



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<https://zenodo.org/records/11172558><https://www.iajps.com/volumes/volume11-may-2024/05-issue-05-may-24/>Available online at: <http://www.iajps.com>

Research Article

**MEDICATION THERAPY MANAGEMENT IN TYPE 2
DIABETES*****Vaddeboina Sowmya¹, Ayesha Thaniyath², Avaraju Srija², Katta Lohith Venkata Mani Sai², Dr. P. Polireddy³, Dr.K.N.V. Rao⁴, Santhosh Illendula⁵**¹Associate processor, Department of Pharmacology, Nalanda College of Pharmacy, Cherlapally(V), Nalgonda(D), Telangana(S), India, 508001.²Under Graduate Scholar, Department of Pharmacology, Nalanda College of Pharmacy, Cherlapally(V), Nalgonda(D), Telangana(S), India, 508001.³ Head of Department, Department of Pharmacology, Nalanda College of Pharmacy, Cherlapally(V), Nalgonda(D), Telangana(S), India, 508001.⁴Principal & Professor, Nalanda College of Pharmacy, Cherlapally(V), Nalgonda(D), Telangana(S), India, 508001.⁵Associate processor, Department of Pharmaceutical Analysis, Nalanda College of Pharmacy, Cherlapally(V), Nalgonda(D), Telangana(S), India, 508001.**Abstract:**

Hospital pharmacy is the profession that strives to continuously maintain and improve the medication management and pharmaceutical care of patients to the highest standards in a hospital setting. Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose, which leads over time to serious damage to the heart, blood vessels, eyes, kidneys and nerves. This study examines the relationship between a pharmacist-led and delivered medication therapy management (MTM) program and achievement of Optimal Diabetes Care benchmarks. MTM is a patient-centered approach that involves pharmacists working collaboratively with healthcare professionals to optimize medication use. It includes components such as medication review, assessment, monitoring, and patient education. MTM promotes medication safety, reduces hospital readmissions, and prevents adverse drug events. Integrating pharmacists into the healthcare team is crucial for successful MTM implementation. A total number of 80 cases are included in our study, all these cases met the inclusion and exclusion criteria. Parameters we assessed in the study are demographic data, risk factors, symptoms, disease diagnosed, complications, category of drugs, drug name. This study aimed to assess the current practices and perceptions surrounding MTM for type 2 diabetes through a comprehensive survey analysis. A survey instrument was designed to evaluate healthcare professionals' perspectives, including physicians, pharmacists, and diabetes educators, as well as patient experiences and perceptions of MTM. The survey was distributed electronically to a diverse sample of healthcare professionals and patients across various healthcare settings. The data collected were analyzed using descriptive statistics and thematic analysis to identify key themes and trends in MTM practices and perceptions.

Keywords: Hospital pharmacy, Diabetes, MTM, healthcare professionals, Demographic data.

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Please cite this article in press Vaddeboina Sowmya et al., *Medication therapy management in type 2 Diabetes., Indo Am. J. P. Sci, 2024; 11 (05).*

INTRODUCTION:

HOSPITAL PHARMACY: The practice of pharmacy within the hospital under the supervision of a professional pharmacist is known as hospital pharmacy.

OBJECTIVES OF HOSPITAL PHARMACY

1. To professionalize the functioning of the pharmaceutical services in hospitals.
2. to ensure availability of the required medication at an affordable cost at the required time.
3. To plan, organize and implement the policies of the pharmacy.
4. To perform functions of management of material, purchase, storage of essential items.
5. To maintain strict inventory of all items received and issued.
6. To counsel the patient, medical staff, nurses and others involved in patient care on the use of drugs, possible side effects, toxicity, adverse effects, drug interactions etc.
7. To serve as a source of information on drug utilization.
8. To manufacture drugs, large/ small volume parenteral which are critical for use in patients.
9. To participate in and implement the decisions of the pharmacy and therapeutics committee.
10. To organize and participate in research programmers, educational programmers.

ROLES AND RESPONSIBILITIES OF HOSPITAL PHARMACIST**INDOOR PHARMACIST'S RESPONSIBILITIES:****a) Central dispensing area:**

1. To ensure that all drugs are stored and dispensed correctly.
2. To check the accuracy of the dosages prepared.
3. Maintain proper records
4. Preparation of bills

5. Co-ordinate over all pharmaceutical needs of the patient

b) Patient care areas:

1. Maintain liaison with nurses
2. Reviewing of drug administration
3. Provide instruction and assistance to the junior pharmacist

c) Direct patient areas:

1. Identification of drugs brought into the hospital
2. Obtaining patients' medication history
3. Assist in the selection of drug products
4. Monitor patients total drug therapy
5. Counseling patients.

