12th September, 2018

Notice of Approval

This is to inform you that the research described in the submitted protocol, the consent forms, and other changes stated in the submitted research protocol addendum have been reviewed and *given full approval by the Institute Review Board (IRB) Committee, National Hospital Abuja.*

This approval dates from **11th December, 2018** to **10th December, 2020.** If there is delay in starting the research, please inform the HREC National Hospital Abuja so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study.*

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the HREC. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit to your research site without previous notification.

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Appendix B

QUESTIONNAIRE

DEPARTMENT OF CLINICAL PHARMACY AND PHARMACY PRACTICE, AHMADU BELLO UNIVERSITY, ZARIA.

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RESEARCH QUESTIONNAIRE ON IMPACT OF PHARMACIST-LED INTERVENTION ON MEDICATION ADHERENCE AND ASTHMA CONTROL AMONG ASTHMATIC PATIENTS AT NATIONAL HOSPITAL, ABUJA.

Dear respondent, this research is intended to evaluate the medication adherence and asthma control among asthma patients attending the respiratory clinic at national hospital, Abuja. All information provided will be treated with utmost confidentiality. Thank you.

SECTIONA: Demographics

Sex: Male ( ) Female ( )

Age (in years): _____

Marital status: Single ( ) Married ( ) Divorced ( ) Separated ( )

Occupation: _____

SECTION B: Patient Knowledge and Experience of Signs/Symptoms.

1. How long have you been diagnosed with asthma?
   1-5 years ( ) 6-10 years ( ) 11-15 years ( )
2. Where were you first diagnosed?
   General hospital ( ) Teaching hospital ( )
   Private hospital ( ) Traditional practitioner ( )
3. What were the initial signs/symptoms that you experienced before the diagnosis?
   Cough ( ) Shortness of breath ( )
   Wheezing ( ) Others, please specify _____
4. Any family history of asthma?
   Yes ( ) No ( )
5. If yes, what is the relationship?
   Father ( ) Mother ( ) Sibling ( ) Grandparents ( )
   Others, please specify _____
6. Any history of allergy that trigger the symptoms?
   Yes ( ) No ( )
7. If yes, what are those allergies?
   Cold air ( ) perfumes ( ) dust ( ) Others, please specify _____
8. What are the triggering signs/symptoms before you experience an attack?
   Breathlessness ( ) cough ( ) others, please specify_____
9. Please indicate your opinion to the statements as it applies to you.
   SA= Strongly agree **A**= Agree **D**= Disagree **SD**= Strongly disagree

Statements	**SA**	**A**	**D**	**SD**
I experience more attacks during cold season/weather				
I experience an attack when frightened or after a shock				
My asthma symptom occur after a particular food				
I get an attack after physical exertion				
I get an attack from excessive laughter				
I begin to experience asthma symptoms after smell of food cooking				

SECTION C: Assessment of Medication Use.

10. What are the present complaints that made you come to see the doctor?
    _____
11. What prescribed and over-the-counter (OTC) medications are you taking presently? *(investigator might crosscheck with the patient).* Salbutamol tablets ( )Salbutamol inhaler ( ) Seretide inhaler ( ) others, please specify

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_____

12. Have you ever discontinued any of your prescribed (controller/relief) medications? Yes ( ) No ( )

13. If yes, could you mention the specific medications discontinued?

_____

14. Could you indicate the reasons why you discontinued the medication(s)?
Physician discontinued the drug ( ) Cost unaffordable ( )
Intolerable side effects ( ) Complex dose regimen ( )
Others, please specify _____

15. If side effect is the reason for discontinuation, could you please describe the effect?

_____

16. Aside medications, what other treatment modalities were recommended by your doctor?
Dust avoidance ( ) Animal avoidance ( )
Hygiene ( )
Others, please specify _____

17. Have you ever used any herbal remedies in the past for the asthma condition?
Yes ( ) No ( )

18. If yes, mention the specific herbal medicine used.

_____

19. Do you find herbal medicines useful?
Yes ( ) No ( )

20. If yes, do your herbs help to bring quick relief?
Yes ( ) No ( )

21. What herbal medicine(s) do you use in the management of your asthma?

SECTION D: Assessment of Medication/Treatment Adherence.

22. Do you ever forget to take your prescription medicine? Yes ( ) No ( )

23. Are you not been careful at times about taking your medicine?
Yes ( ) No ( )

24. Do you sometimes stop taking your medicine when you feel better?
Yes ( ) No ( )

25. Do you sometimes stop taking your medicine if they make you feel worse?
Yes ( ) No ( )

26. Below are likely reasons for treatment non-adherence among patients. Please indicate your opinion to these as it applies to you.
SA= Strongly agree **A**= Agree **D**= Disagree **SD**= Strongly disagree

General reasons	SA	A	D	SD
Concern about side effects				

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Cost of prescribed medications unaffordable
Forgetfulness
Physician mode of approach during treatment
Pharmacist mode of approach during medication delivery and counseling
Daily/continuous use of medication
Complex dosage regimen
Complicated technique of handling inhaler
Physical inability to use the inhaler
Use of multiple medications to control symptoms
Lack of understanding of reasons for taking medications
Interference of regimen with lifestyle
Personal/religious beliefs
Belief in herbal remedies
Co-existing disease states

Others, please specify _____

_____

SECTION E: Assessment of general control of asthma and asthma symptoms.

27. Have you had difficulty in sleeping because of your asthma symptoms, especially coughing? Yes ( ) No ( )

28. Have you had your usual asthma symptoms during the day (cough, wheeze or breathlessness)?
Yes ( ) No ( )

29. Has your asthma interfered with your usual routine activities? Yes ( ) No ( )

Appendix C

Royal College of Physicians 3 Questions for Asthma

No to all questions consistent with controlled asthma

In the last month	YES	NO
"Have you had difficulty sleeping because of your asthma symptoms (including cough)?"	☐	☐
"Have you had your usual asthma symptoms during the day (cough, wheeze, chest tightness or breathlessness)?"	☐	☐
"Has your asthma interfered with your usual activities (e.g. housework, work, school, etc)?"	☐	☐

No to all questions = Controlled asthma; Yes to any of the questions = uncontrolled asthma

Appendix D

ASTHMA EDUCATION

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KEY EDUCATIONAL MESSAGES FOR ASTHMA

- BASIC FACTS ABOUT ASTHMA
- Contrast normal and asthmatic airways
- ROLES OF MEDICATIONS
- Long term control and Quick relief medications
- SKILLS IN DEVICES HANDLING
- Inhalers, spacers, symptom and peak flow monitoring; early warning signs of attack
- RELEVANT ENVIRONMENTAL CONTROL MEASURES
- WHEN AND HOW TO TAKE RESCUE ACTIONS

APPENDIX E

CRITICAL STEPS TO CORRECT PMDI DEVICES USE
ACTIONS PERFORMED

Shake the contents well
Remove the cap
Hold the inhaler upright
Tilt the head back slightly
Breathe out slowly
Open mouth with inhaler 1-2 inches away, then put the mouth piece in the mouth with the lips tightly sealed around it
Begin breathe in slowly and deeply through the mouth and actuate the canister once
Hold breath for 10 to 20 seconds
Exhale and wait one minute before the second dose
Shake again before the second dose
After use, replace the mouth piece cover

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