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Original Article

Identification and Evaluation of Drug-Related Problems in Elderly Hypertensive Patients

Nadia Alrawaiq*, Siraj Iseidiyah, Bassam Khattab

General Department, Faculty of Pharmacy, Sebha University, Sebha, Libya
Corresponding Email *na.alrawaiq@sebhau.edu.ly*

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ABSTRACT

The phrase "Problems related to the drug" serves as a comprehensive term for any condition or care related to the patient, whether it is currently or potentially obstructing the best possible results for the patient. Individuals diagnosed with high blood pressure have an increased risk of experiencing drug-related problems, largely due to their regular drug intake and the existence of many concurrent health issues. Thus, there has been a significant decrease in research focused on elderly patients with high blood pressure till now. The purpose of this investigation is to evaluate drug-related problems and identify the determinants affecting these issues within this demographic. The retrospective analysis was done from January 2021 to February 2021 at a healthcare facility in Libya. The sample included patients diagnosed with chronic high blood pressure. The study identified a total of 70 persons associated with problems related to 404 drugs. Within the investigated population, 81.4% displayed a drug-related problem, with an average of 5. 7 were per capita on issues. Adverse events emerged as a leading category of drug-related problems, which represent 59.29% in total cases. The second most commonly found type of drug-related problem was indicated, which was 18.6% of all recorded issues. Monitoring problems were the third most often, including 17. 3% of the overall count. In contrast, dosage-related complications were at least as frequent, which contribute only 4.7% of all medicines related to medicines. It is important to identify the types and trends of drug-related problems in patients suffering from high blood pressure to prevent and improve the management of these issues. It is necessary to apply effective strategies to reduce the incidence of complications related to treatment within this susceptible group.

Introduction

Hypertension, known as "the silent killer" [1], is a comprehensive global health concern, affecting an estimated 1.3 billion individuals and contributing to about 18 million deaths annually [2]. This "silent killer" has uneven effects on low and middle-aged countries, where its prevalence is high and the effectiveness of control measures is limited [2]. In both the United States and Sub-Saharan Africa, the prevalence of high blood pressure is documented to be around 28%, while the Arab demographics suggest a slightly higher rate of 29.5% [3]. In Libya, the increasing prevalence of the condition is associated with increased risk factors, including sedentary lifestyle, tobacco use, and obesity [4]. Hypertension is associated with a significantly increased risk of developing serious health complications, including stroke, myocardial infarction, heart failure, and cognitive decline [5]. The latter requirement for an array of drugs, known as polypharmacy, often has drug-related problems (DRPs), which disrupt the attainment of medical purposes [6,7]. These issues include drug selection, administration, interaction, and adverse effects, which can increase high blood pressure and increase the rate of mortality and worsening disease [8]. Indeed, DRP can disrupt the level of blood pressure in more than half (57%) of patients with high blood pressure [9]. The development of DRP is affected by several factors, including the number of prescribed drugs, co-health conditions (comorbidities), blood pressure readings, and the presence of geographical factors [10].

Elderly patients are particularly at the highest risk of DRPs [11] due to the following factors [12,13]: Polypharmacy is defined as the use of many drugs. Age related physical changes, which can be caused by the natural process of aging. History of many consultations with healthcare providers.

The important effects of DRP on the efficacy of treatment and quality of life underline the need for intervention aimed at increasing drug management. These interventions can get adequate returns on investment by preventing complications and improving health outcomes.

Antihypertensive treatment is complex; adverse effects and poor adherence can harm older patients and burden health systems. Most evidence on medication-related problems in hypertension comes from different

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countries [9,14,15], so data from Libyan clinical settings are scarce. This study identified DRPs in elderly patients with hypertension and investigated related risk factors to guide improvements in care.

