

# Effect of immunosuppressive treatment of glomerulonephritis on nutritional status, body composition and musculoskeletal system – preliminary results

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## INTRODUCTION

Glomerulonephritis (GN) is a common name for numerous renal disorders caused by immune system dysregulation. Damage to the glomerular filtration membrane in the course of glomerulopathy leads to the loss of plasma proteins in the urine, i.e. albumins, proteins of the hemostasis system, transport proteins, hormones, enzymes, and, as a result, to numerous complications, including metabolic disorders, coagulopathy, malnutrition, muscle weakness, bone disorders, and immunity disorders. Untreated GN may lead to impaired renal function, up to end-stage chronic kidney disease requiring renal replacement therapy - dialysis or kidney transplantation.

The basis of GN treatment is nephroprotection, including angiotensin-converting enzyme inhibitors or angiotensin receptor blockers in the maximal tolerated dose, proper blood pressure control, limiting salt and moderate protein intake. In some cases, especially in patients with persistent proteinuria > 1 g/day and preserved glomerular filtration, treatment must be supplemented with immunosuppression.

IgA nephropathy (IgAN) is one of the most frequently diagnosed GN, the therapy of which begins with corticosteroids and, in case of persistent disease, is supplemented with other immunosuppressive drugs. The basis of its treatment is steroid therapy according to the Pozzi scheme, which includes three pulses of methylprednisolone in the 1st, 3rd, and 5th month of treatment in a cumulative dose of 9 g, supplemented with oral preparations of prednisone 0.5 g/kg of body weight every other day for 6 months (between iv infusions). Both the disease and the applied therapy can cause numerous metabolic disorders, complications, and side effects. Long-term glucocorticosteroid therapy may be associated with numerous side effects, including increased protein catabolism, skeletal muscle weakness, remodeling and excessive adipose tissue growth, osteoporosis, and glucose and lipid metabolism disorders.

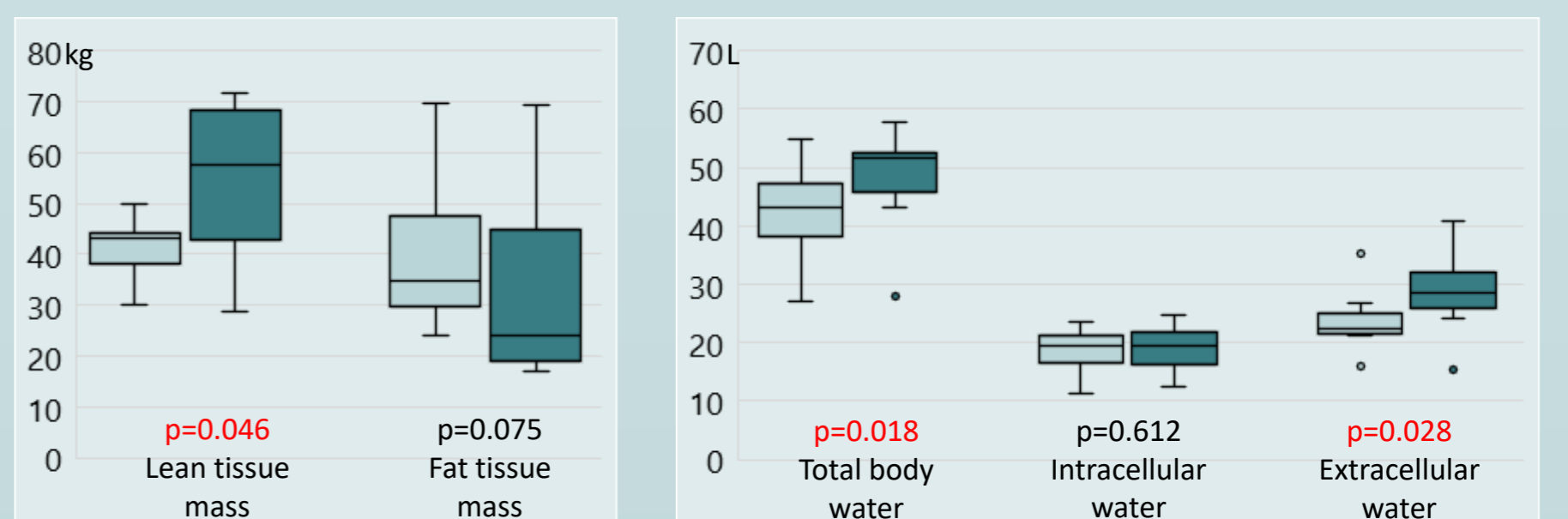
This study aims to evaluate the impact of nephroprotective treatment and steroid therapy on the nutritional status, body composition and muscle strength of patients with biopsy confirmed glomerulonephritis. The study was approved by Medical University of Lodz Bioethical Committee – approval no. RNN/128/22/KE from June 14, 2022.

