

Hubungan Antara Interaksi Polimorfisme Gen *Uncoupling Protein 2 (UCP2)*, K⁺ channel, inwardly rectifying subfamily J, member 11 (KCNJ11), dan *Transcription Factor 7-Like 2 (TCF7L2)* dengan Asupan Tinggi Lemak dan Karbohidrat Sederhana dalam Kaitannya dengan Kejadian Obesitas pada Remaja

INTISARI

Latar belakang: Obesitas pada remaja sangat penting karena prevalensinya semakin lama semakin meningkat dan berkaitan dengan penyakit kardiovaskuler di masa yang akan datang. Penelitian hubungan antara resistensi insulin, pola makan dan pola aktivitas pada remaja putri obes tidak menunjukkan hubungan yang bermakna. Penelitian terhadap orang tua responden menunjukkan bahwa resistensi insulin yang terjadi pada orang tua berkaitan dengan responden yang mengalami resistensi insulin.

Tujuan: Tujuan dari penelitian ini adalah untuk mengetahui hubungan interaksi antara polimorfisme gen KCNJ11, dan TCF7L2 dengan konsumsi tinggi karbohidrat sederhana serta interaksi polimorfisme gen UCP2 dengan asupan tinggi lemak dalam kaitannya dengan kejadian obesitas pada remaja.

Metode: Penelitian ini menggunakan jenis penelitian observasional dengan rancangan *unmatched case control*. Subyek penelitian ini adalah 261 siswa Sekolah Menengah Atas (SMA) di Kota Yogyakarta, dimana 106 orang mengalami obesitas masuk pada kelompok kasus dan 155 tidak obes pada kelompok kontrol. Pada seluruh subyek penelitian dilakukan penilaian pola konsumsi makan dan aktifitas fisik, pemeriksaan berat badan, tinggi badan, gula darah puasa dan insulin puasa. Resistensi insulin ditentukan berdasarkan pengukuran HOMA-IR (> 3.16), penurunan fungsi sel beta ditunjukkan HOMA β (>150%). Substitusi UCP2, KCNJ11, dan TCF7L2 dideteksi dengan metode *polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP)* pada DNA subyek yang sebelumnya telah diisolasi.

Hasil: Tidak ada hubungan antara polimorfisme rs659366 gen UCP2, rs5219 gen KCNJ11, dan rs12255372 gen TCF7L2 dengan kejadian obesitas dengan nilai p masing-masing 0,175; 0,081; 0,794. Polimorfisme -866G/A gen UCP2 setelah dikontrol dengan asupan lemak, ternyata menunjukkan perbedaan yang bermakna pada kelompok yang polimorfisme dan asupan lemak tinggi dengan nilai OR= 0,19 dan p 0,065. Peningkatan HOMA IR lebih rendah pada polimorfisme -866G/A gen UCP dibanding yang tidak polimorfisme tetapi secara statistik tidak bermakna. Polimorfisme E23K gen KCNJ11 lebih berisiko terhadap kejadian obesitas dengan OR=2,35, p 0,036, apabila dalam keadaan asupan karbohidrat sederhana yang tinggi. Sementara peningkatan HOMA β juga menunjukkan kecenderungan meningkat pada kelompok polimorfisme walaupun secara statistik tidak bermakna. Hubungan interaksi polimorfisme rs12255372 gen TCF7L2 dengan asupan tinggi karbohidrat sederhana menunjukkan tidak ada hubungan yang bermakna.

Kesimpulan: Ada hubungan interaksi antara polimorfisme-866G/A gen UCP2 dengan asupan tinggi lemak dan polimorfisme E23K gen KCNJ11 dengan asupan tinggi karbohidrat sederhana, serta tidak terbukti adanya hubungan interaksi antara polimorfisme rs12255372 gen TCF7L2 dengan asupan tinggi karbohidrat sederhana pada remaja SMA di kota Yogyakarta.

Kata kunci: polimorfisme rs659366 gen UCP2, rs5219 gen KCNJ11, rs12255372 gen TCF7L2, asupan lemak, asupan karbohidrat sederhana, obesitas

The interaction of Uncoupling Protein 2 (UCP2), K⁺ channel, inwardly rectifying subfamily J, member 11 (KCNJ11), and Transcription Factor 7-Like 2 (TCF7L2) polymorphisms with high fat and refined carbohydrates intake in relation to incident of adolescents obesity

ABSTRACT

Background: Obesity in adolescents is very important due to the progressively increasing prevalence and strong correlation with cardiovascular disease. Previous study on the relationship between insulin resistance, diet and activity patterns in obese female adolescent showed no relationship. Furthermore, study on the subject's parents indicated that insulin resistance that occurred in the parents was associated with insulin resistance among subjects.

Objective: This study aims to determine the relationship between KCNJ11 and TCF7L2 genes polymorphisms, with high consumption of refined-carbohydrates, and interaction between UCP2 gene polymorphism with high fat intake in relation to the incidence of obesity in adolescents.

Method: The study was an observational study with unmatched case control design. A total of 261 high school students (SMA) in Yogyakarta were involved in the study. The students were then classified into case (obese) and control (non obese) groups and the number of subjects for each group were 106 and 155 students, respectively). Dietary pattern, physical activity, weight, height, fasting blood glucose and fasting insulin were assessed in all subjects. Insulin resistance was determined by HOMA-IR and a decrease in beta cell function was measured by HOMA Beta measurements. Substitution of KCNJ11 and TCF7L2 genes was detected by polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) in DNA that was isolated prior to analysis.

Result: There is no relationship between polymorphisms of rs659366 UCP2 gene, rs5219 KCNJ11 gene, and TCF7L2 rs12255372 gene with obesity (p value were 0.175, 0.081, 0.794, correspondingly). After controlling for fat intake, polymorphism of -866G / A UCP2 gene showed a significant difference amongst the group with polymorphism and high fat intake (OR = 0.19 and p value = 0.0065). HOMAIR level was lower in the -866G / A UCP2 gene polymorphism than non-polymorphism, although not statistically significant. E23K of KCNJ11 gene polymorphism has a substantially higher risk of obesity when in a state of high refined-carbohydrate intake (OR = 2.35, p value = 0.036). Additionally, HOMA β level was increased in the group with polymorphisms, but the difference between the groups was not statistically significant. Finally, the interaction between TCF7L2 rs12255372 gene polymorphism and high intake of refined-carbohydrates showed no significant relationship.

Conclusion: There are significant interactions between 866G/A UCP2 gene polymorphism with high fat intake and E23K of KCNJ11 gene polymorphism with high intake of refined carbohydrates. However, there was no substantial interaction between rs12255372 TCF7L2 gene polymorphism with high intake of refined-carbohydrates among high school students in the city of Yogyakarta.

Keyword: rs659366 UCP2 gene, rs5219 KCNJ11 gene, rs12255372 TCF7L2 gene, polymorphism, fat intake, refined-carbohydrates intake, obesity