ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24NOV887

Assessing Drug-Drug Interaction and Adverse Drug Reactions While Treating Diabetic Foot Infections in Type 2 Diabetic Patients: A Case Study

Subba.Dil
Assistant Professor, Department of Pharmacy, School of Pharmacy,
Sharda University, Greater Noida, 201310, Uttar Pradesh, India.

Abstract:-

- ***Objective***

This case report discusses the ADRs and drug-drug interactions encountered in a 50-year-old male with a complicated illness of type 2 diabetes treated with multiple drugs, including Cefotaxime, Clindamycin and metformin.

- ***Method***

The patient had high sugar levels with electrolyte imbalance and also had symptoms like polyuria, loss of taste, and hypersalivation. The initial regime includes Cefotaxime which to possibly ADR, and Clindamycin was added to the above regimen. DIPS and Naranjo's scale scores have been used for drug interaction and risk of ADRs assessment.

- ***Result***

Score DIPS demonstrated probable interaction between metformin, cefotaxime and other antibiotics. Naranjo's score proved the likelihood of side effects due to Cefotaxime. Once the drug Cefotaxime was stopped, symptoms disappeared and the patient's condition improved indicating that drug-drug interaction caused his bad symptoms.

- ***Conclusion***

This case necessitates monitoring drug interaction and ADRs in diabetes patients on complex treatment regimes. Switch in the approach toward treatment such as stopping the administration of cefotaxime along with maintaining vigilance concerning blood sugar levels, proved help in minimizing the ADRs and regaining stability among patients.

Keywords:- *Adverse Drug Reactions, Drug-Drug Interactions, Type 2 Diabetes, Naranjo Score, DIPS Score, Cefotaxime and Clindamycin.*

I. INTRODUCTION

An estimated 19–34% of patients with diabetes may develop diabetic foot ulcers (DFUs) at some time in their lives, making them a serious health risk [1]. Infections are among the serious side effects that these ulcers frequently cause, and they can raise the risk of lower extremity amputations (LEAs) by 50% when compared to patients that are not infected [1]. The global expenses of DFUs are estimated to be around $78.2 billion USD, indicating a significant economic burden [1]. Poor glucose management, neuropathy, foot abnormalities, and lifestyle choices like obesity and inactivity are risk factors for DFUs [2]. A multidisciplinary strategy is necessary for effective therapy, with a focus on prevention through routine foot exams, patient education, and prompt action [3][2]. Additionally, predictive models have demonstrated a high degree of accuracy in identifying individuals who are at risk, which can greatly lower the frequency of DFUs and related problems [4]. "Stress hyperglycemia" (SH) is a hypercatabolic state that is frequently experienced by people, especially those with diabetes, and is characterized by elevated glucose production and insulin resistance [5] [6]. Systemic infections, which are particularly common in trauma victims, can be made worse by this condition [7] [8].