OUTDOOR PHARMACIST**RESPONSIBILITIES:****a) Central dispensing area:**

1. To ensure that all drugs are stored and dispensed correctly.
2. To check the accuracy of the dosages prepared.
3. Maintain proper records
4. Preparation of bills
5. Keeps the pharmacy neat and tidy manner

b) Patient care areas:

1. Inspect periodically the medication areas
2. Identify the drugs brought into the hospital
3. Monitoring of drugs
4. Counsel the patients

c) General responsibilities:

1. Ensure that all drugs are handled properly
2. Participate in cardio-pulmonary emergencies
3. Provide education and training for pharmacists.¹

DIABETES

Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose, which leads over time to serious damage to the heart, blood vessels, eyes, kidneys and nerves. This high blood sugar produces the symptoms of frequent urination, increased thirst, and increased hunger. Untreated,

diabetes can cause many complications. Acute complications include diabetic ketoacidosis and nonketotic hyperosmolar coma. Serious long-term complications include heart disease, stroke, kidney failure, foot ulcers and damage to the eyes.²

CAUSES:

The exact cause of most types of diabetes is unknown. In all cases, sugar builds up in the bloodstream. This is because the pancreas doesn't produce enough insulin. Both type 1 and type 2 diabetes may be caused by a combination of genetic or environmental factors. Diabetes raises the risk for damage to the eyes, kidneys, nerves, and heart³.

PATHOPHYSIOLOGY:

Type 1 diabetes is fundamentally caused by the autoimmune destruction of these insulin-producing cells. This results in an absolute deficiency of the hormone, with patients having a lifelong dependency on exogenous sources. Type 2 diabetes is characterized by a combination of peripheral insulin resistance and inadequate insulin secretion by pancreatic beta cells. Insulin resistance, which has been attributed to elevated levels of free fatty acids and proinflammatory cytokines in plasma, leads to decreased glucose transport into muscle cells, elevated hepatic glucose production, and increased breakdown of fat⁴.

Epidemiology of Diabetes:

Type 1 diabetes is the acute onset of type 1 diabetes mellitus and its rapid presentation to medical attention facilitates accurate registering of new cases. Provided ascertainment can be verified, these data can be combined with population denominator data to give age- specific and sex-specific incidences.⁵

Symptoms of Diabetes:

- Increased thirst
- Delay wound healing
- Fatigue
- Frequent urination
- Unexplained weight loss
- Blurred vision.⁶

METHODOLOGY

Study design:

- This study is a prospective observational study.

Study location:

- Nalgonda Town.

Study size:

- 80 cases

Study Duration:

- 12TH March - 3RD April 2024

Ethical consideration:

- The study protocol is accepted by the Nalanda college of pharmacy. All the participants should be knowledgeable about study details and informed agreements were acquired before the initiation of the study.

Inclusion criteria:

- Both genders were taken into the age group of 20-80.
- Diagnosed patients and the subjects willing to participate in the study.

Exclusive criteria:

- We excluded critically ill patients.
- We excluded patients, who are afraid to participate in the study.

Study procedure:

- Prospectively select the patients by simple random sampling.
- Patients are further divided according to their age group and social status.
- Then the patients will be categorized according to their disease stage condition.
- Risk factors and complications of Diabetes type 2 have been identified.

Clinical outcomes:

- Assessment of risk and complication in the subjects.
- Lifestyle modification for type 2 diabetes outcomes.
- To enhance risk and complication of diabetes, use appropriate medication.

Statistical plan:

- The statistical analysis was carried out by Microsoft Office (MS Word, MS Excel).
- Descriptive data analysis was performed in a percentage form of demographic variables.

RESULTS:

We included a total number of 80 cases in our study, all these cases met the inclusion and exclusion criteria. Parameters we assessed in the study are age, gender, risk factors, symptoms, disease diagnosed, complications, category of drugs, drug name.

GENDER WISE DISTRIBUTION OF DIABETES PATIENTS:

Among 80 patients we found that 42 patients were male, and 38 patients were female. In this study Male

patients were more prone to develop diabetes than female.

The results had given in table 01

| GENDER | NO.OF PATIENTS | PERCENTAGE |
|--------|----------------|------------|
| MALE | 42 | 52.5 |
| FEMALE | 38 | 47.5 |
| TOTAL | 80 | 100 |

Table 01: Gender Wise Distribution of Diabetes Patients.

