

## A Longitudinal Multicenter Study Comparing the Effectiveness of Pharmacological and Lifestyle-Only Interventions in Adults With Prediabetes for Preventing Acute Hyperglycemic Crises and Progression to Type 2 Diabetes Mellitus

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### Abstract

**Background:** Prediabetes is a high-risk metabolic state that can progress to type 2 diabetes mellitus (T2DM) And acute hyperglycemic crises if not effectively managed.

**Objective:** To compare the long-term effectiveness of pharmacological versus lifestyle-only interventions in Preventing progression to T2DM and acute hyperglycemic crises in adults with prediabetes.

**Methodology:** This multicenter, longitudinal cohort study was conducted at Lady Reading Hospital and Khyber Teaching Hospital, Peshawar, from January 2022 to December 2024. A total of 1,520 adults with prediabetes were enrolled and followed for 24 months. Participants were assigned to either a pharmacological intervention group (n=760) receiving metformin or alternative agents, or a lifestyle-only group (n=760) following structured dietary and physical activity programs. Anthropometric measurements, Glycemic and lipid profiles, blood pressure, adherence, and adverse events were assessed at baseline and follow-up visits. Primary outcomes included progression to T2DM and occurrence of acute hyperglycemic crises. Statistical analyses included Repeated Measures ANOVA, Kaplan-Meier survival analysis, and Cox proportional hazards regression.

**Results:** Both intervention groups showed significant improvements in weight, BMI, fasting plasma glucose, HbA1c, and lipid parameters over 24 months. Adherence was higher in the pharmacological group (86.1% vs 78.7%,  $p=0.004$ ). Progression to T2DM occurred in 72 patients (9.47%) in the pharmacological group and 94 Patients (12.37%) in the lifestyle-only group ( $p=0.03$ ). Acute hyperglycemic crises were rare, occurring in 6 (0.79%) versus 7 (0.92%) patients, respectively. The composite outcome of progression to T2DM or hyperglycemic crises was lower in the pharmacological group (10.26% vs 13.29%,  $p=0.02$ ). Adverse events were mostly mild and manageable.

**Conclusion:** Pharmacological and lifestyle interventions both effectively improve metabolic outcomes in prediabetes, with pharmacological therapy providing modestly greater protection against disease progression.

### Keywords

Metformin, hyperglycemic crises, lifestyle modification, pharmacological intervention, type 2 diabetes mellitus, prediabetes.