

Clinical aspects of the metabolic syndrome according to investigations in several cohorts of the Hungarian population

Doctoral thesis

Judit Nádas MD.

Semmelweis University
Doctoral School of Clinical Medicine



Program leader: Péter Lakatos MD, PhD, DSc.
Tutor: Károly Cseh MD, PhD, DSc.
Official opponents: Tamás Halmos MD, PhD, DSc.
Anna Körner MD, PhD, DSc.
Final exam chair: Péter Kempler MD, PhD, DSc.
Final exam board members: László Gerő MD, PhD, DSc.
Péter Vörös MD, PhD.

Budapest, 2009.

INTRODUCTION

The clinical significance of the metabolic syndrome as a distinct entity has been debated in the past years, although the clustering of cardiovascular risk factors is unquestionable. Although obesity was not included in Reaven's landmark publication about metabolic syndrome, recently central obesity has become the central criterion of the syndrome. There is a large body of evidence that adipose tissue is not only an inactive site for lipid storage, but also a source of multiple biologically active mediators, indicating a pathogenic role for adipocytokines in obesity-associated complications such as insulin resistance and atherosclerosis. There are cross-sectional studies indicating that central obesity is independently associated with numerous cardiovascular risk factors and insulin resistance, moreover a strong relationship between abdominal obesity and type 2 diabetes and cardiovascular diseases was also documented by prospective clinical studies. Therefore, the measurement of waist circumference for assessing abdominal obesity has been recognised as one of the most important anthropometric parameters.

The metabolic syndrome can be frequently detected among people in western and developing countries, and mainly in relation to the increasing frequency of abdominal obesity- its prevalence rate is increasing. The prevalence rate of metabolic syndrome differ significantly according to criteria used, and to cohort analysed (age, ethnicity, comorbidity). Nevertheless, the prevalence rate and the clinical consequences of the metabolic syndrome in patients with type 1 diabetes are less characterized.

Unfortunately unfavourable statistics of cardiovascular morbidity and mortality were recorded during the last few decades in Hungary, placing this country in the upper part of the spectrum for cardiovascular morbidity and mortality compared to other EU countries. In order to achieve an improvement, several important interventions have to be carried out. Among these, evaluation and target-oriented treatment of cardiovascular risk factors and prevention of abdominal obesity in adult patients also are of great importance. In order to provide proper treatment for subjects with the metabolic syndrome and, further, to prevent the metabolic syndrome itself, a wide social collaboration is needed. To achieve these goals, the public awareness of the metabolic syndrome and its serious consequences should be considered as a key point.

AIMS OF OUR STUDY

In the present studies we have analysed some clinical aspects of the metabolic syndrome in the Hungarian population, specifically:

1. In adult patient with type 1 diabetes
 - a. to estimate the prevalence rate of cardiovascular risk factors typical to the metabolic syndrome
 - b. to compare the prevalence rate of metabolic syndrome to the general population
 - c. to analyse the relationship between the prevalence rate of the metabolic syndrome and the clinical, laboratory parameters and education level of the patients
 - d. to estimate the effectiveness of cardiovascular risk management.
2. to evaluate the reliability of waist circumference versus body mass index [BMI] for assessing obesity.
3. to estimate the prevalence rate of obesity characterised by BMI and abnormal waist circumference in general practices and to examine the association between obesity and cardiovascular risk factors.
4. to evaluate the public awareness of the metabolic syndrome in general population.

