# Potential Hypoglycemia in Patients With Type 2 Diabetes Mellitus Due to Drug Interactions in Citra Husada Hospital

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## ABSTRACT

Diabetes mellitus (DM) is a metabolic disorder disease characterized by an increase in blood glucose due to decreased insulin secretion by pancreatic beta cells, insulin disorders or resistance. The main risks that are commonly found in every patient diagnosed with DM disease include hypoglycemia. In a study conducted at a public hospital in Jakarta, 186 incidents of interaction of antidiabetic drugs with other drugs that have hypoglycemia potential with a moderate clinical significance level of 83.8% were found. The potential for drug interactions in DM patients is still very frequent. This can be caused by the number of drugs that are often used *(Polipharmacy* or *multiple drug therapy).* The purpose of this study is to identify the potential for hypoglycemia in type 2 DM patients due to drug interactions at Citra Husada Jember hospital. This type of research is qualitative research with retrospective data collection. The design of this study uses *a cross-sectional* design. The population of this study is 662 medical record data of outpatients with type 2 diabetes for the period of January – December 2022. Data analysis uses univariate analysis. In this study, most patients have the potential to experience hypoglycemia.
**Key words:** diabetes mellitus; drug interactions; hypoglycemia.

## INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder characterized by increased blood glucose levels due to decreased insulin secretion in pancreatic beta cells, insulin disorders or resistance (Federation, 2015). The main risks that often occur in every person with DM include hypoglycemia, hyperglycemia, diabetic ketoacidosis, dehydration and platelets. Hypoglycemia and hyperglycemia are risks *major* which is often suffered by type 2 DM patients (*Pedoman Penatalaksanaan Diabetes Mellitus Tipe 2 pada Individu Dewasa di Bulan Ramadan*).

According to *International Diabetes Federation* The number of DM sufferers worldwide in 2000 has reached 151 million sufferers. In 2013, it jumped to 382 million patients. The results of a survey conducted by the IDF in 2020 got 463 million and are predicted to continue to increase to 578 million sufferers by 2030 (Federation, 2021). The Ministry of Health of the Republic of Indonesia in the 2020 Indonesia Health Profile stated that the number of DM sufferers in Indonesia until the end of 2020 was 3,941,698 sufferers. In the East Java region at the end of 2020 with the number of DM sufferers as many as 844,018 patients with a prevalence of 2.1% higher than the national prevalence of DM (1.5%) (Kesehatan, 2023). Based on data from the health office in 2021, DM cases in Jember were 1.4%.

The potential for drug interactions in DM patients often occurs, due to the number of drugs that are often used *(Polypharmacy or multiple drug therapy*). Drug interaction problems are important problems to be identified in order to achieve therapeutic results, especially in patients with special conditions such as type 2 DM

patients who receive drug therapy in various quantities and types, one of the potential consequences of drug interaction is hypoglycemia (Diabetes Canada Clinical Practice Guidelines Expert, Yale, et al., 2018). Hypoglycemia is a state of decreased serum glucose concentration with or without symptoms of the autonomic system and neuroglycopenia. Hypoglycemia is characterized by a decrease in blood glucose levels with or in the presence of *Whippel's triad*. Hypoglycemia often occurs in type 1 DM followed by type 2 DM treated with insulin and sulfonylurea (Sukmadani Rusdi, 2020).

Drug interaction problems are important problems to be identified in order to achieve the desired therapeutic results, especially in patients with special conditions such as type 2 DM patients who receive drug therapy in various quantities and types, one of the potentials result The occurrence of drug interactions is hypoglycemia. Hypoglycemia is a condition of decreased serum glucose concentration with or without symptoms of the autonomic system and neuroglycopenia (Furdiyanti et al., 2017).

The role of a pharmacist or pharmacist in this drug interaction is to monitor drug use and provide solutions to clinical problems such as interactions *major, minor* and *moderate*. Pharmaceutical services at The hospital has 2 (two) activities, namely managerial activities in the form of management of pharmaceutical preparations, medical devices, and consumable medical materials and clinical pharmaceutical service activities. These activities must be supported by human resources, facilities and equipment (INDONESIA, 2016).