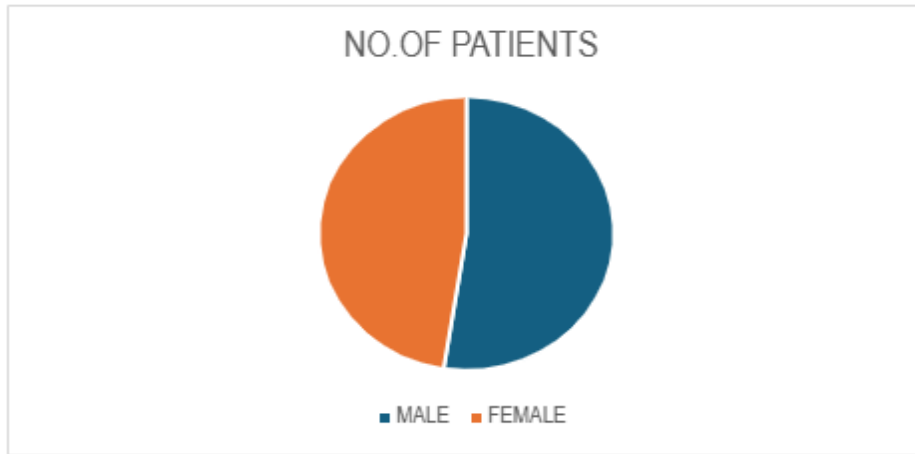


Fig 01: Gender of Diabetes Patients

AGE WISE DISTRIBUTION OF DIABETES PATIENTS:

| AGE | NUMBER |
|-------|--------|
| 20-30 | 6 |
| 30-40 | 6 |
| 40-50 | 19 |
| 50-60 | 24 |
| 60-70 | 11 |
| 70-80 | 9 |

TABLE 02: Age wise distribution of diabetes patients.

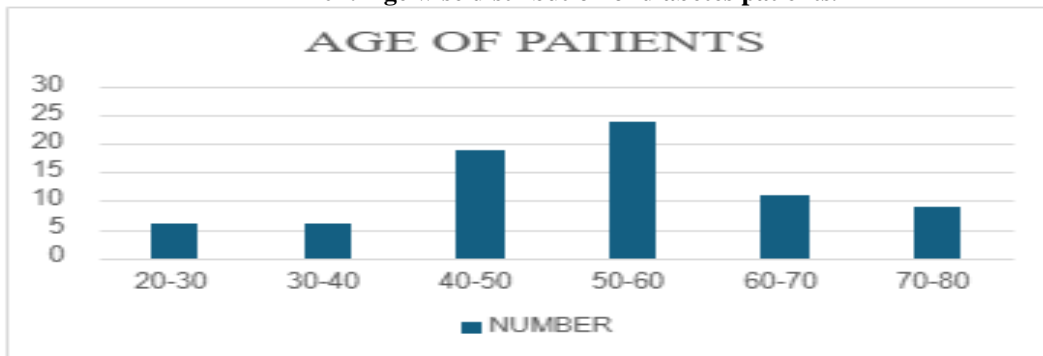


Fig 02: Age wise distribution of Diabetes Patient

DIAGNOSTIC TEST:

1. Blood Glucose Testing: Measures sugar levels after fasting (FPG) or a sugary drink (OGTT). Results of 126 mg/dL (FPG) or 200 mg/dL (OGTT) indicate diabetes.
2. HbA1c Testing: Provides a 2–3-month average of blood sugar levels. A result of 6.5% or higher indicates diabetes.
3. Fasting Plasma Glucose (FPG) Test: Measures blood sugar after fasting for 8 hours. A level of 126 mg/dL or higher indicates diabetes.

| DIAGNOSIS | NUMBER |
|----------------|--------|
| HbA1C | 19 |
| RBS | 24 |
| FBS&PLBS | 41 |
| SERUM CREATINE | 9 |

Table 03: Diagnosis test for Diabetes Patients.

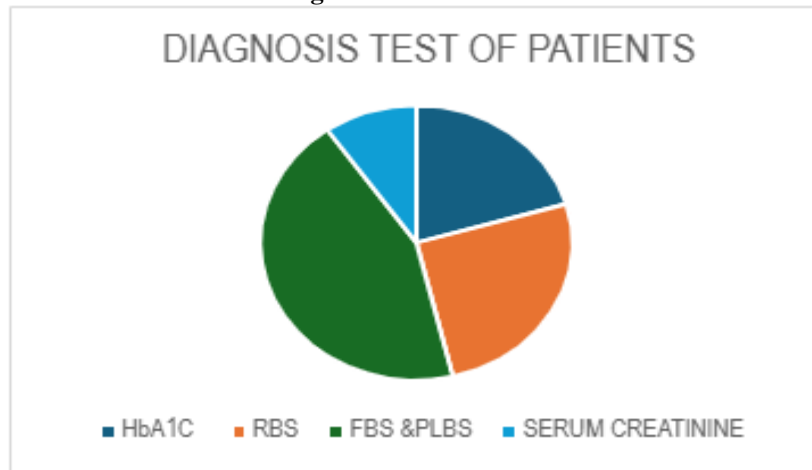


Fig 03: Diagnosis tests of diabetes patients

IN-PATIENTS & OUT-PATIENTS:

In-patients are hospitalized for diabetes care, while out-patients receive care outside the hospital through regular visits.

| TYPES | FEMALES | MALES |
|-------------|---------|-------|
| INPATIENTS | 10 | 12 |
| OUTPATIENTS | 28 | 30 |

Table 04: list of In-patients and Out-patients of diabetes patients.