## PRELIMINARY RESULTS

7 (1F, 6M) patients with a median age of 36.9 (28.9-65.8) years, median CKD-EPI eGFR 43 (31-44) ml/min/1.73 m<sup>2</sup>, median proteinuria 4.4 (3.2-5.4) g/24h were included to the analysis.

Table 1 – Assessments before and after 6-months GKS treatment

	Baseline visit median (IQR)	6-month visit median (IQR)	p
<b>Anthropometric measurements</b>			
Body weight [kg]	91.1 (73.8-118.0)	93 (74.2-123.0)	0.116
BMI [kg/m <sup>2</sup> ]	28.2 (23.3-33.4)	28.9 (24.9-34.8)	0.093
Waist [cm]	93 (85.5-109.0)	102 (91-116)	0.028
Hips [cm]	108 (91-112)	107 (103-117)	0.529
Arm [cm]	30.0 (27.0-33.0)	30.0 (25.5-36.0)	0.675
Waist/hip ratio	0.92 (0.87-1.0)	0.95 (0.88-0.99)	0.173
<b>Bioelectrical impedance</b>			
Overhydration [L]	-1.6 (-2.6-1.1)	-3.3 (-5.2-(-0.5))	0.310
Lean tissue mass [kg]	43.2 (36.9-49.9)	57.7 (39.1-70.8)	0.046
Lean tissue index [kg/m <sup>2</sup> ]	13.7 (12.9-14.1)	17.3 (12.4-21.9)	0.046
Lean tissue percentage [%]	45.7 (42.3-47.9)	60.4 (43.2-76.7)	0.116
Fat tissue mass [kg]	34.9 (28.2-51.9)	24.0 (18.8-50.1)	0.075
Fat tissue index [kg/m <sup>2</sup> ]	15.9 (14.6-20.0)	12.5 (8.1-19.3)	0.075
Fat tissue percentage [%]	42.7 (37.5-52.8)	31.1 (20.8-42.7)	0.043
Total body water [L]	43.2 (35.2-48.0)	51.6 (43.2-53.4)	0.018
Extracellular water [L]	19.4 (13.9-21.4)	19.5 (15.7-24.3)	0.612
Intracellular water [L]	22.3 (21.3-26.8)	28.6 (24.1-32.4)	0.028
<b>Muscle strength of lower extremities</b>			
Quadriceps femoris R/L [kgf]	22.1 (14.7-23.8) / 20.0 (13.9-23.2)	19.6 (18.0-21.9) / 20.6 (19.3-22.7)	0.465 / 0.273
Biceps femoris R/L [kgf]	13.8 (11.2-16.7) / 14.9 (10.2-17.1)	17.2 (13.2-21.6) / 18.3 (12.7-21.6)	0.068 / 0.109
Rectus femoris R/L [kgf]	18.2 (15.9-22.6) / 21.6 (19.7-23.2)	22.8 (20.5-26.3) / 22.7 (19.1-24.2)	0.068 / 0.068
