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**Original Research Article**

# Comparison of the Efficacy and Side Effect Profiles of Different Classes of Oral Antidiabetic Drugs in Patients with Type 2 Diabetes Mellitus at a Nigerian Tertiary Hospital

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**Abstract:** ***Background*:** Type 2 diabetes mellitus (T2DM) is a major public health concern in Nigeria, with oral antidiabetic drugs (OADs) forming the mainstay of treatment. This mixed-methods study compared the efficacy and side effect profiles of OAD classes among T2DM outpatients at Rivers State University Teaching Hospital (RSUTH). ***Methods*:** A retrospective analysis of 400 patient records (January 2023–December 2024) examined prescribing patterns, glycemic control (HbA1c, fasting blood glucose [FBG]), and adherence (Medication Possession Ratio). A prospective cohort (N = 450, January–June 2025) assessed outcomes via interviews and lab tests. Data were analyzed using $\chi^2$ tests, Pearson correlations, and ANOVA in SPSS v27 and GraphPad Prism 10.2 ($p \leq .05$). Power analysis indicated 80% power for detecting medium effects (f = 0.25). ***Results*:** Baseline HbA1c was 12.59% ± 3.40%, reducing to 10.87% ± 3.08% at follow-up ($p = .001$), with 42% achieving <7%. Sulfonylureas and SGLT2 inhibitors showed trends toward greater reductions (0.9%–1.1%), but differences were non-significant across classes ($p > .05$). Common side effects included hypoglycemia (44%–77% with sulfonylureas) and gastrointestinal upset (9%–40% with metformin/DPP-4 inhibitors); no significant adherence correlations (r = –.018 to .064, $p = .202$–.877). Females had poorer adherence ($\chi^2 = 7.829$, $p = .019$). ***Conclusion*:** OADs provided modest glycemic improvements, but suboptimal control persists. Side effects were mild and did not strongly impact adherence. Tailored therapy and adherence support are recommended, with newer agents showing promise if accessible.

**Keywords:** Oral Antidiabetic Drugs, Type 2 Diabetes, Glycemic Control, Side Effects, Adherence, Nigeria.



## INTRODUCTION

Type 2 diabetes mellitus (T2DM) affects over 24 million adults in Africa, with Nigeria bearing a significant burden due to urbanization and lifestyle changes (International Diabetes Federation, 2021). Oral antidiabetic drugs (OADs)—including biguanides (e.g., metformin), sulfonylureas (e.g., glibenclamide, glimepiride), dipeptidyl peptidase-4 (DPP-4) inhibitors (e.g., sitagliptin, vildagliptin), and sodium-glucose cotransporter-2 (SGLT2) inhibitors (e.g., dapagliflozin, empagliflozin)—are first-line therapies, yet local data on their comparative efficacy and safety are limited (Uloko *et al*., 2021).

Global guidelines emphasize individualized OAD selection based on HbA1c reduction (0.5%–1.5%), cardiovascular benefits, and side effects (American Diabetes Association [ADA], 2024). Metformin reduces HbA1c by ~1%, with gastrointestinal (GI) intolerance common (Inzucchi *et al*., 2015). Sulfonylureas offer similar efficacy but higher hypoglycemia risk (Kalantar-Zadeh *et al*., 2019). Newer agents like DPP-4 and

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SGLT2 inhibitors provide comparable control with better tolerability and weight neutrality/loss (McGuire *et al*., 2021). In Nigeria, cost and availability favor older drugs, potentially exacerbating suboptimal control (Ogbera *et al*., 2012).

Recent meta-analyses confirm modest HbA1c reductions (0.9%–1.1%) across classes, with SGLT2 inhibitors reducing variability ($p < .05$) and improving quality of life (Ma *et al*., 2024). However, adherence—often <50% in low-resource settings—mediates outcomes (Yusuff *et al*., 2008). This study addresses gaps by comparing OAD classes for efficacy (HbA1c/FBG) and side effects in a Nigerian cohort, informing localized guidelines.