PATIENTS AND METHODS

The prevalence rate and clinical significance of the metabolic syndrome in type 1 diabetic patients has not been investigated in Hungary. In a period of 6 months, 533 adult Caucasian patients (age >18 years) with type 1 diabetes were consecutively enrolled. The patients were under regular care in 11 diabetes outpatient departments in Hungary. Data on medical history, actual treatment, diabetic complications and cardiovascular status were registered by questionnaires which were completed by the physician based on the medical file. Anthropometric and laboratory parameters as well as blood pressure were actually measured while eating and smoking habits as well as physical activity were evaluated by standardized questionnaires. Fasting blood samples were collected and analysed for glucose, serum lipids and creatinine values. All these measurements were performed locally by standard laboratory methods. The metabolic syndrome was defined according to the diagnostic criteria of the National Cholesterol Education Program Adult Treatment Panel-III (ATP-III) and the International Diabetes Federation (IDF). All subjects fulfilled the criteria for hyperglycaemia by definition. For making comparison, the prevalence rate of the metabolic syndrome in a representative sample was used. This representative survey was performed in 2006 in a random sample of 2000 inhabitants (age 20 – 69 years) registered by general practitioners in Hungary. From the cohort of type 1 diabetic patients, patients aged ≥ 25 years were analysed for association between cardiometabolic risk and educational level assuming that high school/university could be finished by 24 years of age. The treatment goals-to estimate the effectiveness of cardiovascular risk management in the whole cohort of type 1 diabetic patients- were set according to the national guideline which corresponds to the current international task force.

To evaluate the reliability of measuring waist circumference (WC), anthropometric parameters were measured in 150 adult patients from the diabetes or hypertension outpatient departments of the Bajcsy-Zsilinszky Teaching Hospital, Budapest, Hungary by two diabetes educators on two consecutive days. Weight was measured with calibrated digital scale (SECA 701) while height was recorded with a wallmounted stadiometer (SECA 220). WC was measured at the midpoint between the lowest rib and the iliac crest at the end of expiration. Specific attention was given to placing the tape horizontally. The intraobserver difference was defined as the difference in the measurements made by the same educator on different days

and the interobserver difference as the difference in the measurements made by the two educators on the same days. As each educator made 150 pairs of measurement, 300 intraobserver measurements could be achieved. Similarly, 150 pairs of measurement were obtained on both days, so 300 interobserver findings could be analysed. For all measurements (height, weight, BMI, and WC), the following parameters were derived: Δ : the difference in the two means [$X_{avg}-Y_{avg}$], $\% \Delta$: % difference in the two means [$100 \times \Delta / (X_{avg} + Y_{avg}) / 2$], absolute Δ : average difference [$S (X_i - Y_i) / n$], % absolute Δ : % average difference [$100 \times \text{absolute } \Delta / (X_{avg} + Y_{avg}) / 2$].

To underline the clinical importance of measuring WC, a worldwide investigation IDEA (International Day for Evaluation of Abdominal Obesity) was initiated. As a part of this global investigation, 1,234 randomly chosen adult patients (age 20-80 years) in 41 primary care settings were investigated in Hungary, we analysed the Hungarian data separately. Age, gender, data on medical history (known diabetes, hypertension, lipid abnormalities, previous cardiovascular disease), smoking habits were registered by questionnaires which were completed by the physician based on the medical file. Anthropometric parameters (weight, height, WC) were actually measured. Subjects were considered as having cardiovascular disease if they had any one of myocardial infarction, ischaemic heart disease, heart failure, peripheral arterial disease, stroke, transitory ischaemic attack, cardiovascular intervention.

To evaluate the public awareness of the metabolic syndrome, a cross-sectional survey was performed among randomly selected adult subjects aged 35 years or more in Hungary. Simple questionnaires were used by representatives of a communication bureau in 20 cities. People on the street were asked to stop for a moment to answer 14 written questions voluntarily and anonymously. There were 10 questions about the metabolic syndrome and 4 questions about the parameters (gender, age, profession, place of residence) of subjects questioned. We collected data about the consideration of medical information and general health promotion and about the activities to maintain health as well. Results of 1001 questionnaires were summarised.

