

**Assessment of Drug Therapy Problems (DTPs) among hypertensive and diabetic patients attending Lagos Island general hospital, Lagos, Nigeria**

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**ABSTRACT**

**Background:** Drug Therapy Problems (DTPs) are of major concern in health care because of increased cost of treatment, delayed therapeutic goals, morbidity, and mortality.

**Objectives:** The aim of this study was to assess the prevalence, associated factors, and resolution of drug therapy problems among hypertensive and diabetic patients attending General Hospital, Lagos.

**Methods:** This was a retrospective study of 234 systematic randomly selected case notes of diabetic and hypertensive patients older than 18 years, and who had been on medications for more than a month. The data collected was analysed using descriptive analysis and Chi square test. Statistical significance was determined at p-value < 0.05.

**Results:** Of the 234 case notes assessed, 182 (77.78%) had DTPs. The number of DTPs identified were 277. The most common DTP identified was effect of drugs not optimal (27.8%). Neither socio-demographic factors, polypharmacy or presence of comorbidities were associated with having DTPs. The DTPs were either partially resolved (17.01%), fully resolved (14.29%), unresolved (22.4%), or with unknown outcomes (46.3%).

**Conclusion:** The study revealed a high prevalence of DTPs at 77.78% with the most common DTP being effect of drug not optimal. None of the studied variables, however, had significant association with the prevalence of DTPs.

**Keywords:** Drug therapy problems, hypertension, diabetes.

## Évaluation des problèmes de pharmacothérapie (PPT) chez les patients hypertendus et diabétiques fréquentant l'hôpital général de Lagos Island, Lagos, Nigeria

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### RÉSUMÉ

**Contexte** : Les problèmes de pharmacothérapie (PPT) sont une préoccupation majeure dans le domaine des soins de santé en raison de l'augmentation du coût du traitement, du retard dans l'atteinte des objectifs thérapeutiques, de la morbidité et de la mortalité.

**Objectifs** : Le but de cette étude était d'évaluer la prévalence, les facteurs associés et la résolution des problèmes de traitement médicamenteux chez les patients hypertendus et diabétiques fréquentant l'hôpital général de Lagos.

**Méthodes** : Il s'agit d'une étude rétrospective portant sur 234 dossiers de patients diabétiques et hypertendus âgés de plus de 18 ans, sélectionnés de manière systématique et aléatoire, et qui prenaient des médicaments depuis plus d'un mois. Les données recueillies ont été analysées à l'aide d'une analyse descriptive et du test du chi carré. La signification statistique a été déterminée à une valeur  $p < 0,05$ .

**Résultats** : Sur les 234 cas évalués, 182 (77,78%) présentaient des PPT. Le nombre de DTP identifiés était de 277. Le PPT le plus fréquemment identifié était l'effet des médicaments non optimal (27,8%). Ni les facteurs socio-démographiques, ni la polypharmacie, ni la présence de comorbidités n'étaient associés à la présence de PPT. Les PPT étaient soit partiellement résolus (17,01%), soit entièrement résolus (14,29%), soit non résolus (22,4%), soit avec des résultats inconnus (46,3%).

**Conclusion** : L'étude a révélé une prévalence élevée de DTC à 77,78 %, le PPT le plus fréquent étant l'effet du médicament non optimal. Cependant, aucune des variables étudiées n'avait d'association significative avec la prévalence des PPT.