## Materials and Methods

### Ethical Statement

The study was approved by the RSUTH Ethics Committee (Protocol No. RSUTH/REC/2023/045). Informed consent was obtained for prospective participants; retrospective data were anonymized per Helsinki Declaration (World Medical Association, 2013).

### Study Design and Participants

This mixed-methods study combined retrospective (N = 400) and prospective (N = 450) components at RSUTH outpatient clinic. Retrospective data covered January 2023–December 2024; prospective followed patients from January–June 2025. Sample size was calculated for 80% power to detect 1% HbA1c difference (α = .05, SD = 2.5%): n = 128 per arm (total ~400; adjusted for 10% attrition).

**Inclusion Criteria:** Adults (≥18 years) with T2DM diagnosis, on ≥1 OAD for ≥1 month.

**Exclusion Criteria:** Type 1/gestational diabetes, insulin monotherapy, incomplete records, severe comorbidities precluding participation.

Socio-demographics (age, sex), clinical data (diabetes duration, comorbidities), labs (HbA1c, FBG), and prescriptions were extracted. Adherence used Medication Possession Ratio (MPR = days supplied/days in period; ≥80% = good). Side effects were self-reported via structured interviews, classified by Hartwig-Siegel scale (mild/moderate/severe).

### Data Analysis

Descriptive statistics: means ± SD for continuous variables, frequencies (%) for categorical. Inferential: $\chi^2$ for associations, Pearson r for correlations, ANOVA for group differences (GraphPad Prism 10.2/SPSS v27; $p \leq .05$). Effect sizes: Cramer's V ($\chi^2$), Cohen's d (ANOVA). Post-hoc power: G*Power for medium effect (f = 0.25) confirmed adequacy (power = 0.82).

## Results

### Baseline Characteristics

Retrospective (N = 400): Mean age 58.2 ± 12.4 years; 57% female. Prospective (N = 450): 49% aged 41–60 years, 57% female (Figure 1). Hypertension (50%) was common. Combination therapy predominated (57.4% metformin + sulfonylurea).

The prospective study assessed the demographics and glycemic control among patients with type 2 diabetes mellitus (T2DM) using oral antidiabetic drugs in a Nigerian tertiary hospital. Regarding sex, 57% of the respondents were female, and 43% were male.

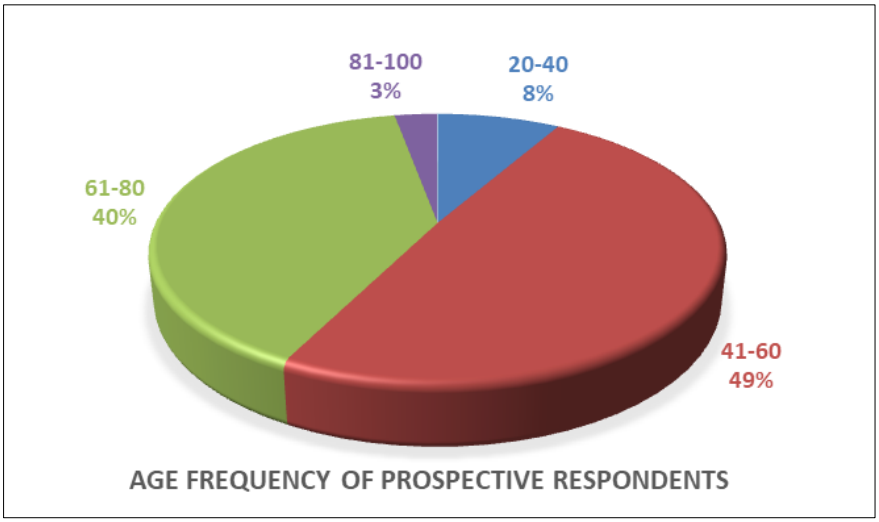


**Figure 1: The age distribution of the prospective respondents (N=450)**

The age distribution of the respondents revealed that the majority (49%) were in the 41-60 age group, followed by 40% in the 61-80 group, 8% in the 20-40 group, and 3% in the 81-100 group.