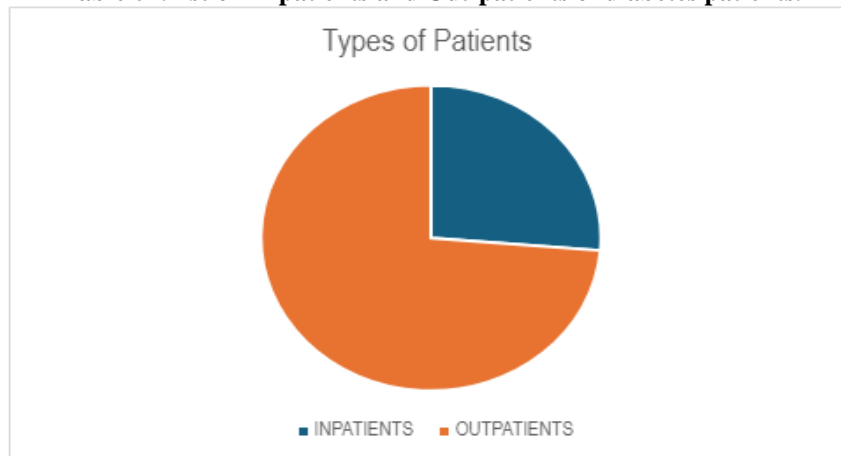
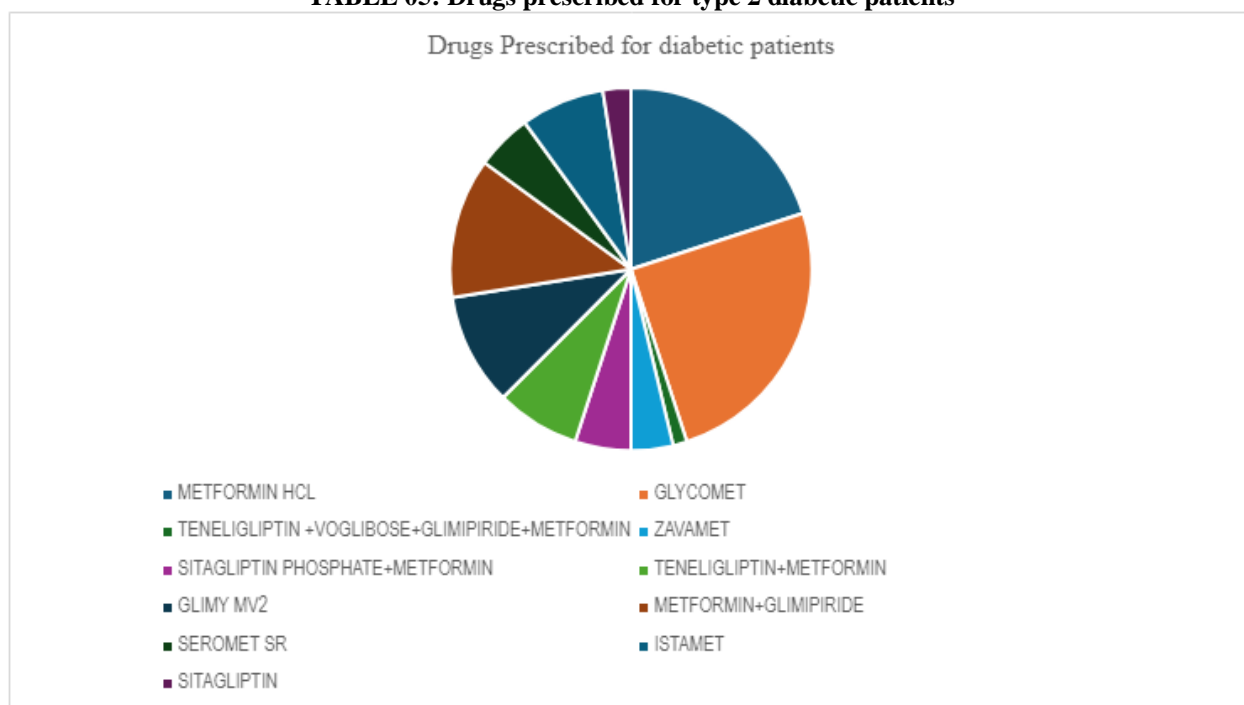


Fig 04: Number of In-Patients and Out-Patients

PRESCRIBED DRUGS FOR DIABETES PATIENTS:

In this study, out of 80 patients the drugs prescribed for Diabetes includes Metformin Hcl 500mg, Metformin Hcl 500mg [PR] + Glimipiride 1mg, Teneiglipitin 20mg + Voglibose 0.2mg + Metformin 500mg, Vidagliptin50mg+Metformin Hcl 850mg + Sitagliptin Phosphate 50mg + Metformin Hcl 500mg, Teneiglipitin 20mg + Metformin 500mg, Glimepiride 2mg + Metformin 500mg + Voglibose 0.2mg, Sitagliptin 50mg + Metformin 500mg [ER], Glimepiride 1mg + Metformin 500mg.