Methods

Study design and setting

This research forms a retrospective analysis held at Sebha Medical Center, Sebha, Libya. The collection of data took place from January 22 to February 29, 2021, with a period of 30 working days. The moral approval for the study was obtained from the research and ethics review committees associated with the faculty of pharmacy at Sebha University. The director of Sebha Medical Center approved the collection of data through official correspondence. In addition, the concerned parties were duly informed about the objectives of the study. In addition, all the information received from the patients was treated with strict privacy, and the data was specially used for research purposes, with a strong emphasis on the protection of the confidentiality of all the data collected.

The current investigation focused on elderly persons aged 60 and above, who were diagnosed with hypertension and admitted to Sebha Medical Center. A total of seventy patients with comprehensive medical documentation were selected for the study.

The inclusion criteria have been determined that patients should be on at least one anti -anti-hypertensive drug, prescribed ≥ 5 drugs in total during treatment. Patients were excluded from studies if their medical records were incomplete, if they were under 60, or if they were receiving outpatient care. A careful examination of the patient's files, age, presence of additional medical conditions, laboratory findings, history of drugs, current prescriptions, and any reported side effects was conducted to extract relevant information. It includes included about each prescribed drug, including dosage, frequency of intake, and method of administration. (Figure 1) shows the flowchart of the study.

Classification and assessment of DRPs

This investigation used the pharmaceutical care network Europe (PCNE) classification version 8. 02 to categorize drug-related problems (DRPs) into six main groups: adverse reactions (P1), drug choice issues (P2), dosing problems (P3), drug use problems (P4), drug interactions (P5), and other (P6). Researchers reviewed the history of patients' medication profiles. Then compared the prescribed therapy with the current guidelines to assess DRPs categories. Finally, we checked whether drugs were used according to the US Square Society Beer Criteria updated for elderly patients.

Statistical analysis

The data evaluation was conducted using SPSS version 22. The classified data is represented by frequencies and percentages, while continuous data is expressed as the mean ±SD (±standard deviation). The total number of problems related to the drug (DRP) was obtained by collecting DRPS for each patient, and the average number of DRP per patient was calculated by dividing the total DRP by the number of patients. The ratio of each subcontinent of DRP was determined by taking the number of events within that subcontinent, dividing by the total DRP, and then multiplying by 100. Similarly, the percentage of patients displaying a specific DRPs was obtained by dividing by at least one example. A statistical significance limit was established at 95% confidence intervals with a P-Value of less than 0.05.

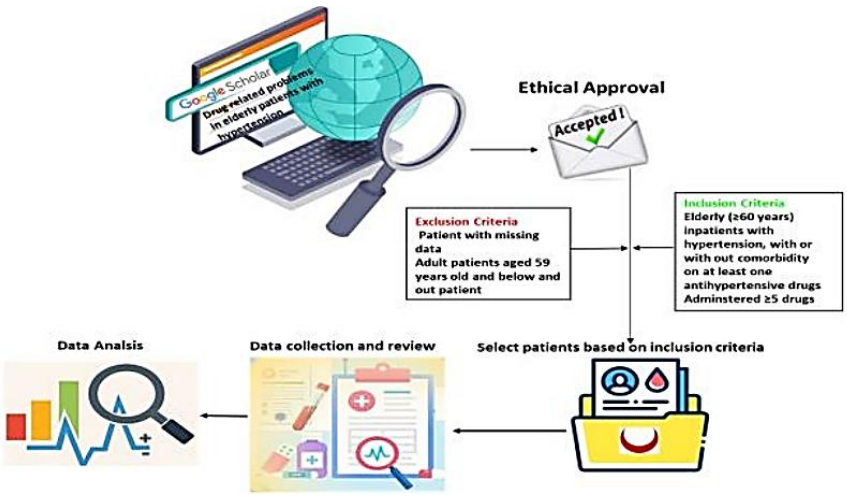

Figure 1. Research methodology Flow chart

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Results and discussion

Patient demographics and baseline characteristics

A total of 70 elderly hospitalized patients with high blood pressure were evaluated during the study. Of these, 37 (52.9%) were women.