**Mots clés** : Problèmes de pharmacothérapie, hypertension, diabète.

## INTRODUCTION

Drug therapy problems (DTPs) are any undesirable event experienced by a patient which involves, or is suspected to involve, drug therapy, and interferes with the desired goals of therapy.<sup>1</sup> According to the Pharmaceutical Care Network Europe (PCNE) drug therapy problems are defined as events or circumstances involving drug therapy that actually or potentially interferes with the desired health outcomes.<sup>1</sup> DTPs are a danger for diseases such as hypertension or DM or when they occur as comorbidity as they affect the therapeutic result.<sup>2</sup> Globally, it is estimated that 415 million adults have diabetes, with 318 million adults having impaired glucose tolerance, putting them at high risk of developing the condition in the future.<sup>3,4</sup> Diabetes affects 9.5-29.3 million individuals in Africa, according to estimates from 2015 according to International Diabetes Federation.<sup>5</sup> In Nigeria, the prevalence of DM is reported to be an estimate of 11% of adults.<sup>6</sup> Hypertension is also a global public health concern, and it is a prevalent comorbidity in Type 2 diabetes mellitus (T2DM) patients, affecting up to two-thirds of the population.<sup>7</sup> Global estimate of hypertensive patients have increased from 594 in 1975 to 1.13 billion people in 2015.<sup>8</sup> In Africa, there had been different increases in the prevalence from 1990 which was estimated at 54.6 million to 130.2 million in 2010 and has been projected to be 216.8 million by year 2030.<sup>9</sup> An estimate of 38.1% of adults has been reported to have in Nigeria.<sup>10</sup> Hypertension and diabetes predispose patients to DTPs because of number of medications that are required to be taken at a time.<sup>11,12</sup>

Persistently high blood pressure despite effective medical therapy has been associated with issues of non-compliance, wrong drug selection, adverse drug reactions and drug interaction which are drug therapy problems.<sup>13</sup> In the case of Diabetes Mellitus (DM), proper diabetes treatment might be difficult at times, not unexpectedly, as the necessity to address comorbid chronic diseases in conjunction to patients' diabetes-specific treatment plans can overburden physicians and patients.<sup>12</sup> Untreated conditions, inappropriate drug selection, unnecessary drug therapy, rejection to receive drug, inconsistencies between prescribed and actual regimens, overdose, adverse drug reactions (ADRs), irrational drug prescribing, and drug interactions are just a few of the problems associated with drug use that have been classified into different systems by different researchers.<sup>14</sup>

Drug therapy problems (DTPs) have been linked to

inappropriate over prescription of pharmaceuticals, considerable worsening of diseases, unjustified increases in hospital admission rates, and longer hospital stays, all of which result in a major medical burden.<sup>15,16</sup> DTPs, on the other hand, may usually be avoided. Understanding the number of DTPs and the rhythm of their recurrence would be useful information for practitioners especially in patients with concomitant diseases.

This study was aimed at identifying the common drug therapy problems among hypertensive and diabetic patients in General hospital Lagos, determining the prevalence of drug therapy problems among hypertensive and diabetic patients in General hospital Lagos, identifying the possible factors leading to the drug therapy problems in hypertensive and diabetic patients in General hospital Lagos Island and determining the resolution status of each drug therapy problem.

## METHODS

### Study design and setting

Institutional based retrospective, cross-sectional study was conducted using case notes of outpatients and inpatients of the cardiology and endocrinology unit of Lagos Island General Hospital, Lagos between January, and June 2022.

### Study population

Male and female hypertensive and or diabetic patients older than 18 years who had been on antihypertensives or antidiabetics for at least a month were included in the study, while hypertensive and diabetic patients who were less than 18 years of age and had been on medications for less than one month were excluded.

### Sample size determination and sampling techniques

Using the Cochran formula, sample size was calculated as 264. Using the electronic medical record and systematic random sampling, the first record was selected while subsequent records were selected from every third record on the list until the required sample size was attained.

### Data collection, processing, and analysis

Data was collected from the selected patients' case note using a data collection form. The data was analyzed using the SPSS software for windows version 20. The analyzed data was summarized with frequencies, percentages, mean, and standard deviation. The information from the analyzed data was presented using tables and charts. Chi-

square test was used to determine significant associations between socio-demographic characteristics and dependent variables. A p-value that is less than 0.05 was considered statistically significant.

#### **Evaluation of drug therapy problems and classification**

All findings related to medication use were documented as recorded in the case note. This was then categorized using the Pharmaceutical Care Network Europe classification system version 9.1. Polypharmacy was defined in this study as the use of 5 or more medications concurrently. Identification of drug therapy problems was carried out by two clinical pharmacists who had been previously trained on the study protocol.

#### **Ethical considerations**

Ethical approval for the study was obtained from the Health Research Ethics Committee (HREC) of Lagos University Teaching Hospital (ADM/DSCST/HREC/APP/5223). Approval was also

obtained from the Lagos State Health Services Commission. Confidentiality was maintained throughout the study.