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24NOV887

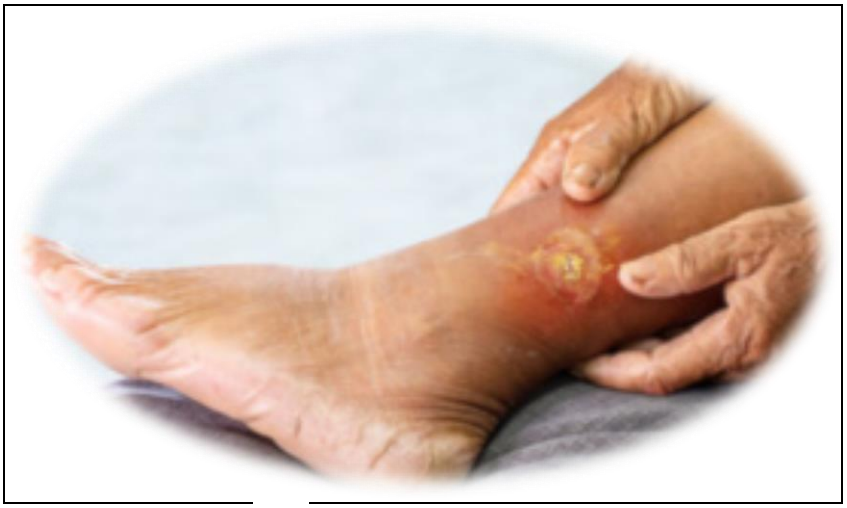

Fig1. Patient's Diabetes Wound

A negative nitrogen balance and possible consequences if improperly handled are the results of the metabolic response to injury, which includes substantial changes in fuel metabolism [5] [9]. Given the patient's diabetes and stress response, the first course of treatment with the broad-spectrum antibiotic Taxim(cefixime) is essential for infection management because infections can cause serious problems in this situation [10] [11]. The Naranjo Adverse Drug Reaction Probability Scale is a tool for determining if an adverse drug reaction (ADR) is due to a specific medicine. It rates numerous parameters, resulting in a total score that classifies the association between the drug and the ADR as certain, probable, plausible, or questionable. Naranjo Scale Interpretation as definite ADR score (9-10), probable (5-8), possible (1-4), and questionable (less than 1)[12].

II. CASE PRESENTATION

A male patient, 50 years of age, complained of stress related to trauma for the previous two months. He also had a cut on his left foot that was discolored. He said he had neither a temperature nor dyspnea. Due to his medical history, he has been taking 500 mg of Metformin twice a day for type 2 diabetes.In the first treatment plan, electrolyte levels were measured at Na 113, K 5.7, and Cl 8.5, and injections of Taxim (Cefotaxime) 1 g once daily, Pentocid (Pantoprazole) 40 mg once daily, Perfalgan (Paracetamol) 1 g, and Actipid 235 mg were administered. At 574 mg/dL, his blood glucose level was noticeably elevated. In addition to the ongoing pain, he also noted a frothy odour on the second day. His blood glucose levels over the day were 112 mg/dL at 2:00 pm and 65 mg/dL at that time 3 am, and 7 am, 117 mg/dL. Taking these results into consideration, the doctor modified the treatment regimen, adding Iverol Forte (Ivermectin+Albendazole) once daily, Dalacin (Clindamycin) 600 mg three times daily, and Tazobactam + Piperacillin (Wiltaz 4.5 g twice daily).Other symptoms, such as vomiting, taste loss, excessive salivation, and increased urination, appeared on the third day. These negative effects led the doctor to stop using Taxim (Cefotaxime). After making these changes, the patient was discharged.

III. CASE MANAGEMENTS

Since the patient's symptoms, which included vomiting, increased urination, and loss of taste, were probably related to adverse reactions, cefotaxime needed to be stopped right once to manage this case. To lessen the possibility of medication interactions with metformin and stop additional adverse drug reactions (ADRs), the antibiotic regimen had to be modified. If the infection continues, other medications with a lesser chance of interaction might be taken into consideration. Another top concern was careful glycemic control monitoring because the patient had notable blood glucose swings, which the combination of metformin and antibiotics may have brought on. Because polypharmacy and the infection itself might strain renal function and alter glycemic stability, it was crucial to carefully modify the metformin dosage and do routine blood glucose monitoring. Maintaining fluid balance and addressing electrolyte abnormalities brought on by the patient's symptoms were the goals of supportive treatment. Further imbalances were avoided by keeping an eye on electrolytes like sodium, potassium, and chloride. A lower-risk substitute or gastric support utilizing non-pharmacological methods to lessen drug load was taken into consideration due to the possible gastrointestinal side effects of pantoprazole. Patient education and counselling were essential, particularly when it came to teaching wound care, good hygiene habits, and efficient diabetes self-management techniques that boost the immune system and promote wound healing. The patient was also instructed to be aware of possible adverse drug reactions (ADRs), recognise the warning signals of ADRs, and know when to seek medical attention right away.

Frequent follow-ups were scheduled to evaluate the patient's glucose control, wound healing progress and overall health, enabling prompt drug modifications in response to the development or alleviation of symptoms. Every prescription, including antibiotics and gastric protection, was re-evaluated regularly to make sure that only necessary medications were continued, further streamlining the pharmaceutical regimen and reducing the possibility of future ADRs or interactions. Alternatives with fewer interactions or ones less likely to impact blood sugar levels

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24NOV887

were taken into consideration in situations that required prolonged antibiotic therapy. The goals of these management techniques were to reduce adverse drug reactions, encourage wound healing, stabilize the patient's state, and offer a safer, more efficient treatment plan that was specifically designed to meet the requirements of a patient with type 2 diabetes and complicated infection-related comorbidities.

- *Naranjo Score*

Figure 04 and Table 2 show that an ADR was likely based on the Naranjo ADRs probability scale score of 4.