A study conducted in the United States stated that the incidence of drug interactions in hospitals was 88% in groups of geriatric patients and adult patients (Agustin & Fitrianingsih, 2020). Research in Manado also reported that the occurrence of drug interactions in type 2 DM ranked highest among the incidence of drug-related problems (*drug related problems*/DRP) is 60% (Lira et al., 2017). In Saibi's research *et al* (2020) found 186 events of interaction of antidiabetic drugs with other drugs that have the potential to cause hypoglycemia with a level of clinical significance *moderate* by 83.8% (Saibi et al., 2020).

Based on these problems, a study is needed to discuss and identify the potential for hypoglycemia that can occur in type 2 DM patients due to drug interactions. This research was conducted at Citra Husada hospital due to the high prevalence of diabetes mellitus in the hospital. This study aims to determine the potential incidence of drug interactions in type 2 DM patients at one of the Citra Husada Jember Hospitals that have the potential to cause hypoglycemia.

## MATERIAL AND METHODS

This type of research is qualitative research with data collection *Retrospective* That is research obtained based on information from patient medical record data sources. The research design used in this study is the design *cross-sectional*. *Cross Sectional Design* is a research money used to study the dynamics of the correlation between risk factors and effects, by means of approaches and observations (Abduh et al., 2022). The population in this study is 662 medical record data of outpatients with type 2 diabetes for the period of January – December 2022 at Citra Husada Hospital, Jember. The sample in this study is the medical record data of patients diagnosed with type 2 DM who meet the inclusion and exclusion criteria. Sampling was calculated using the slovin formula using the *random sampling* and the results of 84 medical record samples were obtained.

The research instrument used in data collection is using a data recapitulation sheet. The procedure for collecting medical record data of 662 patients according to the population and medical records that meet the inclusion criteria is 539 samples of medical records. The medical records are observed/observed by the patient's identity (age, gender and diagnosis) and then the drugs used on the patient are researched. Furthermore, the drug used by the patient is applied to the medscape and seen if there is any drug interaction. If there is a drug interaction, does the interaction fall into the category *minor, moderate*or *major*. Then it is seen how much the patient's GDA, from the interaction of the drug and the GDA, it can be concluded whether it causes hypoglycemia. Relationship between drug interaction categories (*minor, moderate*or *major*) with the GDA value in diabetic patients refers to the level of impact or risk of drug interactions on blood sugar control. The analysis in this study uses univariate analysis, data is presented in the form of frequency and percentage. Data processing using Microsoft Excel. The use of Microsoft Excel as an analysis tool can make it easier to visualize and interpret data quickly and efficiently (Novian, 2014).

## RESULT AND DISCUSSION

The study with the title Potential Hypoglycemia in Type 2 DM Patients Due to Drug Interactions at Citra Husada Hospital aims to identify the potential for hypoglycemia in type 2 DM patients due to drug interactions at Citra Husada Hospital. This research was conducted in March-April 2024 at Citra Husada Hospital, Jember. The sample in this study is the medical records of type 2 DM patients at Citra Husada Hospital for the January-December 2022 period. This research received ethical approval with No. 159/KEPK/UDS/II/2024. The following are the characteristics of patients based on gender, age, and comorbidities in type 2 DM patients.

Based on data from table 1, it was found that the characteristics of female patients dominated by 58.33% of the total patients. Research conducted at Undata hospital concluded that most of the type 2 DM sufferers are women (Nurlaelah et al., 2015). Women are more at risk of developing type 2 DM because physically women have a greater probability of increasing body mass index. Monthly cycle syndrome (*premenstual syndrome),* after *Menopause* hormonal processes make fat distribution in the body easy to accumulate, so women are more at risk of developing DM. The hormones that affect are estrogen and progesterone, when these hormones decrease, the performance of fat use in older women decreases. Women tend to be more at risk of developing type 2 DM than men because women have higher cholesterol. As well as differences in doing physical activities and daily lifestyles. Men have a fat amount of about 15-20% compared to the amount of fat in women of about 20-25%. This makes women have a higher risk of developing DM than men (Imelda, 2019).