## **RESULTS**

#### **Socio demographic characteristics and disease characteristics of patients**

A total of 234 patients were included in the study with a mean age and standard deviation of 56.13 +/- 11.62. There were more females 162 (69.2%) than males 72 (30.8%). Majority of the patients were married 224 (95.7%), of Yoruba indigene 188 (80.3%), with no formal education 109 (46.6%), and retired 100 (42.7%). Most of the patients 109 (46.6%) had a combination of Diabetes and Hypertension while 77 (32.9%) and 48 (20.5%) had hypertension and diabetes mellitus respectively as shown in Figure 1. There were more patients with comorbidities 128 (54.7%) as shown in Table 1.

**Table 1: The Socio-demographic Characteristics of the respondents**

Variables	Frequency (n =234)	Percent (%)
<b>Age Group</b>		
≤50 years	74	31.6
51 – 60 years	82	35.1
> 60 years	78	33.3
<b>Gender</b>		
Male	72	30.8
Female	162	69.2
<b>Marital Status</b>		
Single	4	1.7
Married	224	95.7
Widowed	6	2.6
<b>Tribe</b>		
Yoruba	188	80.4
Igbo	37	15.8
Hausa	9	3.8
<b>Education</b>		
None	109	46.6
Primary	46	19.7
Secondary	41	17.5
Tertiary	38	16.2
<b>Employment Status</b>		
Employed	54	23.1
Self-employed	74	31.6
Retired	100	42.7
Unemployed	6	2.6
<b>Polypharmacy</b>		
Yes	105	44.87
No	129	55.13
<b>Comorbidity</b>		
Yes	128	54.7
No	106	45.3
<b>Patient's Diagnosis</b>		
Diabetes	48	20.5
Hypertension	77	32.9
Diabetes and Hypertension	109	46.6

**Classes of drugs used by respondents.**

In this study, the most prescribed antihypertensive was calcium channel blocker 149 (22.47%) while the most

prescribed anti-diabetics was the biguanides 124 (18.70%) as shown in Table 2.

**Table 2: Classes of drugs prescribed for respondents**

Drug classes	Frequency (n=663)	Percent (%)
<b>Anti-hypertensives</b>		
Calcium channel blockers	149	22.47
Diuretic	96	14.48
Angiotensin-converting enzyme Inhibitors	58	8.75
Angiotensin 2 Receptor blockers	58	8.75
Beta blockers	23	3.47
Centrally acting agonist	17	2.56
Alpha blockers	3	0.45
Alpha-Adrenergic Agonist	2	0.30
<b>Anti-diabetics</b>		
Biguanides	124	18.70
Insulin	67	10.11
Sulfonylurea	51	7.69
Dipeptidyl Peptidase 4 Inhibitors	8	1.21
Alpha-glucosidase inhibitors	4	0.60
Sodium-Glucose Cotransporter-2	2	0.30
Acarbose	1	0.15

**Respondents' Drug therapy problems**

Of the 234 case notes assessed, 182 (77.8%) of patients had drug therapy problems, and 52 (22.2%) had no drug therapy problems.

**Drug therapy problems according to PCNE vs 9.1**

A total of 277 drug therapy problems were identified from the review of patients' case notes and classed into three domains which were, the treatment effectiveness

domain (159, 57.41%) which included "No effect of drug treatment despite correct use (8, 2.89%)", "Effect of drug treatment not optimal (77, 27.80%)", and "Untreated symptoms or indications (74, 26.71%)" and treatment safety domain has DTP of adverse drug event occurring 26 (9.39%) and the last domain tagged others has "unnecessary drug treatment 18 (6.50%)" and adherence problem 74 (26.71%) as shown in Table 3.

**Table 3: Drug therapy problems according to PCNE**

Primary Domains	Drug therapy problem classification	Frequency (%)
Treatment effectiveness.	No effect of drug treatment despite correct use	8 (2.89)
	Effect of drug treatment not optimal	77 (27.80)
	Untreated symptoms or indication	74 (26.72)
Treatment Safety	Adverse drug event (possibly) occurring	26 (9.38)
	Unnecessary drug-treatment	18 (9.02)
Others	Adherence problem	67 (24.19)

**The Domains of Causes of DTPs**

Table 4 shows that the causes with the highest occurrence of DTPs were found in the drug selection

domain 100 (36.1%), followed by dose selection 79 (28.53%), patient-related causes 42 (16.96%), and treatment duration 38 (13.72%) respectively.

