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Metformin Dosage and Renal Protection in Type 2 Diabetes Mellitus

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Metformin

- ✓ Biguanide oral antidiabetic agent
- ✓ Approved by the (FDA) in 1994
- ✓ First-line treatment for (T2DM) in 2005

(International Diabetes Federation Guideline)

Mechanism of action

reducing glucose production in the liver,
and decreasing insulin resistance

Benefits of Metformin:



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Renal Excretion: Metformin and Renal Function

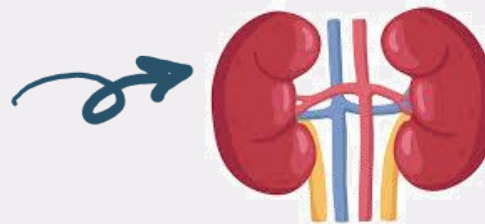
- ✓ Metformin is primarily
Risk of Lactic Acidosis

The concern about metformin

accumulation leading to

lactic acidosis in patients with renal

impairment



KIDNEY

FDA guidelines Metformin is contraindicated in patients with:

- ✓ Renal disease or dysfunction serum creatinine levels :
males ≥ 1.5 mg/dL and ≥ 1.4 mg/dL [females]
- ✓ Abnormal creatinine clearance (CrCl).
- ✓ Aged 80 years or older



Metformin and Renal Function



The ADA/KDIGO guidelines provide valuable recommendations for the safe and effective use of metformin in patients with T2DM and CKD.

- ✓ Dose adjustment based on eGFR are recommended.
- ✓ Reduced metformin dose of 1,000 mg daily is suggested for patients with an eGFR between 30 and 44 mL/min/1.73 m².
- ✓ Metformin is recommended for most patients with T2DM and CKD who have (eGFR) of ≥ 30 mL/min/1.73 m².

Recent Research: Metformin's potential renal protective properties
Dose-dependent effects on renal function

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Aim:

To investigate the renoprotective effects of metformin by analyzing its dose-dependent impacts on estimated glomerular filtration rate (eGFR) in Libyan patients with T2DM.



Aim

Introduction

Methodology :

1. Study Design cross-sectional study. from September 2022 to October 2023.
2. Sample size: Participants:** 302 T2DM The Epi-info software.

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Population size:

Expected frequency:

Acceptable Margin of Error:

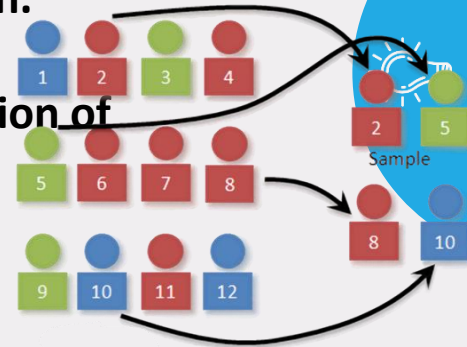
Design effect:

Clusters:

Confidence Level	Cluster Size	Total Sample
99.9%	240	240

random sampling method
 collected from BDC, JADC, and
 es of metformin.

ose, and duration of
 Drug history



6. Statistical analysis
 - JASP version 0.18.3
 - Survival analysis test

Conclusion

Discussion

Result

Included Criteria

- ✓ Adult patients with type 2 diabetes mellitus (T2DM)
- ✓ Patients on metformin therapy
- ✓ Patients taking statins and antihypertensive drugs
- ✓ Patients with complete medical records.



Methodology

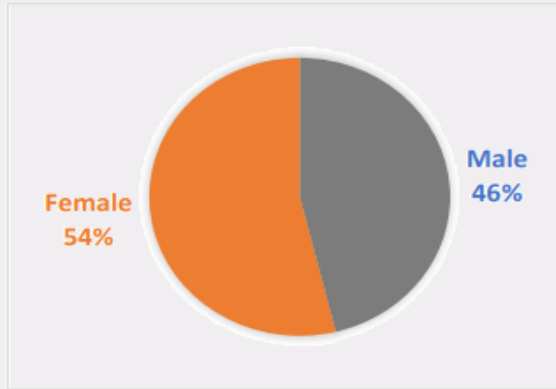
Aim

Introduction

Excluded Criteria

- ✓ Patients with significant comorbidities (liver disease, heart failure, malignancy)
- ✓ Patients taking nephrotoxic medications
- ✓ Patients with recent acute illnesses or surgical procedures
- ✓ Pregnant or lactating women
- ✓ Patients with inadequate medical records
- ✓ Patients non-adherent to metformin therapy
- ✓ Patients with $eGFR < 30 \text{ mL/min/1.73 m}^2$ (considered severe kidney dysfunction)



Figure 1: Gender distribution of the patient**Table 1:** Patients' distribution according to the age

Variables	Percentile %				
	Mean &STD	Mode	25th	50th	75th
Age (Year)	58.3±11.9	60	51	59	66.25

Table 2: Mean HbA_{1c} and diabetes duration

Variables	Percentile %				
	Mean &STD	Mode	25th	50th	75th
HbA _{1c} (%)	7.7±1.3	7.1	6.9	7.1	7.5
Diabetic duration	11.4±8.1	12	5	10	15

Table 3: Distribution of urea and creatinine

Variables	Percentile %				
	Mean &STD	Mode	25th	50th	75th
Creatinine (mg/dl)	1.0±0.9	0.6	0.6	0.8	1.07
Urea (mg/dl)	36.7±23.8	46	25	32	42



Result

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Distribution of patients according to GFR:

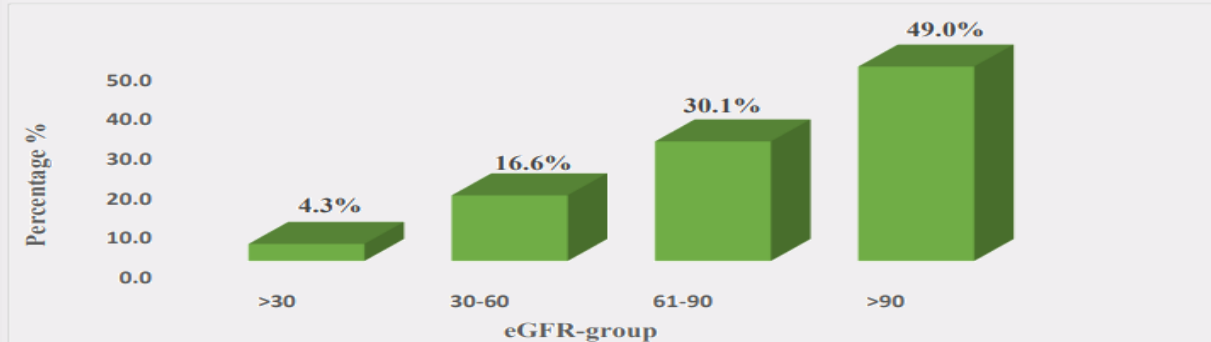
The mean of the GFR was 89.5 ± 85.5

The most frequent value was 99

the biggest group, which is 49.0% of the patients, had a GFR-R greater than 90

indicating normal or near-normal kidney function.

Variables	Percentile %				
	Mean & STD	Mode	25th	50th	75th
Glomerular Filtration Rate (GFR) (mL/min)	89.5±85.5	99	65	89	104



Result

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Survival analysis and risk assessment of metformin dosage on eGFR :

- ✓ 500 mg dose (largest group) with **167** patients, **46** experienced a decrease in GFR.
- ✓ 850 mg dose (2ND largest) with 109 patients, only seven experienced reduced GFR.
- ✓ 1000 mg dose (smallest group) with 23 patients had the highest number of events with 10 patients experiencing decreased GFR.

Table 7: Survival table analysis of different metformin doses on eGFR

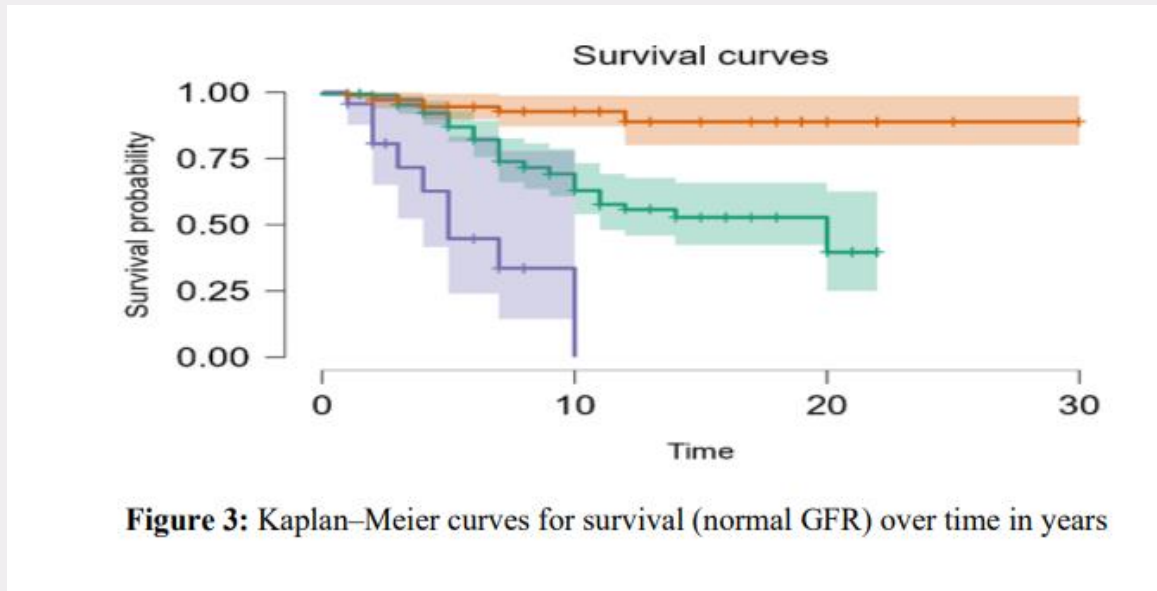
Strata (Metformin)	N	Events	Restricted Mean	Standard Error	Median Survival	Log-rank (Mantel-Haenszel)
Dose=500 mg	167	46	18.127	1.372	20	<0.001
Dose=850 mg	109	07	27.395	1.006		
Dose=1.000 g	23	10	6.006	0.873	05	

Event (decreased in GFR), N=number of patients used metformin



Survival curve analysis:

- ✓ The survival curves compared the survival probabilities among the different metformin dose groups **over up to 30 years**.
- ✓ Patients using the 850 mg dose showed the highest survival probability, indicating a better GFR rate over time



Result

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- ✓ Significant differences in eGFR across different metformin doses ($p < 0.001$).
- ✓ Higher doses of metformin showed better renal function preservation.
- ✓ The protective effect of metformin may be influenced by dosage and duration of therapy.

Specifically, longer metformin usage is associated with a slower decline in renal function.



Discussion

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Conclusion:

The findings suggest that, the accurate estimated dose of metformin can enhance renal protection and prevent declines in eGFR. indicating that appropriate dosage is crucial for maintaining renal function in patients with type 2 diabetes.



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The image features a solid teal background. Scattered throughout the background are numerous small, white, irregular shapes that resemble confetti or paper scraps, some with small dots at their ends, creating a festive or celebratory atmosphere.

*Any
Questions?*

Thank
You