Iliopsoas R/L [kgf]	20.2 (18.8-23.7) / 20.2 (18.7-22.4)	20.8 (15.7-25.4) / 19.4 (17.3-24.2)	0.465 / 0.465
Triceps surae R/L [kgf]	14.6 (8.3-18.1) / 15.1 (8.1-20.1)	14.6 (12.0-16.7) / 13.8 (11.8-16.6)	0.715 / 1.000
Tibialis R/L [kgf]	9.3 (6.3-15.0) / 10.5 (6.7-13.5)	13.0 (10.4-15.4) / 13.0 (11.3-17.0)	0.273 / 0.068
<b>Survey data</b>			
STC score (dietary habits)	7 (7-9)	6 (5-6)	0.059
SNAQ score (appetite)	31 (28-33)	30 (29-31)	0.787
GPPAQ score (physical activity)	16.0 (9.0-19.0)	16.5 (15.0-19.0)	0.225
<b>Quality of life self-assessment</b>			
SF36	77.3 (59.6-79.6)	68.6 (63.7-77.3)	0.916
Physical functioning	90.0 (80.0-95.0)	90.0 (70.0-100.0)	0.686
Limitations physical	75.0 (31.3-100.0)	62.5 (50.0-75.0)	0.800
Limitations emotional	75.0 (66.7-100.0)	66.7 (58.3-100.0)	1.000
Energy/fatigue	56.3 (43.8-62.5)	62.5 (50.0-62.5)	1.000
Emotional well being	65.0 (55.0-70.0)	70.0 (65.0-75.0)	0.225
Social functioning	75.0 (37.5-65.0)	87.5 (50.0-100.0)	0.138
Pain	67.5 (42.5-90.0)	90.0 (67.5-100.0)	0.116
General health	55.0 (40.0-70.0)	50.0 (45.0-70.0)	0.612
Health change	25.0 (25.0-50.0)	50.0 (25.0-50.0)	0.109
<b>Laboratory data</b>			
Serum urea [mg/dL]	52 (46-69)	59 (55-76)	0.249
Serum creatinine [mg/dL]	1.69 (1.45-2.72)	1.86 (1.60-2.39)	0.735
Serum albumin [g/dL]	35.3 (33.2-40.5)	42.0 (39.0-43.8)	0.028
Serum total protein [g/dL]	59.9 (57.4-63.3)	64.6 (60.4-67.0)	0.753
Total cholesterol	164 (157-229)	169 (138-216)	0.398
Triglycerides	83 (56-271)	153 (66-204)	0.612
LDL	107 (70-145)	61 (55-133)	0.108
HDL	50 (46-73)	56 (50-91)	0.128
Morning urine protein [g/L]	2.64 (1.27-3.19)	0.51 (0.4-1.2)	0.018
24-h proteinuria [g/dL]	4.4 (3.2-5.4)	1.14 (0.4-1.3)	0.028



During the study period, 42.9% (n=3) of patients reported any kind of adverse effects, including post-steroid acne (n=2), insomnia (n=1), and pneumonia (n=1).