| DRUG NAME | NO. OF PATIENTS | PERCENTAGE |
|--|-----------------|------------|
| METFORMIN Hcl 500mg | 16 | 20 |
| METFORMIN Hcl 500mg[PR] + GLIMEPIRIDE 1mg | 20 | 25 |
| TENELIGLIPTIN 20mg + VOGLIBOSE 0.2mg + METFORMIN 500mg | 1 | 3.85 |
| VIDAGLIPTIN50mg + METFORMIN Hcl 850mg | 3 | 3.75 |
| SITAGLIPTIN PHOSPHATE 50mg + METFORMIN 500mg | 4 | 5 |
| TENELIGLIPTIN 20mg + METFORMIN 500mg | 6 | 7.5 |
| GLIMEPIRIDE 2mg + METFORMIN 500mg + VOGLIBOSE 0.2mg | 8 | 10 |
| SITAGLIPTIN 50mg + METFORMIN 500mg [ER] | 10 | 15 |
| GLIMEPIRIDE 1mg + METFORMIN 500mg | 12 | 9.9 |

TABLE 05: Drugs prescribed for type 2 diabetic patients**Fig 05: Prescribed Drugs for Patients.****SYMPTOMS OF DIABETES PATIENT:**

In this study, among 80 patients only 2 patients had Symptoms of GIT Disturbance,15 patients have Frequent Urination,20 patients have Increase in hunger, 15 patients had side effects of weight loss and weight gain,07 patients have Polydypsia, 03 patient have Liver inflammation. The results are given in table 06:

| SYMPTOMS | NO. OF PATIENTS | PERCENTAGE |
|--------------------|-----------------|------------|
| GIT DISTURBANCE | 2 | 2.5 |
| FREQUENT URINATION | 15 | 18.75 |
| INCREASE IN HUNGER | 20 | 25 |
| WEIGHT GAIN & LOSS | 15 | 18.75 |
| POLYDIPSIA | 7 | 8.75 |
| LIVER INFLAMMATION | 3 | 3.75 |

Table 06: Symptoms of Diabetes Patients.

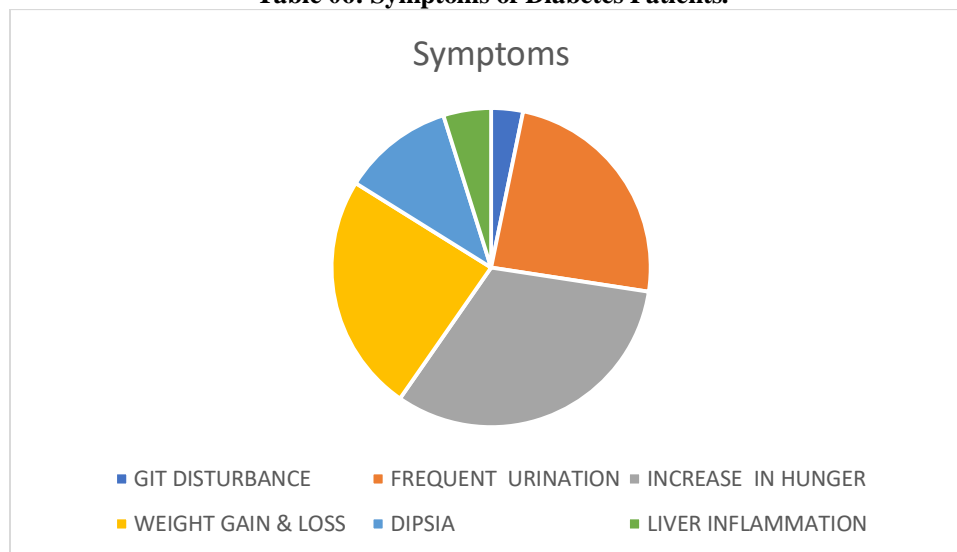


Fig 06: Symptoms of diabetes patients

DRUG – DRUG INTERACTIONS OF DAIBETES PATIENTS

Drug interactions in type 2 diabetes can impact blood sugar control. Examples include beta-blockers masking hypoglycemia. In detail given below in table 07

| DRUG NAME | DRUG - DRUG INTERACTION | AFFECTED PATIENTS |
|-------------|-------------------------|-------------------|
| METFORMIN | METFORMIN + CIMETIDINE | 8 |
| METFORMIN | METFORMIN +ANTIBIOTICS | 8 |
| METFORMIN | METFORMIN +DIURETICS | 21 |
| GLIPIZIDE | GLIPIZIDE + ACELOFENAC | 17 |
| GLYBURIDE | GLYBURIDE + IBUPROFIN | 9 |
| SITAGLIPTIN | TERBINAFINE | 4 |
| SAXAGLIPTIN | AZITHROMYCIN | 5 |
| NOVORAPID | NOVORAPID+PROPRANOLOL | 8 |