- *Drug Interaction Probability*

The improvement in the patient's health after stopping Cefotaxime was evidence of a positive interaction recorded by the DIPS following the co-administration of cefotaxime and clindamycin the likelihood of a DDI was indicated by DIPS Score which showed on Figure 3 and table 1[13].

- *Clinical Observation*

The patient's loss of taste and over-salivation, increased urination and fluctuation of blood glucose level stopped after cefotaxime and modified other drugs. After stopping the cefotaxime, the patient's increased urination, which had started the medication was given, went away, and they were discharged.

IV. DISCUSSION

This case shows the difficulties of controlling infections in type 2 diabetes patients on several drugs, where drug-drug interactions (DDIs) and adverse drug reactions (ADRs) are major issues. After commencing Cefotaxime, the patient reported taste loss, increased salivation, and frequent urination, with a DIPS score of 1+2+1+1+1-1+0=5 indicating possible interactions between Cefotaxime and Clindamycin so, that Naranjo score of 4 indicating Cefotaxime-related ADR following table 2 . Discontinuing Cefotaxime relieved symptoms, suggesting its probable participation in the ADRs.The instance also demonstrates how antibiotics can influence glycemic management, as the patient's blood glucose levels fluctuated. Glycemic management necessitates frequent monitoring and, in some cases, Metformin dosage adjustments. Additionally, electrolyte abnormalities necessitated supportive care to avoid future problems. Pantoprazole was utilized for stomach support, however alternatives should be considered to lessen the drug load.

Patient education about recognizing ADR symptoms is critical for timely intervention. This example emphasizes the necessity of close monitoring, ADR assessment, treatment regimen reassessment, and patient counselling in improving outcomes in diabetic patients with infections.

Table 1: DIPS Question Score

Sl. No	Drug Interaction Probability Scale (DIPS) Question	Answer	Result
01.	Are there previous reports of the interaction?	yes	+1
02.	Did the interaction occur after co-administration of the drugs?	yes	+2
03	Did the adverse effect improve after discontinuation of one of the drugs?	yes	+1
04	Could other factors have caused the interaction (e.g., disease)?	Possible	-1
05	Was the interaction more severe when the dose of one or both drugs was increased?	yes	+1
06	Was the interaction confirmed by objective evidence (e.g., blood levels)?	yes	+1
07	Did the adverse event reappear when the drugs were re-administered?	Not Applicable	0

The total score of 5 shows Table 1 a probable drug-drug interaction, indicating that the reported symptoms are most likely a result of the medication interactions between antibiotics and clindamycin[12][13].