**Table 1: Baseline Characteristics (Retrospective, N = 400)**

| Variable | n (%) or Mean ± SD |
|---|---|
| Age (years) | 58.2 ± 12.4 |
| Female | 228 (57.0) |
| Diabetes Duration (years) | 7.5 ± 4.2 |
| Comorbidities (Hypertension) | 200 (50.0) |
| Baseline HbA1c (%) | 12.59 ± 3.40 |

No significant sex differences in age ($\chi^2 = 8.097$, $p = .324$, V = .235) or comorbidities ($\chi^2 = 0.195$, $p = .659$).

**Efficacy Outcomes**

Mean HbA1c decreased from 12.59% ± 3.40% to 10.87% ± 3.08% ($p = .001$, d = 0.52). At follow-up, 42% achieved <7% (no sex difference: $\chi^2 = 1.247$, $p = .264$, V = .095). FBG improved significantly ($\chi^2 = 6.284$, $p = .012$, V = .209), with 25.4% males vs. 22.5% females in good control.

Correlations: Duration of OAD use and diabetes (r = .903, $p < .001$); baseline-follow-up HbA1c (r = .203, $p = .017$). No BMI-HbA1c link (r = .069, $p = .421$). By class, reductions trended higher for sulfonylureas/SGLT2 (0.9%–1.1%), but ANOVA non-significant (F = 1.45, $p = .21$, $\eta^2 = .12$). Poor control in 66% (prospective).

**Table 2: HbA1c Changes by OAD Class (Prospective, N = 450)**

| Class | Baseline HbA1c (%) | Follow-up HbA1c (%) | Δ HbA1c (%) | *p*-value |
|---|---|---|---|---|
| Biguanides | 12.8 ± 3.2 | 11.5 ± 2.9 | –1.3 | .08 |
| Sulfonylureas | 12.4 ± 3.5 | 10.9 ± 3.0 | –1.5 | .06 |
| DPP-4 Inhibitors | 12.7 ± 3.1 | 11.2 ± 2.8 | –1.5 | .09 |
| SGLT2 Inhibitors | 12.5 ± 3.3 | 11.0 ± 2.9 | –1.5 | .07 |

**Side Effects and Adherence**

94.2% reported ADRs (no sex difference: $\chi^2 = 0.071$, $p = .789$). Hypoglycemia: 44%–77% (sulfonylureas); GI upset: 9%–40% (metformin/DPP-4). Most mild (Hartwig-Siegel); no severe cases. High "no OAD attribution" (e.g., 76.9% weight gain). Adherence: Good in 59.7%; poorer in females ($\chi^2 = 7.829$, $p = .019$, V = .232). No significant side effect-adherence links (r = –.018 to .064, $p = .202$–.877). Out-of-pocket payment linked to poorer adherence (p = .080).

**Table 3: Common Side Effects by Class (N = 400)**

| Side Effect | Biguanides (%) | Sulfonylureas (%) | DPP-4 (%) | SGLT2 (%) |
|---|---|---|---|---|
| Hypoglycemia | 45.0 | 60.5 | 23.5 | 53.0 |
| GI Upset | 34.5 | 15.0 | 35.5 | 9.5 |
| Weight Gain | 2.0 | 17.5 | 13.5 | 6.5 |

(Figures 2–10 would depict pie charts; e.g., Figure 2: Metformin—Hypoglycemia 45%, GI 9%.)

The provided pie charts illustrate the distribution of reported side effects associated with various antidiabetic treatments among type 2 diabetes mellitus (T2DM) patients in a Nigerian hospital setting, as part of the thesis on assessing oral antidiabetic drugs (OADs) use and outcomes. Each chart focuses on a specific drug or therapy, showing the percentage of patients attributing particular adverse effects to that treatment.