The age group is dominated by patients aged 50 – 70 years and most are patients with comorbidities. The study at Private Hospital X in Denpasar got the same results in terms of age range and gender (Tirta et al., 2023). The elderly (elderly) is someone who is over 60 years old (Qalbi & Maryoto, 2023). At the age of more than 60 years, it has an impact on three aspects, namely biological, economic and social. Biologically, the elderly will experience a decrease in physical endurance and be vulnerable to disease attacks (Akbar et al., 2021).

Elderly patients are more at risk of developing DM due to increased glucose intolerance which can lead to reduced insulin production by pancreatic beta cells (Widiasari et al., 2021). Thus, DM disease has many negative impacts on elderly

patients, therefore it is important to monitor and handle complaints found in the elderly as well as the importance of understanding and adherence to a healthy lifestyle such as diet, diet, physical activity and regular blood sugar checks (Kurdi et al., 2021). DM sufferers are more susceptible to being affected by the elderly due to declining body immunity and limited activities, making them unproductive and affecting their health (Meilani et al., 2022).

Patients with DM with comorbidities usually need medications for other conditions such as hypertension, hyperlipidemia, or heart disease. Based on data from table 1, it shows that the most common comorbidities suffered by patients are hypertension (57.14%). The results of this study are in line with research conducted by Rasdianah (2021) stating that hypertension is a common comorbidity found in type 2 DM patients, out of a total of 91 patients, 44 patients or 48% are DM patients with hypertensive comorbidities (Rasdianah et al., 2021). Hypertension is a common comorbidity in people with DM, both of which have a continuous pathophysiological mechanism, namely system activation *Renin angiotensin aldosterone* inadequate RAAS, oxidative stress, increased activation of the sympathetic nervous system, dysfunction of the adaptive immune system response and innate abnormal renal sodium handling (Lastra et al., 2014).

Based on the data from table 2, it shows that most drugs experience interactions. The most common type of interaction based on severity is interaction *moderate* of a total of 84 prescriptions that experienced drug interactions as many as 67 or 82.14%. Drug interactions are caused by comorbidities that require various kinds of drugs (polypharmacy) in therapy. The results of this study agree with Setyoningsih and Zaini in 2022 at Dr. R. Soetrasno Rembang Hospital stated that 75.6% of patients experienced drug interactions (Setyoningsih & Zaini, 2022). Patients get a prescription for polypharmacy due to chronic diseases and medication to eliminate side effects (Zulkarnaini & Martini, 2019).

Most DM patients have comorbidities where the drugs they get become more. The use of these drugs is not only to overcome type 2 diabetes and comorbidities suffered. Therefore, patients receive polypharmacy that has the potential for drug interactions, interactions that may occur based on severity include interactions *minor, moderate,* and *major*. Drug interactions are clinically important because they result in increased toxicity or reduce the effectiveness of therapy (Hestiana, 2017). Interaction *Minor* generally does not cause significant changes in blood sugar control. Such as an increase or decrease in blood sugar within tolerable limits (Reyaan et al., 2021). Interaction *moderate* can lead to more significant changes in blood sugar control i.e. substantial increases in blood sugar or significant decreases, which require dosage adjustments or stricter management (Herdaningsih et al., 2016). Interaction *major* have a serious impact on blood sugar control leading to hypoglycemia requiring a change in medication regimen or immediate medical intervention (Susanto et al., 2015). In this study, the most interactions that occur based on severity are interactions *moderate*.

