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EFFECT OF FLUOROQUINOLONES ON DYSGLYCEMIA AMONG NON-DIABETIC PATIENTS

General Medicine

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ABSTRACT

Fluoroquinolone antibiotics have a varied and diverse activity with good tolerance and are extensively used. Patients receiving antibacterial medication, such as fluoroquinolones, have been seen to experience dysglycemic episodes; hyperglycemia and hypoglycemia. While dysglycemia can also occur in individuals without diabetes due to various other factors like diet, medications, and underlying medical conditions. The study was conducted prospectively over a period of 3 months at a tertiary care hospital. It included non-diabetic patients above 18 years of age who were prescribed with fluoroquinolones during the course of the treatment. Patients were enrolled based on inclusion and exclusion criteria. Data were collected using a combination of case sheets and direct interaction with patients, consultants, and doctors. Additionally, the GRBS of the enrolled patients were monitored by the student 3 times a day to assess glycemic fluctuations associated with fluoroquinolone use. A total of 30 patients were enrolled comprising of equal distribution of males and females. Patients under the age group of 21-40 years showed 36.6% while the age group of 41-60 years represented 33.33% of overall use of fluoroquinolones. The study showed the use of fluroquinolones was decreased with increasing age. Among these patients only 1 (3.3%) experienced dysglycemia (i.e.; Hypoglycemia) associated with the use of levofloxacin. Hypersensitive reaction was also seen in 1 patient (3.3%) following the use of the same fluoroquinolone. Overall, a total of 6.6% of ADRs were reported during the study. The study concluded that although the incidence of dysglycemia was low, the finding underscores the vulnerability of adult patients and suggests that even non diabetic individuals may be at risk. Importantly, no cases of mortality were reported during the study.

KEYWORDS

Fluoroquinolones, dysglycemia, Blood glucose levels.

INTRODUCTION

The fluoroquinolones are a family of broad spectrum, systemic antibacterial agents that have been used widely as therapy for respiratory and urinary tract infections. Fluoroquinolones are active against a wide range of aerobic gram-positive and gram-negative organisms. The antibacterial activity of 4-quinolones is greatly increased by the addition of 6-fluoro and 7-piperazinyl groups hence named fluoroquinolones[1].The fluoroquinolones are indicated for treatment of several bacterial infections, including bacterial bronchitis, pneumonia, sinusitis, UTI, septicemia, typhoid fever, anthrax, bacterial gastroenteritis, and several other infectious conditions. The fluoroquinolones are an attractive group of drugs to use for the therapy of an extensive range of conditions[2]. These agents are well absorbed orally and well tolerated with a low rate of adverse effects. Several quinolones and fluoroquinolones were introduced but were subsequently withdrawn after spontaneous reports of severe adverse events including hepatotoxicity[3]. Fluoroquinolones are important as safe and broad-spectrum antibiotics in the treatment of resistant infections, they may be associated with disturbances in blood glucose levels[4,5].

Nearly all quinolone antibiotics in modern use are fluoroquinolones, which contain a fluorine atom in their chemical structure and are effective against both gram-negative and gram-positive bacteria[6]. From an observational study it was concluded that cefaperazone sulbactum along with quinolone is a good first choice antibiotic and reserve the imipenem for sicker and non-responders to cephalosporins[7]. The pharmacokinetics of fluoroquinolones are well studied. All drugs in this series, well absorbed in the intestinal tract, amounting for 50-90% [8,9]. The capacity of antimicrobial fluoroquinolones to block kATP channels in pancreatic β cells and so start insulin secretion explains why these drugs can cause life-threatening hypoglycemias, albeit with greatly varied frequencies[10].

Dysglycemia refers to abnormal blood glucose levels, encompassing both hyperglycemia and hypoglycemia. While dysglycemia is commonly associated with diabetes mellitus, it can also occur in individuals without diabetes.

Hyperglycemia occurs when blood glucose levels rise above normal range (70-99mg/dl), typically defined as fasting glucose levels above 100 mg/dL. A study hypothesized that increased gatifloxacin exposure correlates with age-related decreases in renal function and may be responsible for elderly patients being at an increased risk for hyperglycemia[11].

Hypoglycemia occurs when blood glucose levels drop below normal range, typically defined as levels below 70 mg/dL.

Importance of Managing Dysglycemia:
1. Prevention of Acute Complications: Effective management of dysglycemia is crucial for preventing acute complications such as hyperglycemic and hypoglycemic emergencies.
2. Reduction of Long-term Complications: Chronic dysglycemia, particularly hyperglycemia, is associated with an increased risk of complications such as cardiovascular disease, neuropathy, etc.
3. Improvement of Quality of Life: Stable blood glucose levels promote overall well-being and quality of life.

Elevated glucose levels impair the ability to combat infections, making patients susceptible to hospital-acquired infections. In some cases, medications administered during hospitalization may lower blood glucose levels excessively, leading to hypoglycemia[12,13].

METHODOLOGY:

A hospital based prospective observational study was carried out for 3 months at a tertiary care hospital. The study population included non-diabetic patients above 18 years of age who were prescribed with fluoroquinolones during their course of treatment. Patients were enrolled based on specific inclusion and exclusion criteria. Exclusion criteria comprised of pregnant and lactating women, individuals with known diagnosis of Diabetes Mellitus who were also receiving fluoroquinolones, and patients who declined to participate in the study.