**Table 4: The Primary Domains of Causes of DTP**

Primary Domains (causes)	Frequency (n=277)	Percent (%)
Drug selection	100	36.10
Drug form	1	0.36
Dose selection	79	28.52
Treatment duration	38	13.72
Dispensing	9	3.25
Drug use process	0	0.0
Patient related	47	16.97
Patient transfer related	0	0.0
Others	3	1.08

**The Domains of Interventions to the DTPs**

Table 5 shows that of the 277 drug therapies identified, there were no interventions documented for 130 (46.93%) drug therapy problems while 147 drug therapy problems had various interventions which include

counselling 37 (13.36%), change of dose 31 (11.19%), addition of new drugs 29 (10.47%), drug changed 16 (5.78%), drug stopped 16 (5.78%), instruction changed 11 (3.97%), patient care 1 (0.36%) and referral 4 (1.44%).

**Table 5: Interventions on identified DTPs**

Intervention	Frequency (n=277)	Percent (%)
Additional drug prescribed	2	0.72
Counselling	37	13.36
Dose change	31	11.19
Drug changed	16	5.78
Drug stopped	16	5.78
Instruction changed	11	3.97
New drug added	29	10.47
Patient care	1	0.36
Patient referred	4	1.44
Unknown	130	46.93

### The Domains of Interventions to the DTPs

Table 6 shows that the major interventions provided to the patients were rendered mostly at prescriber level 105

(71.42%) and at patients' level 41 (27.89%) domains while other intervention or activity domain had 1 (0.68%).

**Table 6: The Primary Domains of Interventions to the DTPs**

Primary Domains (interventions)	Frequency (n=147)	Percent (%)
At Prescriber level	105	71.42
At Patient level	41	27.89
Other intervention or activity	1	0.68

### The Domains of Outcomes to the DTPs

The outcomes of the DTPs of the patients were mostly unknown 68 (46.3%) while others were either partially resolved 25 (17.0%) 'interventions made but problem not completely resolved', fully resolved 21 (14.3%)

'interventions made, and problem completely resolved', or not resolved 33 (22.4%) 'problem not solved because of either lack of cooperation of patient or prescriber' as shown in Table 7. The outcomes were documented from each patient's record and analysed by the researcher.

**Table 7: The Primary Domains of Outcomes to the DTPs**

Primary Domains (outcomes)	Frequency (n=147)	Percent (%)
Not known	68	46.3
Solved	21	14.3
Partially solved	25	17.0
Not solved	33	22.4

### Association between socio demographic characteristics, polypharmacy, and DTPs

The results show that none of the socio-demographic parameters such as age group and sex had any association with the presence or absence of DTPs in the

patients in this study. Also, the presence or absence of polypharmacy and the presence of comorbidity or its absence did not have any association with the presence or absence of drug therapy problems ( $p > 0.05$ ) as shown in Table 8.



**Table 8: Association between socio demographic characteristics, polypharmacy and DTPs**

Characteristics	No DTPs(n=52)		DTPs(n=182)		Total	$\chi^2$	df	P-value
<b>Age (Years)</b>	Frequency	Percent (%)	Frequency	Percent (%)		1.975	2	0.373
50 & below	18	24.3	56	75.7	74			
51 – 60	14	17.1	68	82.9	82			
>60	20	25.6	58	74.4	78			
Total	52	22.2	182	77.8	234			
<b>Sex</b>								
Male	19	26.4	53	73.6	72	1.045	1	0.307
Female	33	20.4	129	79.6	162			
Total	52	22.2	182	77.8	234			
<b>Polypharmacy</b>								
Yes	19	18.1	86	81.9	105	1.877	1	0.171
No	33	25.6	96	74.4	129			
Total	52	22.2	182	77.8	234			
<b>Comorbidity</b>								
Yes	26	20.3	102	79.7	128	0.596	1	0.528
No	26	24.5	80	75.5	106			
Total	52	22.2	182	77.8	234			

## DISCUSSION

In this study, the prevalence of at least one drug therapy problem experienced by the patients was 77.78%. This is similar to the prevalence of DTPs recorded in the study by Tefera *et al.*<sup>9</sup> which had 76% of patients with DTPs and Kefale *et al.*<sup>10</sup> which was 75.51%. This prevalence was however less than that found in the study by Niriayo *et al.*<sup>11</sup> which was 83.5% and Wendie and Angamo<sup>12</sup> which was 91.3%. These are studies on DTPs which were conducted in Africa and of related experiences to this study.