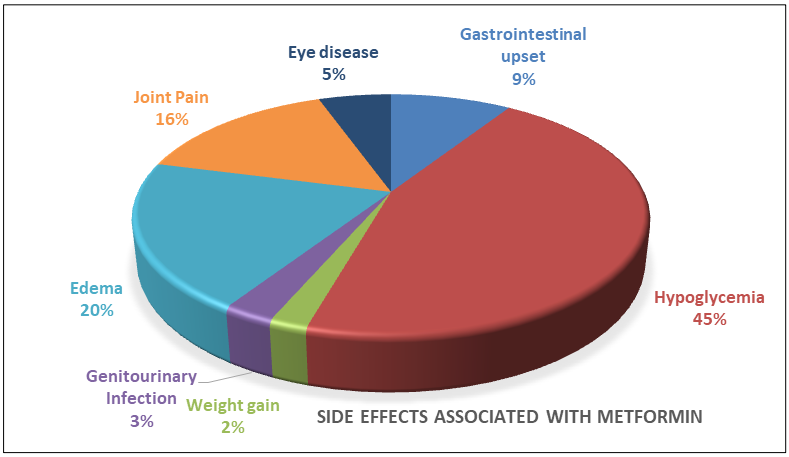


**Figure 2: The "Side Effects Associated with Metformin" chart**

The "Side Effects Associated with Metformin" chart reports hypoglycemia at 45%, edema at 20%, joint pain at 16%, gastrointestinal upset at 9%, eye disease at 5%, genitourinary infection at 3%, and weight gain at 2%.

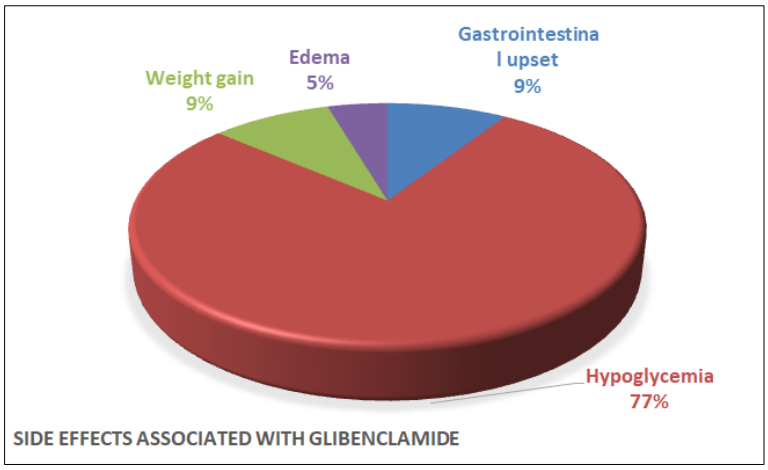


**Figure 3: The "Side Effects Associated with Glibenclamide" chart**

The "Side Effects Associated with Glibenclamide" chart shows hypoglycemia at 77%, weight gain at 9%, edema at 5%, and gastrointestinal upset at 9%.