The research student participated in ward rounds actively on daily basis. Patients who fulfilled the inclusion criteria were recruited and informed consent was duly obtained. Data was gathered using a combination of patient case sheets and direct interaction with patients, consultants, and resident doctors. Comprehensive information such as demographic data, medical history, medication history, social history was systematically collected. GRBS was monitored at 3 time points to detect any glycemic fluctuations i.e.; prior to the initiation of fluoroquinolone antibiotics, during the course of treatment and at the end of therapy. All the values were recorded and the data was

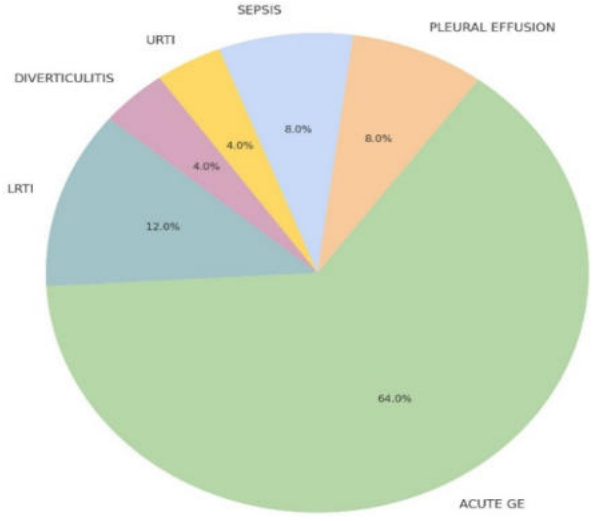
expressed as descriptive statistics.

RESULTS:

A total of 30 patients were enrolled in the study, comprising of an equal distribution of males and females-15 (50%) in each group. An analysis of the age distribution of patients receiving fluoroquinolones showed that the majority of patients

i.e.; 36.6%, fell within 21 to 40-years age range, followed closely by the 41 to 60-year age group, which accounted for 33.33% of patients; indicating that middle-aged adults were primary recipients of fluoroquinolones in this study population.

Fluoroquinolones in this study was prescribed to patients who were diagnosed with LRTI, URTI, UTI, Pulmonary TB, Acute gastroenteritis, Rhinopharyngitis, Sepsis, Enteric fever and dengue fever. Fluoroquinolones were prescribed maximum for the diagnosis of Acute GE.



PIE Graph: Distribution Of Diseases Based On Fluoroquinolones Used

Among these participants, only 1 patient who was diagnosed with LRTI experienced dysglycemia (3.3% of the total) associated with Inj Levofloxacin 750 mg once a day; which was prescribed for the diagnosis of LRTI. GRBS values recorded before, during and after the treatment was 125mg/dl, 59mg/dl and 112mg/dl respectively. Levofloxacin was withdrawn post hypoglycemia. ADRs reported other than hypoglycemia due to its use was hypersensitive reaction in 1 patient (3.3% of the total) indicating a total of 6.6% of the overall ADRs during the study.

Ofloxacin was the most commonly prescribed fluoroquinolone, but Levofloxacin was identified as the causative agent for the ADRs reported in the study. Hypoglycemia and Hypersensitive reaction were reported post levofloxacin administration.

Table: Distribution Of Fluoroquinolones Prescribed.

Sr. No.	FLUOROQUINOLONES USED	NO. OF PATIENTS PRESCRIBED	PERCENTAGE OF PATIENTS PRESCRIBED
1.	MOXIFLOXACIN	2	6.66%
2.	OFLOXACIN	15	50%
3.	CIPROFLOXACIN	5	16.66%
4.	LEVOFLOXACIN	7	23.33%
5.	NORFLOXACIN	1	3.33%
TOTAL		30	100%

Overall, the study findings highlight that while fluoroquinolone-associated adverse events were rare in this sample, Levofloxacin was implicated in reporting dysglygemic event, indicating the importance of monitoring GRBS of patients receiving the drug.

DISCUSSION:

In an In-patient setup antibiotics are widely used either as prophylactic, empirical or definite treatment. Fluoroquinolones are widely used in the treatment of bacterial infections, including respiratory tract infections, urinary tract infections and gastrointestinal infections. Their broad-spectrum activity and ability to penetrate various tissues make them effective against a wide range of pathogens[14]. Though, there are many common ADRs for antibiotics, dysglycemia is also one among them. Physicians don't look for dysglycemic events for patients receiving fluroquinolones especially among non-diabetic patients. This leads to many consequences such as development of nosocomial infections. Thus, this study indicated the use of fluoroquinolones showing a linear relationship of occurrence of dysglycemic event in patients. An Extensive use of Levofloxacin antibiotic responsible for both hypersensitive reaction and dysglycemic event, highlights the importance of cautious observation, enhanced patient care and GRBS monitoring in patients. In addition, the risk for hypoglycemia was greater with levofloxacin than ciprofloxacin in non-diabetic patients[15]. The occurrence of dysglycemic event induced by fluoroquinolones among non-diabetic patients underscores the necessity of vigilant monitoring of GRBS prior, throughout and at the end of the treatment. Data from this kind of study would be an eye opener to monitor all these parameters.

CONCLUSION:

A three-months prospective observational study was conducted at a tertiary care hospital involving a total of 30 patients who were prescribed fluoroquinolones during their hospital stay. The study population primarily consisted of adult patients across various medical departments. GRBS were recorded at regular intervals throughout the day using a calibrated glucometer, and readings were carefully documented to ensure accuracy and consistency. Of the 30 patients enrolled, one patient developed dysglycemia during the course of treatment, highlighting the potential glycemic risk associated with fluoroquinolone use in certain individuals.

We can conclude that although the incidence of dysglycemia was low, the finding underscores the vulnerability of adult patients to such events and suggests that even non-diabetic individuals may be at risk. Importantly, no cases of severe complications, resulting in a zero percent mortality rate.

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