Detection and evaluation of drug-related problems

This study has DRPs treated in Sebha medical center in patients with more than three-fourths of 81.4% high blood pressure. A total of 404 DRPs were observed in the studied patients were with an average of 5.7 DRPs. Descriptive conclusions of DRP's categories and subcontinents are presented in (Table 1).

Table 1. Descriptive findings of categories and subcategories of DRPs

DRPs	subcategory	N	(%) Out of the total DRPs
Adverse events	Actual Potential Contraindication	26 210 4	6.4 52 1
	Total	240	**59.29**
Dosing errors	Dose too low Dose too high	14 5	3.5 1.2
	Total	19	**4.7**
Indication problems	Untreated indications Improper drug selection Ineffective Inappropriate	30 2 14 29	7.4 0.5 3.5 7.2
	Total	75	**18.6**
Other	Monitoring	70	17.3
	Total	70	**17.3**
Total DRPs		404	=100

Adverse Events

Drug interactions

In the present study, an adequate proportion of drug-related problems (DRPs) was kept for adverse events, 240 cases (59.29%) (Table 1). Between the patients studied, 81% (57 patients) demonstrated potential pharmaceutical drug interactions, while 19% (13 patients) showed no possible interaction based on their treatment plans. Despite the known risks associated with such interactions, a total of 52% (210 cases) of the total adverse effects demonstrated signs of potential drug interactions (Table 1). Analysis of the age of the patient concerning the number of interactions showed that 20 persons (35%) in the age group of 60 and 65 years performed potential drug-drug interactions. Advanced number of drugs prescribed in combination with a combination of different classes of drugs played an important role in the increased incidence of severe possible drug-drug interaction within this demographic, which was 52.8%. The interaction found during this research was mainly established on the literature and existing evidence. An adequate body of research has documented the prevalence of DRP in individuals with heart conditions, such as high blood pressure, as is evident from prior studies. Nevertheless, hypertensive patients were treated at Adama General Hospital, as well as a tertiary cardiovascular hospital in Indonesia, and in patients with high blood pressure in Malaysia, drug interactions were the most frequently identified DRPs [9,16,17]. The high percentage of potential drug-drug interactions in the current study could be related to the patients had a high number of comorbid conditions, took more drugs (polypharmacy; ≥5 drugs), and all of them were ≥ 60 years. In addition, polypharmacy ($p < 0.05$) was found to be associated with drug interactions. (Figure 2) shows the distribution of polypharmacy among patients.

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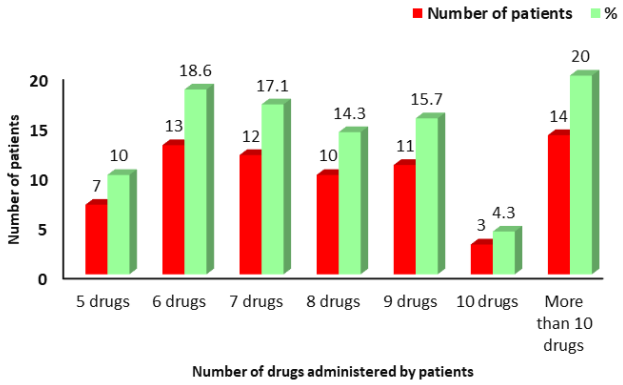

Figure 2. Distribution of polypharmacy among patients

Actual adverse events

The actual side effects were documented in this examination between 26 patients, accounting for 6.4% of the total DRPs (Figure 3). The current study identifies electrolyte imbalance as individuals suffering from high blood pressure have the most frequent side effects, 61.4%. In 30.8% of cases, hypotension was applied. The prevalence of hypoglycemia was found to be 7.7% (for all actual adverse events) (Figure 3).