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24NOV887

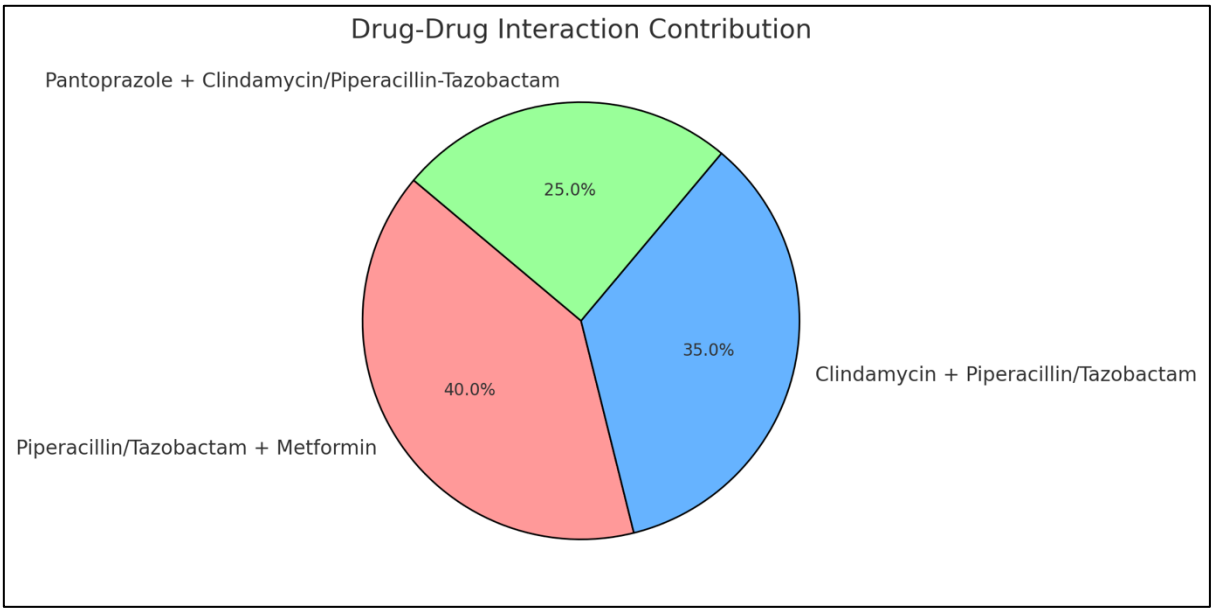

Fig 3: DIPS Score

A pie chart Figure 3 depicting hypothetically each medicine combination's potential contribution to the total risk of drug-drug interactions in this situation. This breakdown shows how interactions between metformin, clindamycin, and pantoprazole contribute to probable side effects[13].

Table 2: DIPS Question Score

Naranjo's score					
Sl No.	**Question**	**sure**	**Not sure**	**No idea**	**Score in our case**
01	Does this response have any prior conclusive reports?	1	0	0	1
02	Did the suspected medication cause the adverse event	2	-1	0	2
03	When the medication was stopped or a particular antagonist was given, did the adverse reaction get better?	1	0	0	1
04	When the medication was given again, did the adverse reaction manifest?	+2	1	0	0
05	Could the reaction have been brought on by any other factors except the drug?	-1	+2	0	-1
06	Was there a hazardous concentration of the medication found in any bodily fluids?	+1	0	0	0
07	When a placebo was administered, did the reaction resurface?	-1	+1	0	0
08	Did a higher dose cause a more severe reaction, or did a lower amount cause a less severe reaction?	+1	0	0	0
09	Has the patient already experienced a similar reaction to the same or comparable drugs?	+1	0	0	0
10	Did objective evidence support the detrimental events?	+1	0	0	1

The total score of 4 is shown in Table 2, indicating that the reported symptoms are most likely a result of the possibility of ADRs[12].

A pie chart shows Figure 4 hypothetically shows each medicine's potential contribution to the overall risk of adverse drug reactions (ADRs) in this situation. This distribution depicts how cefotaxime, piperacillin/tazobactam, clindamycin, and pantoprazole may affect the patient's adverse effects.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24NOV887

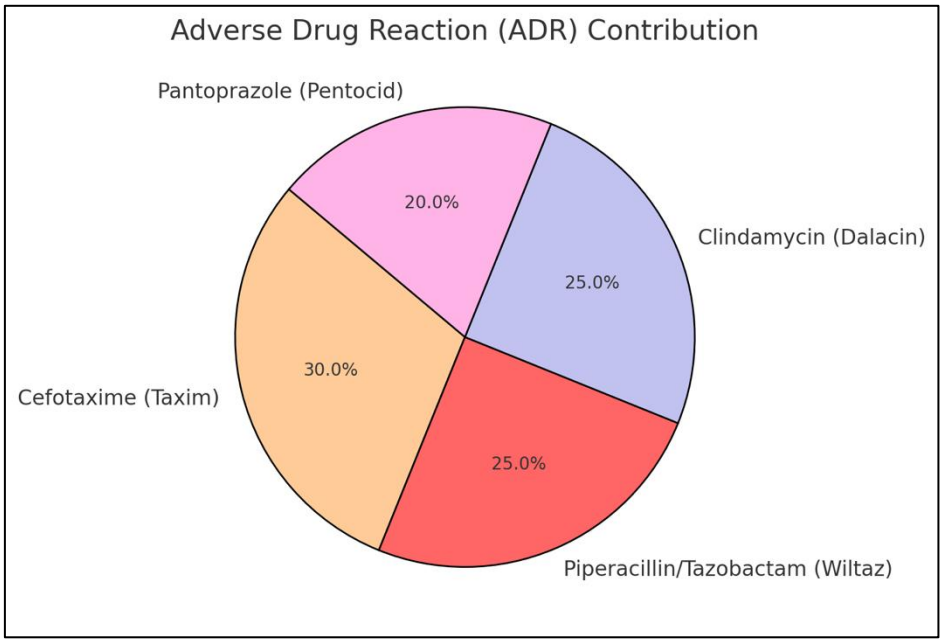

Fig 4: DIPS Score

V. CONCLUSION

In this case emphasises the importance of meticulous drug monitoring in type 2 diabetic patients getting complex infection treatment. Cefotaxime induced adverse responses that required its withdrawal, which alleviated symptoms and stabilised blood glucose levels. Effective management entailed selecting appropriate drugs, monitoring glucose and electrolytes, and informing the patient about potential side effects. This personalised approach helped limit hazards and improve patient results.