TABLE:07 Drug – Drug interactions of diabetes patient

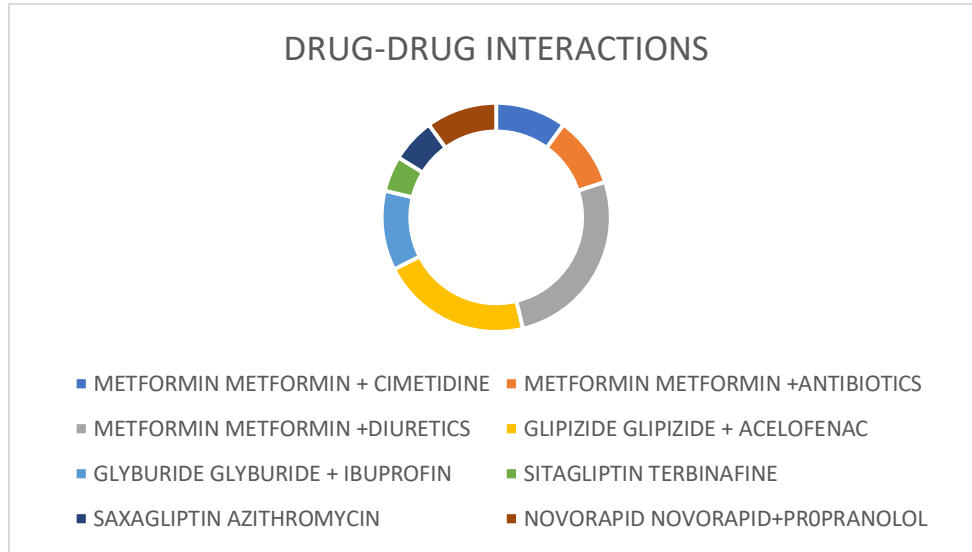


Fig 07: Drug interactions of diabetes patients

Type 2 diabetes can affect people in all professions, from office workers to healthcare professions, impacting their work and lifestyle.

| OCCUPATION | MEN | WOMEN |
|--------------------|-----|-------|
| SOFTWARE EMPLOYEES | 4 | 5 |
| SEDENTARY JOBS | 6 | 4 |
| DRIVING | 9 | 0 |
| HIGH STRESS JOBS | 11 | 13 |
| SHIFT WORKERS | 12 | 6 |
| HOUSEWIFE | 0 | 12 |

TABLE 08: Diabetes Across Professions: Impact on Diverse Occupational Groups

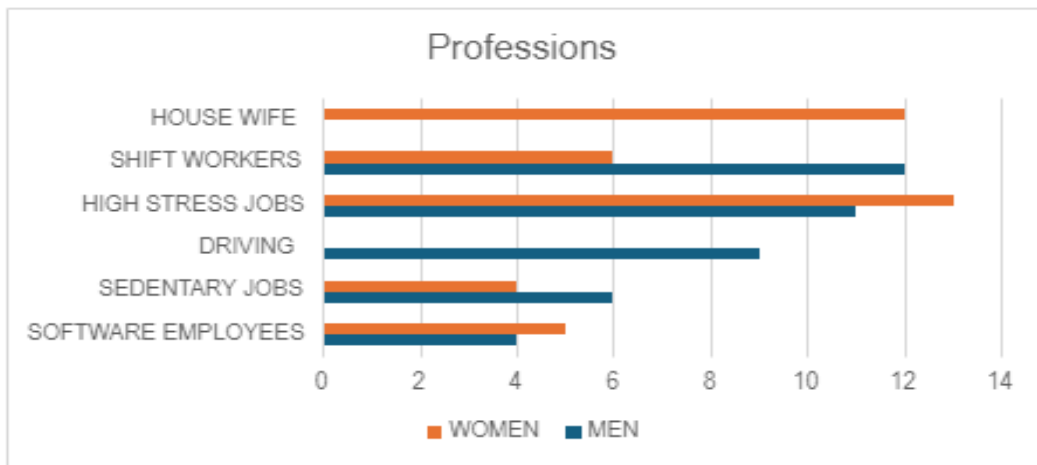


Fig 08: Diabetes Across Professions: Impact on Diverse Occupational Groups

SYNERGISTIC ACTIVITY:

Synergistic activities for type 2 diabetes patients involve combining diet, exercise, and medication management for optimal blood sugar control and overall health.