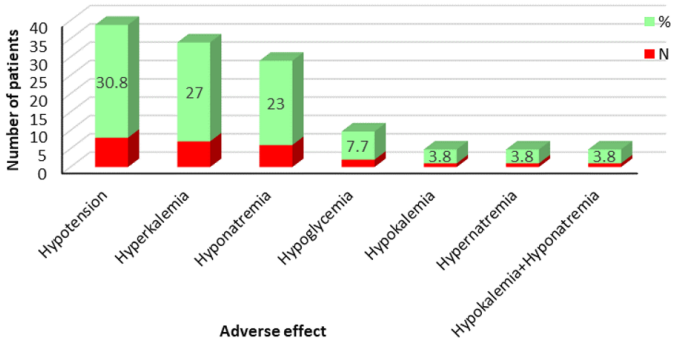

Figure 3. Actual adverse events

Figure 3 shows that hyperkalemia was found to be the commonest electrolyte imbalance (27%) among the patients in the current study. Hyponatremia was found to be the second most common pattern (23%) of electrolyte imbalance. Hypokalemia, hypernatremia, and both (hypokalemia and hyponatremia) were found to be the 3rd commonest pattern (3.8 %).

Potassium (K^+) is the primary intracellular cation and is required to maintain relaxing membrane capacity. It has been established that variation in serum K concentration can change the electrical activity of stimulating cells, including cardiac myocytes, skeletal muscle cells, and vascular smooth muscle cells. This, in turn, can result in serious complications, such as life-threatening arrhythmia. The standard reference limit for serum K level is 3.5 to 5.0 mmol per liter. 3 mmol/l. In this study, hyperkalemia was identified as the most prevalent electrolyte imbalance, affecting 27% of the participants. Hyponatremia emerged as the second most prevalent issue, appearing in 23% of cases. The third most prevalent pattern affects 3.8% of themes, characterized by the presence of a combination of hypokalemia, hypernatremia, or both. Hyperkalemia, a serious electrolyte disorder that could be a threat to life, was seen in 27% of subjects. Drugs used to manage hypertension, such as angiotensin receptor blockers (ARB), angiotensin-converting enzyme inhibitors (ACEIs), and spironolactone, are displayed to contribute to the phenomenon, hyperkalemia [18]. Hyponatremia is characterized by a serum NA^+ concentration that is falling below 135 mmol/l [19].

The findings of this study indicated that all patients were in their senior years, especially classified as individuals aged 60 or older [20]. Hyponatremia is prevalent in elderly individuals admitted to medical facilities. Electrolyte imbalances are prevalent among the elderly, mainly due to their low ability to regulate water and electrolyte levels in response to diet and environmental changes [21]. Acute or symptomatic hyponatremia has been observed as a result of high proliferation of sickness and mortality [22-24].

Planned drug remedies in managing hypertension or congestive heart failure (CHF), including diuretics, angiotensin receptor blockers (ARB), and angiotensin-converting enzymes (ACE) inhibitors, can induce electrolyte imbalance. In this study, hyponatremia was identified in 23% of patients receiving diuretics.

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Hyponatremic hypertensive syndrome is a recognized condition, in which the strongest association is found among individuals with essential hypertension who are treated with diuretics [25].
Hypokalemia is defined as a serum potassium concentration that falls below 3.5 mmol/L [26]. In this investigation, the condition was identified as the third most prevalent type of electrolyte imbalance, accounting for 3.8% of the total cases. The condition has been identified as one of the most prevalent electrolyte disorders in both outpatient and inpatient settings [27,28]. Hypokalemia has been seen as a common position among the elderly population, with a strong correlation with an increased phenomenon of the disease. In the current study, a correlation was identified between beta-2 agonists and administration of corticosteroids, which were usually prescribed for the treatment of bronchial asthma [29], and the occurrence of hypokalemia in 3.8% of cases. In contrast, a serum of hypernatremia, 144 mmol/l, is indicated by sodium levels, usually arising out of an excessive loss of total body weight relative to sodium content, leading to a free water deficit. As a result, it is mandatory to consult possible adverse effects, especially in elderly individuals who can withstand sufficient negative consequences.