## CONCLUSIONS

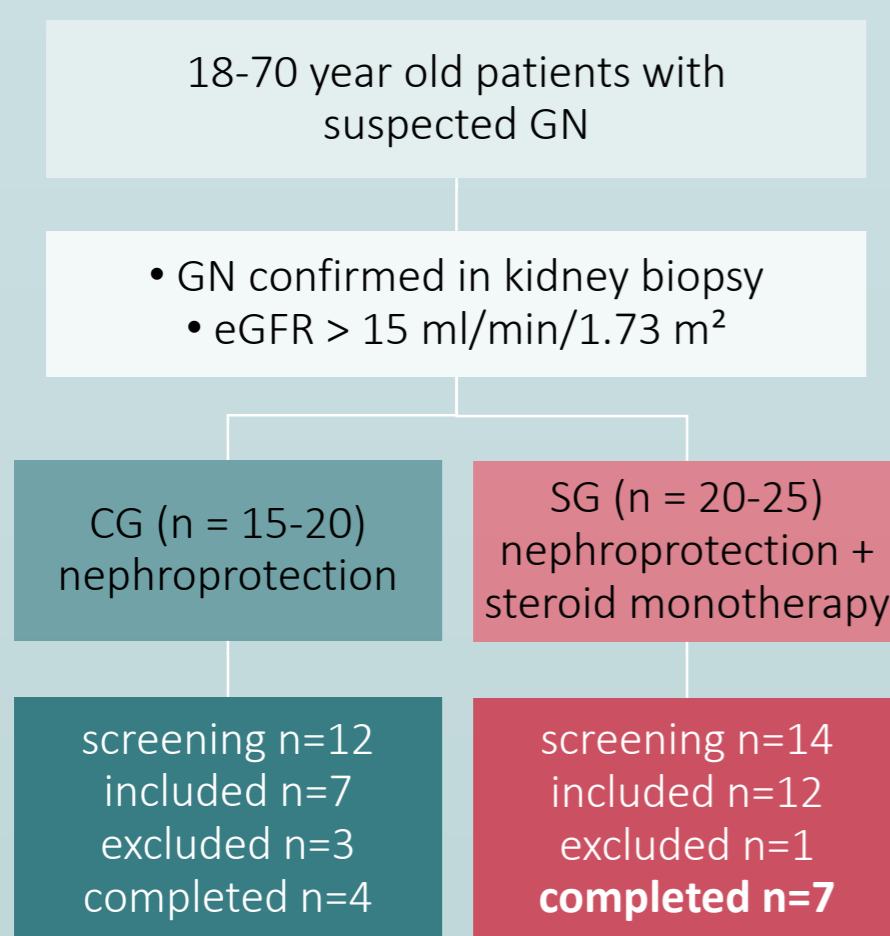
6-month GCS treatment results in significant changes in the body composition of patients with KZN, namely an increase in fat-free mass, a decrease in the percentage of body fat and an increase in the water content in the form of intracellular water, and also improves the nutritional status (albuminemia). There was no significant effect yet observed on changes in muscle strength, appetite, eating habits, level of physical activity or quality of life.

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## STUDY GROUP

The study will include 40 patients aged 18-70 with GN diagnosis based on kidney biopsy, with kidney disease grade 1-4 (eGFR > 15 ml/min/1.73 m<sup>2</sup>) qualified per Polish Society of Nephrology or KDIGO guidelines to only nephroprotective treatment (control group, CG) or to nephroprotective treatment together with a 6-month immunosuppressive therapy regimen in Pozzi scheme (study group, SG).



Assessments will be performed at the baseline visit and after 24 weeks ±14 days (CG) and at the baseline visit, after 8 weeks ±7 days, 16 weeks ±7 days and 24 weeks ±14 days (SG).

The preliminary statistical analysis has been performed in SG patients who have completed the study (n=7).

## METHODS

- Medical history, comorbidities, medications
- Anthropometric data - sex, age, height, weight, waist, hip, arm circumference, blood pressure
- Body composition analysis with bioelectrical impedance - Body Composition Monitor Fresenius™ - estimation in unique, three compartment model adjusted to patients with renal disease and fluid retention, including lean tissue mass, fatty tissue mass and overhydration
- Muscle strength assessment - analysis of the isometric strength of the six muscles/muscle groups of the lower limbs using a hand-held dynamometer
- Assessment of quality of life (Short Form 36, SF36), nutritional status (Malnutrition-Inflammation Score, MIS), diet (Staring The Conversation, STC), appetite (Council on Nutrition Appetite Questionnaire, CNAQ), level of physical activity (General Practice Physical Activity Questionnaire, GPPAQ)
- Laboratory data: complete blood count, lipid profile, serum concentration of: glucose, electrolytes, CRP, urea, creatinine, albumin, total protein, TSH; general urine test; loss of protein in the 24-hour urine collection