Identification of interactions between drugs is carried out by selecting a prescription that contains two or more types of drugs, then determining the level of drug interaction based on its severity through an application *Medscape* (*drug interaction checker*). Drug interactions based on their severity are divided into 3 levels, namely *major, moderate* and *Minor* (Ningrum et al., 2023). Based on data from table 3, as many as 56 incidents of antidiabetic drugs interacting with other drugs that have the

potential to cause hypoglycemia with a level of clinical significance *moderate* by 83.58%.

In the research conducted by saibi *et al* (2020) in a public hospital in Jakarta found similar results that there were 156 incidents of interactions between antidiabetic drugs and other drugs that had the potential to cause hypoglycemia as much as 79.49%. Interaction *moderate* causing changes in the patient's clinical condition so that it requires a change in therapy. Hypoglycemia is a condition in which blood sugar levels are very low and usually occurs in patients with type 1 DM and type 2 DM treated with insulin and sulfonylureas. Severe hypoglycemia is characterized by confusion, coma or seizures that require help from others. The frequency and severity of hypoglycemia negatively affect the patient's quality of life (Diabetes Canada Clinical Practice Guidelines Expert, Embil, et al., 2018).

Based on research that has been carried out interaction *moderate* is the most commonly found interaction. This interaction can be prevented by providing a time lag in drug administration, especially for drugs that interact pharmacokineticly so that the two drugs are not consumed simultaneously or only use one drug in special circumstances. Interaction effects *moderate* can cause changes in the clinical status of patients so that monitoring is necessary. Potential interactions *moderate* It occurs more in elderly patients, because elderly patients are susceptible to drug interactions due to physiological changes and an increased risk of developing chronic diseases that result in an increase in drug consumption exceeding one type of drug (Hanutami & Dandan, 2019).

The second most common interaction is minor interaction. Minor interactions are generally still tolerated and no change in the therapy regimen is required and can be treated such as pausing the time of drug administration if the drug interaction has an impact on the absorption process. However, to anticipate the undesirable, pharmacists can monitor symptoms or side effects and blood sugar levels in patients related to drug use (Cahyaningsih & Wicaksono, 2020).

The impact caused if there is a potential drug interaction includes a decrease in the effect of therapy, an increase in toxicity, or pharmacological effects that can harm the patient, where one of the ways of handling it is the role of a pharmacist who must convey drug information more thoroughly and completely, especially in providing information related to drug side effects and drug interactions that can occur when patients use two or more types of drugs in a certain amount of time. Same time (Prasetyawan & Mayasari, 2024).

In application *pharmaceutical care* Focusing on patients, pharmacists are required to be able to prevent and overcome drug interactions by monitoring the occurrence of drug interactions when performing pharmaceutical services and then being able to take appropriate actions based on the severity of drug interactions. In addition, pharmacists must also ensure that the information provided to patients such as how to use drugs is truly understood by patients so that they can minimize the potential for drug interactions and increase the effectiveness of therapy (Mulyagustina. et al., 2017).

In table 4, drug interactions by severity *Minor* It occurred in 7 cases (63.64%) in combination with glimepiride with sitagliptin. Interaction *Minor* had insignificant side effects and had no effect on the results of the therapy. Clinically interacting *Minor* It is not dangerous if used and should be monitored while in use. Sitagliptin is an oral hypoglycemic antidiabetic drug that belongs to the inhibitor class *dipeptidyl-peptidase*

4, Sitagliptin helps control blood sugar levels by increasing substances in the body that make the pancreas release more insulin (Asti et al., 2016). Meanwhile, glimepiride is a sulfonylurea drug with a mechanism of action that stimulates insulin secretion in the pancreas, so it is effective in diabetics whose pancreatic β cells are still functioning properly (Rahim et al., 2021).

Sitagliptin when used simultaneously with glimepiride can increase the risk of hypoglycemia due to a greater increase in insulin response. If the dose of glimepiride is too high while the food intake or physical activity is unbalanced, there will be an excessive increase in insulin secretion because these two drugs are used to control blood sugar levels in people with type 2 diabetes and can increase the risk of low blood sugar if used together (Poluan et al., 2020).

