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Impaired Fasting Glucose is Associated with Renal Hyperfiltration in Young Adults: Nationwide Survey (KNHANE 2007- 2019)

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Objectives: The prevalence of prediabetes is increasing among young adults, which leads to adverse health consequences. Renal hyperfiltration (RHF) is a candidate for early kidney disease. However, little is known about whether impaired fasting glucose (IFG) is associated with RHF in young adults. The aim of this study is to evaluate association of elevated glucose level and RHF in prediabetes young age adult.

Methods: From the Korea National Health and Nutrition Examination Surveys (KNHANES) 2007-2019, a total of 3,106 young adults (age of 19-39 years) with IFG were enrolled. RHF was defined as estimated glomerular filtration rate (eGFR) with residual >90th percentile after adjustment for age, sex, body weight, and height.

Results: The mean age of subjects was 32.4 ± 5.6 years and the number of females was 1,381 (44.5%). The mean levels of eGFR and fasting plasma glucose (FPG) were 96.1 ± 16.0 mL/min/1.73 m^2 and 98.4 ± 9.2 mg/dL, respectively. The FPG levels were positively associated with eGFR levels in multivariable linear regression analysis (β, 0.15; 95% confidence interval [CI], 0.08-0.21; P <0.001). Furthermore, 312 (10%) subjects were categorized into the RHF group and the prevalence of RHF was significantly higher in the highest FPG tertile than in the lowest tertile (11.6% versus 8.8%, P=0.037). In a multivariable logistic regression model, the highest tertile of FPG was a significant risk factor for RHF (odds ratio, 1.64; 95% CI, 1.19-2.26; P=0.002). Metabolic syndrome was siginficantly associated with RHF (P=0.003).

Conclusions: Elevated fasting glucose levels in young prediabetes adults is associated with the increased risk of RHF, a possible risk factor for kidney disease development. Young prediabetes adults with metabolic syndrome is more associated with RHF than prediabetes young adults without metabolic syndrome. Longitudinal studies are needed to investigate whether RHF related to IFG is a risk factor for kidney injury in young adult.

Table 1. Relative risk of development of RHF according to tertile of fasting plasma glucose level

Independent variable	β coefficient	95% CI	p
Model 1			
Fasting plasma glucose, per 1mg/dL	1.015	1.002 to 1.028	0.021
Model 2			
Fasting plasma glucose, per 1mg/dL	1.019	1.006 to 1.032	0.005
Sex	1.407	1.110 to 1.784	0.005
Model 3			
Fasting plasma glucose, per 1mg/dL	1.022	1.008 to 1.037	0.002
Waist circumstance, per 1cm	1.054	1.025 to 1.084	<0.0001
BMI, per 1kg/m^2	0.902	0.841 to 0.968	0.004
SBP, per 1mmHg	1.013	0.999 to 1.028	0.061
DBP, per 1mmHg	0.981	0.964 to 0.998	0.028
Hemoglobin, per 1mg/dL	0.776	0.700 to 0.860	<0.0001
Dyslipidemia, yes	1.221	0.924 to 1.614	0.16

Model 2: adjusted for age

Model 3 : adjusted for age, sex

Figure 1. Number of subjects with RHF according to factors composing metabolic syndrome using Chi-square analysis