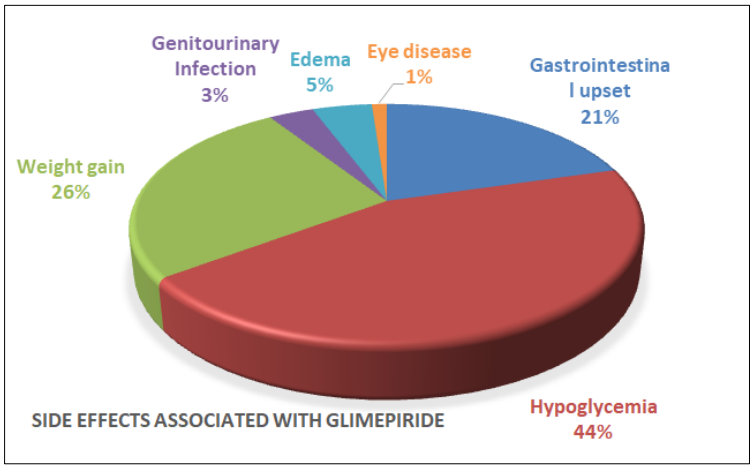


**Figure 4: The "Side Effects Associated with Glimepiride" chart**

The "Side Effects Associated with Glimepiride" chart indicates hypoglycemia at 44%, weight gain at 26%, gastrointestinal upset at 21%, genitourinary infection at 3%, edema at 5%, and eye disease at 1%.

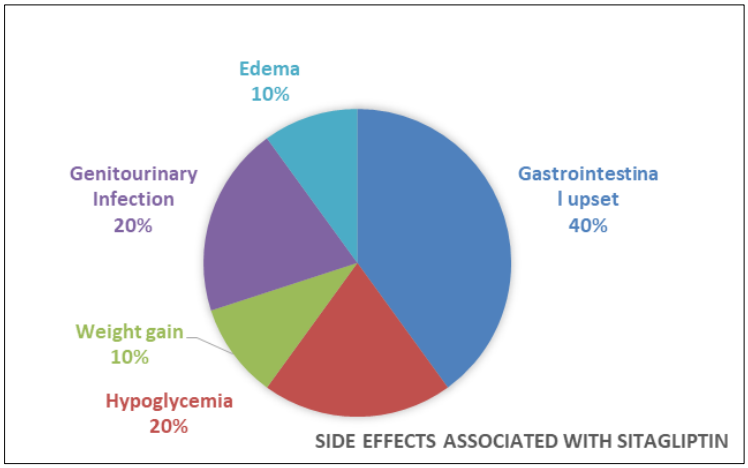


**Figure 5: The "Side Effects Associated with Sitagliptin" chart**

The "Side Effects Associated with Sitagliptin" chart shows gastrointestinal upset at 40%, hypoglycemia at 20%, genitourinary infection at 20%, weight gain at 10%, edema at 10%, and no other significant categories.

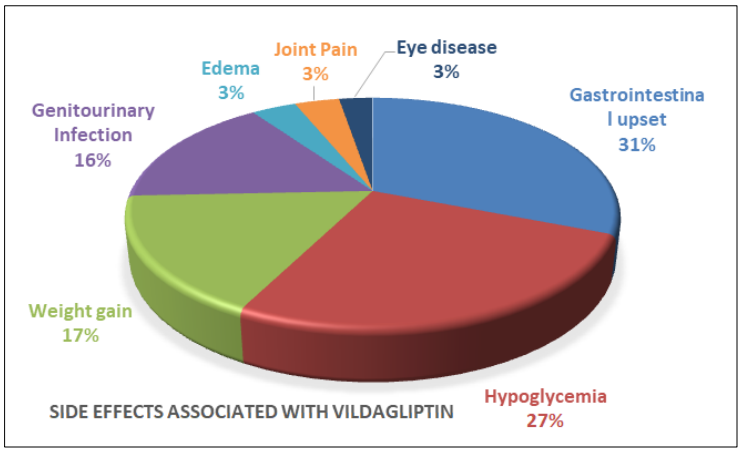


**Figure 6: The "Side Effects Associated with Vildagliptin" chart**

The "Side Effects Associated with Vildagliptin" chart reports gastrointestinal upset at 31%, hypoglycemia at 27%, weight gain at 17%, genitourinary infection at 16%, edema at 3%, joint pain at 3%, and eye disease at 3%.