Indication

In the present study, indication-related problems were the second most common type, accounting for 18.6% of all DRPs (Table 1). In this category, untreated indication-related problem was the most common indication-related problem was 7.4%, inappropriate drug therapy 7.2% and ineffective drug therapy 3.5% followed by wrong drug selection 0.5% (Table 1).
Specific examples illustrate the impact on individuals; three older adults with diabetes (40-75 years, LDL-C 70-189 mg/dL) were not prescribed lipid-lowering medications despite initial evidence of prevention; one patient with benign prostatic hyperplasia was not prescribed an alpha-blocker; and eight patients had untreated diabetes. We also observed prescribing errors, such as giving Glibenclamide to patients with type 1 diabetes instead of insulin, and frequent use of inappropriate medications in elderly patients (diazepam in seven patients and tramadol in eight), raising safety concerns related to falls and fractures [30]. Inappropriate prescribing occurred in 7.2% of patients in our cohort, higher than the 5.2% previously reported in an Ethiopian study [31], and drug combinations were common: ACE inhibitors were combined with oral antidiabetics in 10 patients (a combination that increases the risk of hypoglycemia) [32,33], and NSAIDs were used in some patients with heart disease and kidney disease [34]. Thiazides are sometimes prescribed even if the glomerular filtration rate (GFR) is low, and loop diuretics are better. Blood pressure control was poor in the subgroup: 14 treated patients (29.8%) remained with blood pressure above 140/90 mmHg, and most diabetic patients did not achieve the most aggressive goals recommended for diabetic patients, although ACE inhibitors, calcium channel blockers, and diuretics were the most commonly used drug classes. In general, the burden of complications associated with treatment was higher, reflecting the complexity of care and the diversity of drugs used. These findings suggest potential strategies: reviewing and comparing patient-reported medications, adhering to recommended preventive measures (e.g., statins for patients with diabetes as appropriate), avoiding or closely monitoring high-risk medications in older patients, and discontinuing or substituting NSAIDs in those taking medications that are combined with ACE inhibitors in high-risk patients.

Dosing

Overdose was reported in five cases (1.2%) (Table 1), for example, when digoxin was used in high doses, not as indicated, which led to toxic effects in patients. Ineffective doses of the drug were the cause of dosing errors (Table 1). In this study, the dose was too low in 14 cases (3.5%), and one incident involved the administration of antihypertensive drugs, where the dose administered was within the prescribed dose range, but the effectiveness of the drug on the patient's blood pressure did not reach a level within the normal blood pressure range. Fourteen patients treated with this treatment had blood pressure above the threshold of 140/90 mmHg.
The result of the current study is higher than the previous Indonesian study, which found that the dose was too low in 2.86% [9].

Conclusion

Research indicated that problems related to drugs, especially drug interactions, side effects, problems with appropriate indications, and dosage complications, are prevalent in elderly patients with high blood pressure who are hospitalized. Timely detection and management of these drug issues is paramount to improving the results of the patient. Research emphasizes the importance of implementing effective strategies to resolve challenges related to treatment in front of this vulnerable population. The limitations of the study include a limited participant pool, dependence on historical patient data, and non-prescription drugs were not taken into account. The solo-site, cross-sectional approach and absence of direct patient engagement suggest that

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most identified drug interactions are largely theoretical, and can affect any interval or missing data conclusions. The number of doctors involved and the lack of data related to the inability to evaluate the true clinical results compromise the generality and reliability of the study. Future investigation should adopt potential functioning with large patient groups and extended monitoring periods to achieve deep insights into the challenges related to the drug. In addition, patients' compliance with prescribed treatments and self-management should be evaluated, and in the healthcare settings, strong strategies should be implemented to address drug-related issues. The full and reviews of patients' medical history is mandatory to recognize and avoid possible complications, in which the final objective is to increase health results and reduce healthcare expenditure for elderly persons suffering from high blood pressure.

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Conflicts of Interest
The authors declare no conflicts of interest.

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