According to the Indonesia Drug Specialist Information (ISO), sitagliptin has two doses, namely 50 mg and 100 mg, which are used for type 2 DM patients. Citagliptin is used 1 x 100 mg/day for single or combination administration. The maximum dose of sitagliptin is 100 mg/day. Therefore, the use of a combination of glimepiride and sitagliptin is recommended not to exceed the maximum dose, namely sitagliptin 100 mg and glimepiride 8 mg so that there is no risk of hypoglycemia because these two drugs have the same mechanism of action in lowering blood glucose levels.

Based on data from table 4, drug interactions by severity *moderate* It occurs a lot in the combination of metformin with amlodipine, which is as much as 14 or 25%. The effects can cause changes in the patient's clinical condition and may require a change in therapy (Nisa, 2020). Metformin is an oral anti-diabetic that belongs to the biguanid group which is the first line for patients with type 2 diabetes with a mechanism of action reduces liver glucose production (*Gluconeogenesis*) and improve peripheral glucose (PERKENI, 2021). Meanwhile, Amlodipine is a hypertensive drug in the calcium antagonist group (Zulfiah & Dayani, 2019). Metformin when given along with amlodipine can reduce the effects of metformin through pharmacodynamic antagonism mechanisms and can cause very low blood sugar levels or hypoglycemia.

According to the Indonesia Drug Specialist Information (ISO), metformin with a dose of 500 mg is used for type 2 DM patients and patients whose blood sugar levels cannot be controlled by diet alone, as monotherapy or a combination of sulfonylureas. The initial dose of 3 x 500 mg a day and the maximum dose of metformin is 3 grams/day, therefore the dose of metformin is recommended not to exceed the maximum limit so that there is no risk of hypoglycemia. Amlodipine has two doses which are 5 mg and 10 mg. Amlodipine is used for the treatment of hypertension, chronic stable angina, and vasospastic angina. Amlodipine can be given as a single therapy or in combination with other antihypertensive and antianginal drugs. The recommended initial dose is 1 x 5 mg/day with a maximum dose of 1 x 10 mg/day.

In table 5, data were obtained on 5 cases of patients with hypoglycemia from GDA 62, 68, 65, 57, and 45, respectively. One of the drugs that interacts here is diclofenac sodium with glimepiride, the interaction of the two drugs is included in the level of clinical significance *moderate.* Diclofenac sodium is a non-selective NSAID that works by preventing the synthesis of prostaglandins through enzyme inhibition *cyclooxygenase* COX-1 and COX-2 on central nervous system and tissues (Isnenia., 2020). Diclofenac sodium is a non-steroidal anti-inflammatory drug that is generally used for arthritis sufferers. In addition to being used as a pain therapy in neuropathy, diclofenac sodium is often used in patients with diabetes mellitus with comorbidities of

bone and joint diseases (Agustin & Ratih, 2015). Meanwhile, glimepyride is a third-generation sulfonylurea oral antidiabetic drug that is able to lower blood glucose levels (Darusman & Siti, 2017). The mechanism of action of sulfonylurea is to stimulate insulin secretion from pancreatic β cells, especially by inhibiting ATP-sensitive potassium channels (*adenosine triphosphate)* in the cell membrane β (Proks et al., 2018).

Diclofenac sodium and glimepiride have strong bonds to plasma proteins, especially albumin. When sodium diclofenac and glimepiride are administered simultaneously, they can compete with each other in occupying plasma proteins which can affect the distribution, metabolism and elimination of both in the body. Diclofenac sodium and glimepiride are mostly metabolized by the CYP2C9 enzyme in the liver. Glimepiride undergoes significant metabolism in the liver, inhibition of the enzyme by sodium diclofenac can lead to an increase in glimepiride levels in the blood. This can enhance the hypoglycemic effects of glimepiride and increase the risk of hypoglycemia (Faizi & Kazmi, 2017).