Informed consent form: NA.

Conflict of interest: NA.

REFERENCES

[1]. Ruchi, Roy., Raj, Kumar, Singh., Sasha, H., Shafikhani. 3. Infection in Diabetes: Epidemiology, Immune Dysfunctions, and Therapeutics. Contemporary diabetes, (2024). doi: 10.1007/978-3-031-55715-6_17.

[2]. Victoria, Nalls. 5. Caring for Diabetic Foot Ulcers. Caring for The Ages, (2023). doi: 10.1016/j.carage.2023.09.011.

[3]. Sabyasachi, Maity., Noah, Leton., Narendra, Nayak., A., Jha., Nikhilesh, Anand., Kamala, Thompson., Danielle, Boothe., Alexandra, Cromer., Yaliana, Garcia., Aliyah, Al-Islam., Samal, Nauhria. 1. A systematic review of diabetic foot infections: pathogenesis, diagnosis, and management strategies. Frontiers in clinical diabetes and healthcare, (2024). doi: 10.3389/fcdhc.2024.1393309.

[4]. Nasrin, Piran., Maryam, Farhadian., Ali, Reza, Soltanian., Shiva, Borzouei. 2. Diabetic foot ulcers risk prediction in patients with type 2 diabetes using classifier based on associations rule mining. Dental science reports, (2024). doi: 10.1038/s41598-023-47576-w.

[5]. Meldijana, Omerbegović., Amira, Durić., Nusreta, Muratović., Lejla, Mulalić., Emina, Hamzanija. 2. Metabolic response to trauma and stress. Medicinski arhiv, (2003).

[6]. P., R., Black., D., W., Wilmore. 5. Alterations in fuel metabolism in stress. (1983). doi: 10.1007/978-94-011-5918-0_22.

[7]. Olivia, B., Hughes., Flor, Macquhae., Adele, Rakosi., Ingrid, Herskovitz., Robert, S., Kirsner. 7. Stress and Wound Healing. (2017). doi: 10.1007/978-3-319-46352-0_19.

[8]. Stephen, Breazeale., Stephanie, Barrett., William, Daniel, Holland., Megan, Webb. 8. Pain and Mental Health Symptoms After Traumatic Orthopedic Injury.. American Journal of Nursing, (2022). doi: 10.1097/01.NAJ.0000873444.48723.48.

[9]. P., R., Black., D., W., Wilmore. 5. Alterations in fuel metabolism in stress. (1983). doi: 10.1007/978-94-011-5918-0_22.

[10]. Raffaella, Di, Luzio., Rachele, Dusi., Arianna, Mazzotti., Maria, Letizia, Petroni., Giulio, Marchesini., Giampaolo, Bianchi. 3. Stress Hyperglycemia and Complications Following Traumatic Injuries in Individuals With/Without Diabetes: The Case of Orthopedic Surgery. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, (2020). doi: 10.2147/DMSO.S225796.

[11]. Cheng-Shyuan, Rau., Shao-Chun, Wu., Yi-Chun, Chen., Peng-Chen, Chien., Hsiao-Yun, Hsieh., Pao-Jen, Kuo., Ching-Hua, Hsieh. 4. Higher Mortality in Trauma Patients Is Associated with Stress-Induced Hyperglycemia, but Not Diabetic Hyperglycemia: A Cross-Sectional Analysis Based on a Propensity-Score Matching Approach.. International Journal of Environmental Research and Public Health, (2017). doi: 10.3390/IJERPH14101161.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24NOV887

[12]. Subba.Dil .1.EVALUATION OF ADVERSE DRUG REACTIONS ASSOCIATED WITHMONOCEF(CEFTRIAXONE) IN A 65-YEAR-OLD MALE WITH HYPERTENSION AND COPD: A CASE STUDY. International Research Journal of Modernization in Engineering Technology and Science.(2024). doi: 10.13140/RG.2.2.21990.043846.
[13]. Tecen-Yucel, K., Bayraktar-Ekincioglu, A., Yıldırım, T., Demirkan, K., & Erdem, Y. (2024). Evaluation of drug interaction between cyclosporine and lercanidipine: a descriptive study. *European journal of hospital pharmacy : science and practice*, *31*(6), 560–563. https://doi.org/10.1136/ejhpharm-2023-003757.