The common drug therapy problems identified were lack of adherence to medication, effect not optimal, untreated indications, and adverse events of drugs. Findings from Garin *et al.*<sup>13</sup> are similar to the DTPs found in this study, though reported to address two major domains which are drug selection and dose selection.<sup>13</sup>

Ahmed *et al.*<sup>14</sup> and Adisa and Osoba<sup>15</sup> found that effect of drug not optimal and adverse drug event were mostly responsible for drug therapy problems in their study. Al Hamid *et al.*<sup>16</sup> also from their study on hypertension and/or diabetes mellitus identified adverse drug reaction and untreated indications as common DTPs in their study. Kefela *et al.*<sup>13</sup> also identified "dose being too low", "lack of adherence/compliance" and "needing additional drug therapy" in their own study, which captured some of the DTPs found in this current study. According to the PCNE, the drug therapy problems in this study were largely caused by patient-related factors, such as their disposition to the medication such as lack of adherence and prescribing factors such as dose and drug selection by the health care professional.<sup>7</sup> This is also close to the findings of Zazuli *et al.*<sup>7</sup> that indicated that most DTPs arose from dose and drug selection.

Findings from studies have established that factors such as age, lack of adherence to medications, presence of comorbidity, and polypharmacy have been found to be associated with DTPs.<sup>7,8,10,17,18</sup> In this study, however, socio-demographic characteristics such as age, sex, polypharmacy, presence of comorbidity and duration of hypertension and diabetes mellitus were not associated with DTPs. This agreed with findings from a study by Wendie and Angamo<sup>12</sup> where age, sex, marital status, education, number of comorbidities, number of drugs used (polypharmacy), length of hospital stay, and number of clinical/pharmacological risk factors were analyzed and found not to be associated with DTPs. Also, this study agreed with a study by Tefera *et al.*<sup>9</sup>, where, age, sex, income, presence of comorbidity, pre-admission medications were not significantly different when tested to predict DTPs.

The interventions in this study were largely through counselling, and in other cases through dosage changes, starting of new drugs and changes made to previous drug regimen. It is also important to point out that some interventions were not documented. According to Ukoha-Kalu *et al.*<sup>19</sup>, it was reported that about 25% of the study patients' reports did not show any form of intervention which was due to lack of proper documentation and poor patient-care approach. Ukoha-Kalu *et al.*<sup>19</sup> also agreed with counselling as a viable intervention which improves patients' adherence and outcome of the intervention. It was also reported that change of drugs in case of adverse drug event or addition of the right choice of drugs and dose of drugs can be done by competent prescriber when there is improper selection of drug.<sup>19</sup> Some of the interventions provided by the study from Tefera *et al.*<sup>9</sup> also included change of dose, addition of new drugs, stopping of some drugs amongst others which is also in line with the interventions made during this study.

Resolution of the DTPs is an important aspect of studies of DTPs.<sup>7</sup> In this study, most of the outcomes were unknown. This is due to lack of documentation which appeared to affect some of the data about intervention in this study. The study from Ukoha-Kalu *et al.*<sup>19</sup> had similar outcome where there was lack of proper documentation of the outcomes. Also, fully and partially solved DTPs were the lowest in this study compared to cases of DTPs that were not solved by the interventions. Many studies may not really assess the resolution of the DTPs at all.<sup>4,12</sup> However, Tefera *et al.*<sup>9</sup> showed that 67.3% cases of DTPs were resolved by the interventions

provided in the study which was higher than the DTPs resolved in this study.

## CONCLUSION

This study evaluated the drug therapy problems in diabetic and/or hypertensive patients who were attending the General Hospital, Lagos Island. There was a relatively high prevalence of DTPs identified in this study with lack of adherence, dose too low, effect of drugs not optimal, needs additional therapy, untreated indications and adverse events occurring most frequently. Most of the outcomes in the study were, however, unknown. It is therefore recommended that drug therapy problems, interventions and outcomes are properly documented as it will help physicians plan effectively towards preventing risks caused by these problems and help policy makers design effective policies to mitigate problems related to drug therapy thereby maximizing patient care.

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