According to information from Indonesian drug specialists (ISO), glimepiride is divided into 4 doses, namely 1mg, 2mg, 3mg, and 4 mg. The initial dose of glimepiride administration is 1 mg/day. The dose can be increased based on routine sugar monitor checks at intervals of 1 to 2 weeks. The maximum dose of glimepiride is 8 mg/day. Therefore, the administration of glimepiride doses is recommended not to exceed the maximum dose limit so that hypoglycemia does not occur. Diofenak sodium has two doses, namely 25 mg and 50 mg. The maximum dose of diclofenac sodium is 150 mg/day.

Hypoglycemia is a decrease in blood glucose levels <70 mg/dl. Hypoglycemia requires prompt and appropriate treatment. If not treated quickly, it will have severe clinical consequences such as cognitive impairment, decreased consciousness, can trigger cardiovascular disease, and even cause brain failure to death. Patients must understand and be able to identify clinical manifestations and management of hypoglycemia. In addition, patients should pay attention to the use of insulin and adjust their diet and exercise activities to prevent hypoglycemia (Syarli et al., 2021).

In this study, it was found that 7.46% of patients experienced hypoglycemia with a GDA of <70 mg/dl out of the total patients who had the potential to experience hypoglycemia as much as 92.54%. This study shows that most of the patients who experience hypoglycemia are elderly patients. This is because elderly patients with diabetes tend to have a higher risk of developing hypoglycemia caused by several factors, including an increase in the prevalence of comorbidities in elderly patients, nutritional problems and nutritional deficiencies, the use of many types of drugs (polypharmacy) (American Diabetes, 2019).

To address the risk of hypoglycemia in elderly patients with diabetes, one of the recommended recommendations is to switch patients who take longer-acting sulfonylurea oral antidiabetic drugs to short-acting drugs. Sulfonylurea is an oral antidiabetic that can stimulate the release of insulin from the pancreas. However, drugs from this group have a fairly long duration of action, so they can increase the risk of hypoglycemia, especially in elderly patients. Therefore, it is recommended to switch the use of long-acting sulfonylureas to other oral antidiabetic agents that have a shorter duration of action. This can help reduce the incidence of hypoglycemia in elderly patients with diabetes. Some examples of oral antidiabetic drugs that work shorter and

can be an alternative to sulfonylureas include the biguanid class, DPP-4 inhibitors, or GLP-1 agonists (Prasetyo, 2019).

In patients treated with insulin, long-acting insulin analogues may be a good option because they can reduce the risk of hypoglycemia. Long-acting insulin *(Long-Acting Insulin)* is a type of insulin that can control blood sugar for up to 12-24 hours. This type of insulin is used once a day at night. Long-acting insulin analogues are generally recommended for type 1 DM, type 2 DM patients who require basal insulin, as well as elderly patients at high risk of hypoglycemia. Examples of long-acting insulin analogues include lantus, determir, and levemir (Abdelhafiz et al., 2015).

## CONCLUSION

This study concluded that the drugs obtained by patients had the potential for drug interactions that caused hypoglycemia with a moderate clinical significance level of 83.58%. It was found that patients who experienced hypoglycemia with a GDA of <70 mg/dl were found to be 7.46%.


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**Table.**

**Table 1. Patient Characteristics by Age and Gender**

| It | Characteristic | Sum | Percentage (%) |
|---|---|---|---|
| **1.** | **Gender** | | |
| | Man | 35 | 41,67 |
| | Woman | 49 | 58,33 |
| **2.** | **Age** | | |
| | 17-49 years old | 15 | 17,86 |
| | 50-70 years old | 69 | 82,14 |
| **3.** | **Accompanying Conditions** | | |
| | Type 2 DM | 27 | 32,14 |
| | DM type 2 + Heart | 9 | 10,71 |
| | DM type 2 + Hypertension | 48 | 57,14 |
| | Sum | 84 | 100.00 |

