

**PENGARUH KADAR LEPTIN DAN GHRELIN SERUM TERHADAP  
FUNGSI PENDENGARAN PADA OBESITAS DAN DIABETES MELLITUS  
TIPE II**

Hasil Penelitian untuk Tesis S-2



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## ABSTRAK

**Latar Belakang:** Diabetes Melitus Tipe II (DMT II) adalah penyakit metabolik kronis yang ditandai oleh hiperglikemi kronis karena resistensi insulin dan disfungsi sel beta pancreas dengan faktor resiko obesitas. DM menyebabkan berbagai macam komplikasi termasuk gangguan pendengaran, melalui mekanisme disfungsi endotel, kerusakan mikro dan makrovaskular telinga dalam. DM ditandai juga oleh ketidak seimbangan hormonal terkait pengaturan nafsu makan yaitu leptin dan ghrelin. Keterkaitan antara kadar leptin dan ghrelin serum terhadap fungsi pendengaran melalui mekanisme obesitas dan DMTII masih belum dapat dijelaskan dengan baik.

**Tujuan :** Untuk menganalisis pengaruh kadar leptin dan ghrelin serum terhadap fungsi pendengaran pada obesitas dan DMTII.

**Metode:** Penelitian ini menggunakan metode analitik observasional dengan pendekatan *cross sectional*. Sebanyak 48 orang responden atau 96 telinga dikelompokkan menjadi kelompok normal (K1), obesitas (K2), DM non obesitas (K3), dan DM dengan obesitas (K4). Dilakukan identifikasi data demografi meliputi usia, jenis kelamin, dan jenis pekerjaan. Kemudian dilakukan pemeriksaan Gula Darah Puasa (GDP) dan kadar leptin dan ghrelin serum dengan menggunakan ELISA. Pemeriksaan fungsi pendengaran dengan audiometer untuk mengetahui rata-rata Ambang Dengar Hantaran Udara (ADHU) dan Tulang (ADHT), serta *Speech Reception Threshold* (SRT) dan *Speech Discrimination Score* (SDS). Analisis statistik menggunakan software SPSS versi 22.

**Hasil:** Sebanyak 48 orang responden atau 96 telinga, dengan rerata usia  $48.64 \pm 11.51$  tahun. Responden dikelompokkan menjadi kelompok normal (K1) 10 orang, obesitas (K2) 13 orang, DM non obesitas (K3) 12 orang, dan DM dengan obesitas (K4) 13 orang. Terdapat perbedaan bermakna antara rerata kadar leptin serum (17.48 ng/ml; 36.14 ng/ml; 46.13 ng/ml; dan 60.95 ng/ml;  $p < 0.05$ ) dan ghrelin serum ( $6.17 \pm 2.47$  ng/dl;  $7.66 \pm 1.60$  ng/dl;  $8.63 \pm 1.02$  ng/dl;  $8.14 \pm 0.79$  ng/dl;  $p < 0.05$ ). Kadar leptin serum kelompok DMTII dengan obesitas paling tinggi daripada kelompok lain. Sedangkan kadar ghrelin tertinggi terdapat pada kelompok DMTII tanpa obesitas. Leptin serum memiliki pengaruh bermakna terhadap fungsi pendengaran terutama pada SRT dan SDS ( $R=0.348$ ;  $R=0.239$ ;  $p < 0.05$ ). Sedangkan ghrelin serum memiliki pengaruh bermakna terhadap fungsi pendengaran terutama pada ADHU, ADHT, SRT dan SDS ( $R=0.230$ ;  $R=0.217$ ;  $R=0.362$ ;  $R=0.369$ ;  $p < 0.05$ ).

**Kesimpulan:** Kadar leptin dan ghrelin serum berpengaruh terhadap fungsi pendengaran.

**Kata kunci:** leptin, ghrelin, ADHU, ADHT, SRT, SDS

## ***ABSTRACT***

**Background:** Type II Diabetes Mellitus (T2DM) is a chronic metabolic disease characterized by persistent hyperglycemia due to insulin resistance and beta-cell dysfunction in the pancreas, with obesity as a major risk factor. Diabetes leads to various complications, including hearing impairment, through mechanisms involving endothelial dysfunction and microvascular and macrovascular damage in the inner ear. Additionally, diabetes is associated with hormonal imbalances in appetite regulation, specifically leptin and ghrelin. The relationship between serum leptin and ghrelin levels and hearing function through the mechanisms of obesity and T2DM remains poorly understood.

**Objective:** To analyze the influence of serum leptin and ghrelin levels on hearing function in individuals with obesity and T2DM.

**Methods:** A total of 48 participants, representing 96 ears, were divided into four distinct groups: normal (K1); obese (K2); DMTII without obese (K3); and DMTII with obese (K4). Demographic data, including age, gender, and occupation, were collected. Fasting Blood Glucose (FBG), serum leptin, and serum ghrelin levels were measured using ELISA. Hearing function was assessed using pure-tone and speech audiometry to determine the average Air Conduction Threshold (ACT) and Bone Conduction Threshold (BCT), as well as Speech Reception Threshold (SRT) and Speech Discrimination Score (SDS). Statistical analysis was conducted using SPSS version 22.

**Results:** Results: A total of 48 respondents or 96 ears have mean age of  $48.64 \pm 11.51$  years old. The respondents were grouped into the normal group (K1) 10 people, obese (K2) 13 people, non-obese DM (K3) 12 people, and DM with obesity (K4) 13 people. There was a significant difference between the mean leptin serum levels (17.48 ng/ml; 36.14 ng/ml; 46.13 ng/ml; dan 60.95 ng/ml;  $p < 0.05$ ) and ghrelin serum levels ( $6.17 \pm 2.47$  ng/dl;  $7.66 \pm 1.60$  ng/dl;  $8.63 \pm 1.02$  ng/dl;  $8.14 \pm 0.79$  ng/dl;  $p < 0.05$ ). Leptin serum level in the DMTII group with obesity were higher than the other groups. Meanwhile, the highest ghrelin serum levels were found in the DMTII group without obesity. Leptin serum had a significant effect on hearing function especially SRT and SDS ( $R = 0.348$ ;  $R = 0.239$ ;  $p < 0.05$ ). Meanwhile, ghrelin serum has a significant effect on hearing function, especially ACT, BCT, SRT, and SDS ( $R = 0.230$ ;  $R = 0.217$ ;  $R = 0.362$ ;  $R = 0.369$ ;  $p < 0.05$ ).

**Conclusion:** Leptin and ghrelin serum levels affect hearing function.

**Keywords:** leptin, ghrelin, ACT, BCT, SRT, SDS