| DRUGS | SYNERGIESTIC | NO OF PATIENTS |
|--------------------------|---------------------------|----------------|
| METFORMIN+EMPAGLIFLOZIN | SHOWS SYNERGIESTIC EFFECT | 12 |
| METFORMIN+LIRAGLUTIDE | SHOWS SYNERGIESTIC EFFECT | 5 |
| GLIMIPRIMIDE+SITAGLIPTIN | SHOWS SYNERGIESTIC EFFECT | 2 |

TABLE 09: Synergistic activities for type 2 diabetes

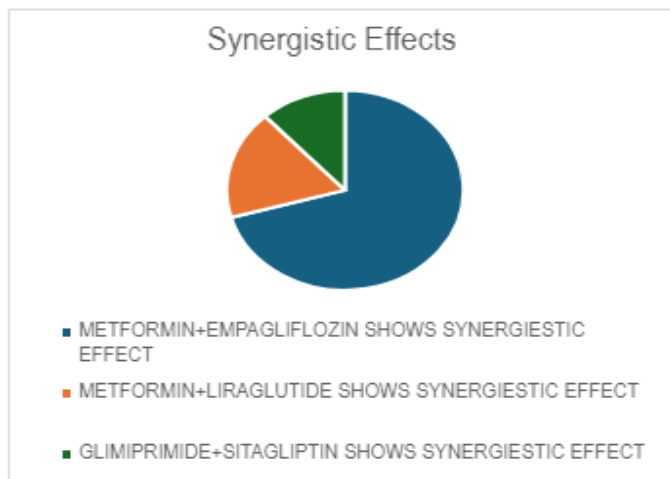


Fig 09: Synergistic effects of type 2 diabetes

Dietary Impacts on Type 2 Diabetes: Vegetarian vs. Non-Vegetarian Perspectives

Both vegetarians and non-vegetarians can be affected by type 2 diabetes. Vegetarians may have a lower risk due to their diet's higher fiber and antioxidant content, while non-vegetarians need to be mindful of saturated fats and processed meats.

| FOOD HABITS | NO.OF PATIENT |
|-----------------|---------------|
| VEGETARIAN | 22 |
| NON- VEGETARIAN | 58 |

TABLE 10: Dietary Impacts on Type 2 Diabetes: Vegetarian vs. Non-Vegetarian Perspectives

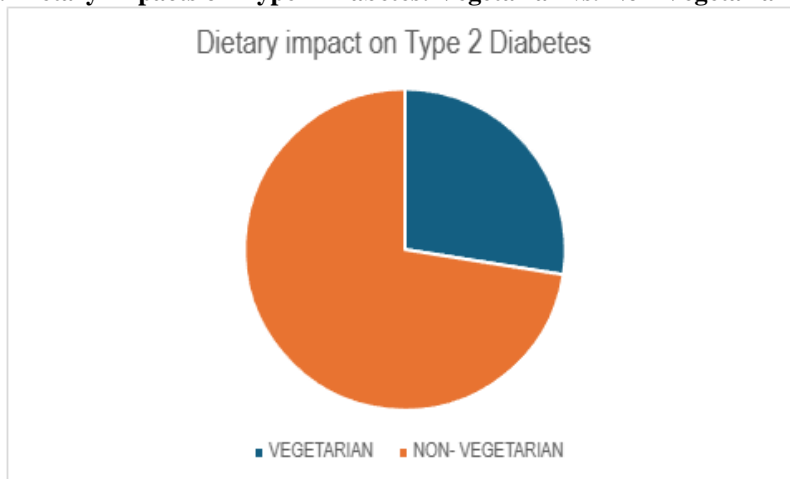
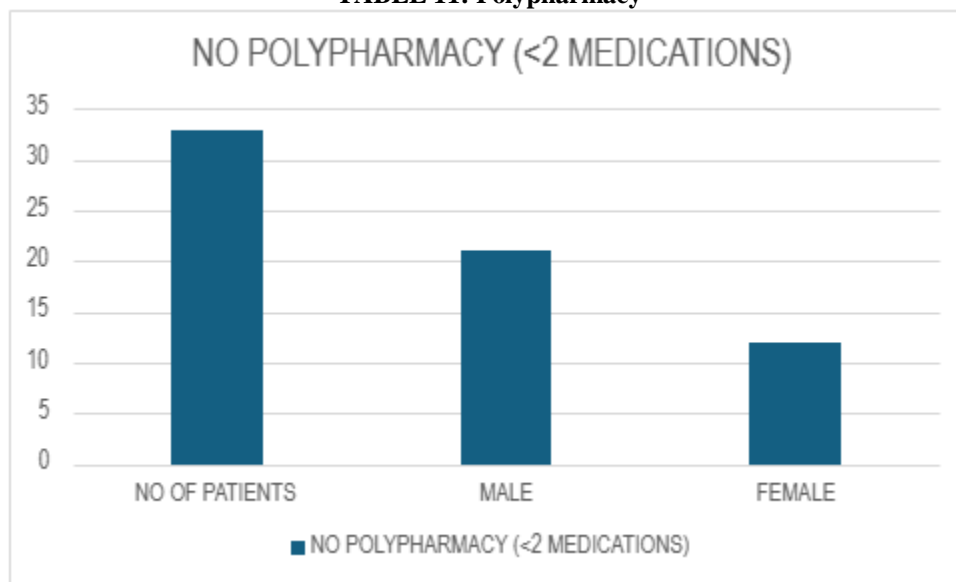