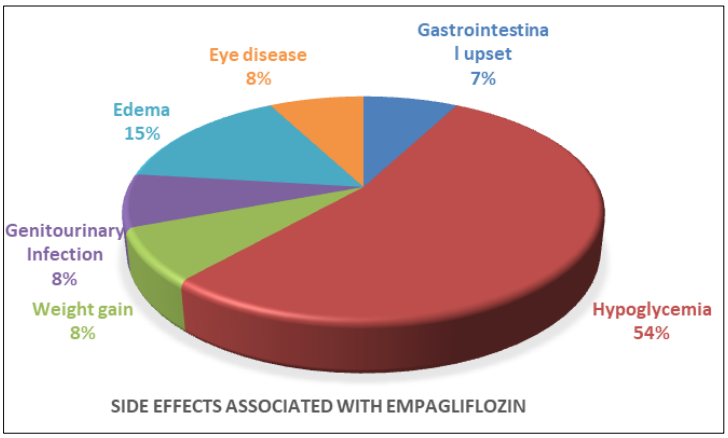


**Figure 7: The "Side Effects Associated with Empagliflozin" chart**

The "Side Effects Associated with Empagliflozin" chart highlights hypoglycemia at 54%, edema at 15%, weight gain at 8%, genitourinary infection at 8%, gastrointestinal upset at 7%, and eye disease at 8%.

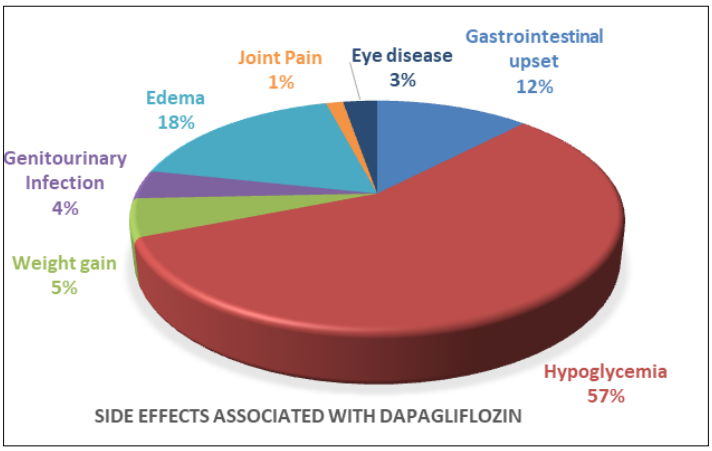


**Figure 8: The "Side Effects Associated with Dapagliflozin" chart**

The "Side Effects Associated with Dapagliflozin" chart shows hypoglycemia at 52%, gastrointestinal upset at 12%, edema at 18%, weight gain at 5%, genitourinary infection at 4%, joint pain at 1%, and eye disease at 3%.

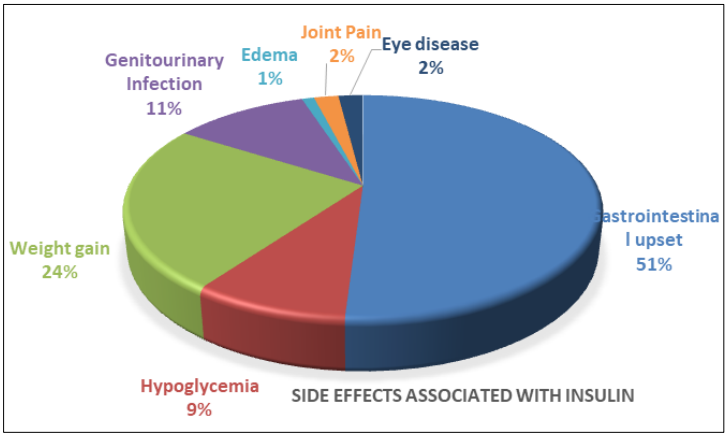


**Figure 4.9: The Side effects associated with Insulin**

The study on the assessment of oral antidiabetic drugs (OADs) and insulin use in T2DM patients in a Nigerian hospital includes several pie charts detailing side effects associated with specific treatments. The "Side Effects Associated with Insulin" chart indicates that gastrointestinal upset is the most common side effect at 51%, followed by weight gain at 24%, hypoglycemia at 9%, genitourinary infection at 11%, and edema, joint pain, and eye disease each at 2%.