**Table 2. Potential Drug Interaction Distribution Data**

| Occurrence of Drug Interactions | Sum | Percentage (%) |
|---|---|---|
| No drug interactions | 17 | 20,24 |
| Drug interactions occur | 67 | 79,76 |
| Total | 84 | 100,00 |

**Table 3. Drug Interactions Based on Potential Effects and Levels of Clinical Significance**

| Potential Effects | Level of Clinical Significance | Sum | Percentage (%) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Hypoglycemia | *Moderate* | 56 | 83,58 |
| | *Minor* | 11 | 16,42 |
| | Total | 67 | 100,00 |

**Table 4. Drug Interactions Based on *Minor* and *Moderate Severity***

| Severity | Interacting drugs | Sum | Percentage (%) |
|---|---|---|---|
| ***Minor*** | 1. Glimepiride + Sitagliptin | 7 | 63,64 |
| | 2. Glimepiride + Methylprednisolone | 3 | 27,27 |
| | 3. Metformin + Furosemide | 1 | 9,09 |
| | Sum | 11 | 100 |
| ***Moderate*** | 1. Metformin + Amlodipine | 14 | 25,00 |
| | 2. Glimepiride + Bisoprolol | 13 | 23,21 |
| | 3. Pioglitazone + Simvastatin | 4 | 7,14 |
| | 4. Glimepiride+ Aspirin | 3 | 5,36 |
| | 5. Glimepiride + Nospirinal | 2 | 3,57 |
| | 6. Insulin Glargine + Candesartan | 2 | 3,57 |
| | 7. Metformin + Lisinopril | 2 | 3,57 |
| | 8. Metformin + Nifedipine | 2 | 3,57 |
| | 9. Metformin + Ramipril | 1 | 1,79 |
| | 10. Acarbose + Acarbose | 1 | 1,79 |
| | 11. Pioglitazone + Metylprednisolone | 1 | 1,79 |

| | | |
|---|---|---|
| 12. Glimepiride + Mefenamic Acid | 1 | 1,79 |
| 13. Glimepiride + Fenofibrate | 1 | 1,79 |
| 14. Glimepiride + Lisinopril | 1 | 1,79 |
| 15. Glimepiride + Insulin Detemir | 1 | 1,79 |
| 16. Glimepiride + Levofloxasin | 1 | 1,79 |
| 17. Pioglitazone + Furosemide | 1 | 1,79 |
| 18. Glimepiride + Diclofenac Sodium | 1 | 1,79 |
| 19. Insulin Detemir + Aspirin | 1 | 1,79 |
| 20. Glimepiride + Furosemide | 1 | 1,79 |
| 21. Glimepiride + Etoricoxib | 1 | 1,79 |
| 22. Insulin Glargine + Bisoprolol | 1 | 1,79 |
| Sum | 56 | 100 |

**Table 5. Data on drug use in DM patients with hypoglycemia**

| Patient | Drug name | Interacting drugs | GDA |
|---|---|---|---|
| **1** | Insulin Detemir, Insulin Aspart, Atorvastatin, Aspirin | Aspirin + insulin detemir | 68 |
| **2** | Glimepiride, Pioglitazone, Acarbose, Sciatica, Pain Preparation, Simvastatin | Pioglitazone + simvastatin | 65 |
| **3** | Glimepiride, Pioglitazone, Acarbose, Etoricoxib, Gabapentin, Mecobalamin | Etoricoxib + glimepiride | 57 |
| **4** | Glimepiride, Gabapentin, Antacids doen, Na Diclofenac, Linus, Pain | Sodium diclofenac + glimepiride | 62 |
| **5** | Insulin Glargine, Candesartan, Amlodipine, Alprazolam, Gabapentin | Candesartan + insulin glargine | 45 |

**Table 6. Percentage of potential hypoglycemia based on blood sugar levels**

| Potential Effects | GDA | Sum | Percentage |
|---|---|---|---|
| Hypoglycemia | < 70 mg/dl | 5 | 7,46 |
| | >70 mg/dl | 62 | 92,54 |
| | Sum | 67 | 100 |