Fig 10: Dietary Impacts on Type 2 Diabetes

POLY PHARMACY:

Polypharmacy refers to the practice of taking multiple medications concurrently to manage various health conditions. It commonly occurs when an individual is prescribed numerous medications by different healthcare providers, leading to the simultaneous use of multiple drugs. While polypharmacy can be beneficial in treating complex medical conditions, it carries certain risks and challenges.

| CHARACTERISTICS | NO POLYPHARMACY (<2 MEDICATION) |
|-----------------|---------------------------------|
| NO. OF PATIENTS | 33 |
| MALE | 21 |
| FEMALE | 12 |

TABLE 11: Polypharmacy**Fig 11: Polypharmacy****DISCUSSION:**

A survey of Type 2 diabetes patients can provide valuable insights into their experiences, challenges, and needs. Such a survey could include questions about their diagnosis journey; by analyzing the survey data, healthcare professionals and policymakers can better understand the specific needs of Type 2 diabetes patients. This understanding can help in developing tailored interventions, improving patient education, and enhancing support services. We had done a study among 80 cases in the Nalgonda Town, Telangana and the climate condition of this area is very hot. In our study we observed that patients in the age groups of 30-60 & above years are acquired to develop Diabetes type 2. Diabetes among children has not been seen. Female and Male cases are respectively 38(47.5%) and 42(52.5%). In our study, in total number of cases, a greater number of males had diabetes. The maximum number of patients have showed primary symptoms like Frequent urination,

thirst, weight loss, hunger, having blurry vision. Out of 80 cases 20 patients are found to be having an increase in hunger. Overall, surveys of Type 2 diabetes patients play a crucial role in shaping diabetes care and support services, ultimately leading to better outcomes for individuals living with this condition. Epidemiologically, diabetes has reached epidemic proportions, with an increasing prevalence worldwide. This rise is largely attributed to lifestyle factors such as sedentary behavior, unhealthy dietary habits, and obesity. Additionally, genetic predisposition and environmental factors play significant roles in the development of diabetes. Preventive strategies for diabetes focus on addressing modifiable risk factors, such as obesity, physical inactivity, and unhealthy dietary habits. Public health initiatives aimed at promoting healthy lifestyles and early detection of diabetes can help reduce the burden of the disease. Both vegetarians and non-vegetarians can get type 2 diabetes. Vegetarians, with a diet rich in whole grains,

fruits, vegetables, nuts, and legumes, may have a lower risk due to better blood sugar control and insulin sensitivity. Non-vegetarians, especially those consuming a lot of red and processed meats, may have a higher risk due to factors like saturated fats and heme iron. Synergistic activities for type 2 diabetes patients involve interventions working together to improve insulin sensitivity, reduce inflammation, and oxidative stress, ultimately leading to better management of type 2 diabetes. Type 2 diabetes affects various professions, with certain occupations having a higher risk of developing the condition due to lifestyle factors. The condition can lead to substantial losses in productivity due to diabetes management. Some common prescription errors found in our project survey were incorrect dosage instructions for medications. Urine tests for monitoring glucose levels in type 2 diabetes have become less common due to advancements in blood glucose monitoring technology, which offer more accurate and timely results.

CONCLUSION:

- In conclusion, the survey of Type 2 diabetes patients has provided valuable insights into their experiences, challenges, and needs. The data gathered has highlighted the importance of personalized care and support services tailored to the individual needs of patients. It has also identified areas where improvements in diabetes care and education are needed, including better access to healthcare services, more comprehensive patient education, and increased support for lifestyle changes. Overall, this survey underscores the importance of a holistic approach to managing Type 2 diabetes, focusing not just on medical treatment but also on lifestyle factors and patient empowerment. The survey data indicating a higher prevalence of Type 2 diabetes among male patients compared to females underscores the importance of targeted interventions for this demographic. The findings suggest a need for increased awareness, early screening, and tailored prevention strategies for men. Addressing the specific risk factors and challenges faced by male patients can lead to improved health outcomes and a reduction in the overall burden of Type 2 diabetes. By the

survey data we have found some drug-drug interactions of diabetes patients and Synergistic effects of type 2 diabetes, Dietary Impacts on Type 2 Diabetic patients.

ACKNOWLEDGEMENT

The authors are grateful for the management of Nalanda college of pharmacy for their unwavering support and guidance, as well as the hospitals, doctors, and patients who participated in this survey. Their commitment, cooperation, and valuable contributions have been instrumental in the successful completion of this study.

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