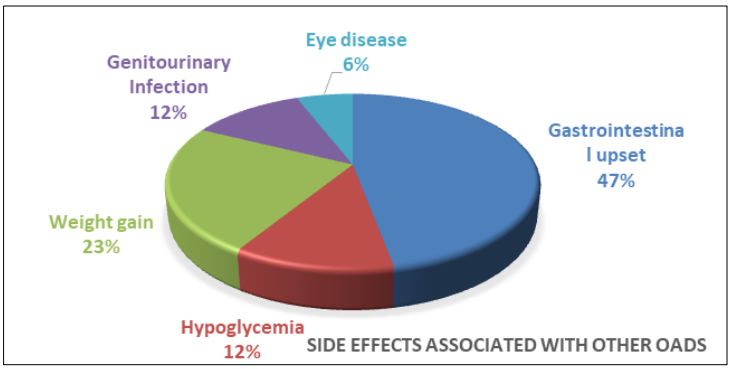


**Figure 9: The "Side Effects Associated with Other OADs" chart**

The "Side Effects Associated with Other OADs" chart lists gastrointestinal upset at 47%, weight gain at 23%, genitourinary infection at 12%, hypoglycemia at 12%, eye disease at 6%, and no other significant categories.

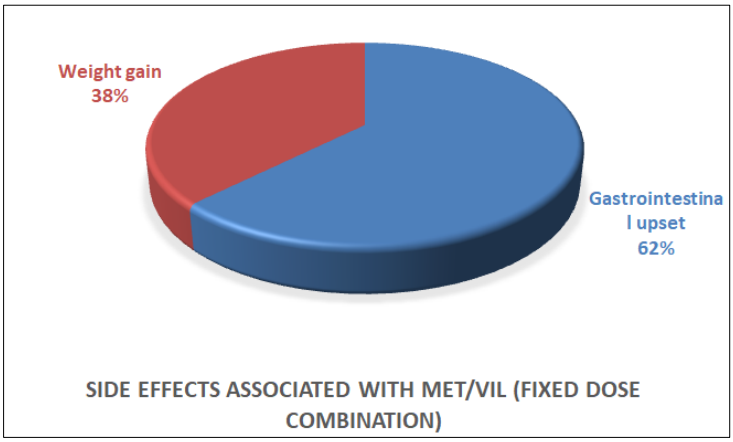


**Figure 10: The "Side Effects Associated with Met/Vil (Fixed Dose Combination)" chart**

The "Side Effects Associated with Met/Vil (Fixed Dose Combination)" chart shows gastrointestinal upset at 62% and weight gain at 38%, highlighting common adverse reactions to metformin/vildagliptin.

## DISCUSSION

OADs yielded modest HbA1c reductions (~1.7% overall), consistent with meta-analyses (0.9%–1.1%; McGuire *et al.,* 2021), but suboptimal control (66% poor) reflects adherence barriers and late presentation (Ogbera *et al*., 2012). Trends favored sulfonylureas/SGLT2, aligning with Ma *et al*., (2024) on variability reduction, though non-significant due to power limitations. Side effects were mild, with no adherence impact, echoing Yusuff *et al.*, (2008). Females' poorer adherence may stem from socioeconomic factors (Uloko *et al*., 2021). In Nigeria, older OADs dominate due to cost; newer agents could improve outcomes if subsidized (ADA, 2024). Limitations: Self-report bias, no adjustment for confounders. Future RCTs needed.

## CONCLUSION

OADs offer comparable efficacy with manageable side effects, but barriers hinder control. Enhanced access and education are key for better T2DM management in Nigeria.

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