RESULTS

There were 256 (48 %) men and 277 (52 %) women among the adult patients with type 1 diabetes investigated (n = 533). The mean age of patients was 35.6 ± 11.6 years with a mean diabetes duration of 18.0 ± 11.1 years ($x \pm SD$). The prevalence rate of the metabolic syndrome according to the ATP-III criteria was 31.1 % (29.7 % in men, 32.7 % in women; $p > 0.05$). Using the IDF criteria, a higher overall prevalence rate of the metabolic syndrome (36.2 % ; [32.8 % in men, 39.4 % in women; $p > 0.05$]) was observed. Comparing type 1 diabetic patients to the general population, the prevalence rate of the metabolic syndrome proved to be significantly higher in each age-group of patients with type 1 diabetes. Comparing patients with *versus* without the metabolic syndrome, the following significant differences were found: patients with the metabolic syndrome had higher age, longer duration of diabetes, higher BMI, larger waist circumference, higher serum cholesterol and LDL-cholesterol, higher serum creatinine values; and used higher daily insulin dose. Cardiovascular diseases in the past medical history were more often observed in patients with as without the metabolic syndrome. The prevalence rate of physical inactivity was higher in patients with than without the metabolic syndrome. The HbA_{1c} and GFR values did not differ significantly in patients with versus without the metabolic syndrome. The prevalence rate of the metabolic syndrome increased with increasing age, systolic and diastolic blood pressure, serum triglyceride, total-cholesterol and creatinin level, with increasing BMI and WC. There was a significant positive correlation between albuminuria and the presence of the metabolic syndrome ($p < 0.001$). According to the stepwise logistic regression analysis, the metabolic syndrome in type 1 diabetic patients was significantly associated in a decreasing ranking order of significance with WC, serum triglycerides, female gender, antihypertensive medication, HDL-cholesterol, diastolic blood pressure and serum creatinine.

From this cohort 437 patients were analysed for association between cardiometabolic risk and educational level. This group involved 209 (47.8 %) men and 228 (52.2 %) women with an average age of 38.0 ± 10.4 years and with a mean duration of diabetes of 19.2 ± 11.0 years ($x \pm SD$). There was no difference between patients with low (n=56), middle (n=251) and high (n=130) educational levels regarding gender, age and duration of diabetes. Cardiovascular diseases were more often observed in patients with low than high educational level. Although BMI and WC were significantly higher in low versus high education level in the total group (n=437), the difference proved to be statistically significant only in women (n=228). Although

the daily insulin dose was higher, poorer metabolic control (higher HbA_{1c} value) was found in patients with low than high educational level. There was no significant difference between groups regarding serum creatinine values, however, micro/macroalbuminuria was more prevalent in patients with low than high educational level. The proportion of patients with regular (daily) alcohol use and smoking was the highest while that of the regular physical activity was the lowest in patients with low educational level. The prevalence rate of the metabolic syndrome was inversely associated with the increasing educational levels in both men (statistically significant) and women (borderline significance).

Of 533 patients, the body mass index target level (<25 kg/m²) was achieved by 295 (55.3 %) patients. The proportion of overweight patients was 31.3% (n=167) and 13.3% (n=71) of the patients were obese. Ideal WC (<80 cm for women and <94 cm for men) was measured in 140 (50.5 %) and in 165 (63.7 %) patients, respectively. Optimal glycaemic control (HbA_{1c} level <6.5 %) was documented in 45 (8.4 %) patients, HbA_{1c} level <7% was reached in 109 patients (20.5%). Antihypertensive drugs were used by 173 patients among which 17.3% (n=30) reached the systolic and the diastolic target values (<130/80 mmHg). Among those not taking antihypertensive therapy (n=360) in 151 patients (41.9%) was the actual blood pressure below the target level. Lipid lowering drugs (statins, fibrates or ezetimibe) were used by 130 patients, among which 53.1 % reached the target triglycerides level, 71.5 % the target HDL-cholesterol and 27.8 % the target LDL-cholesterol levels. Taking the lipid target values together, only 23 (17.7 %) patients were at goal. In the total cohort 129 patients (24.2%) had all of the measured lipid parameters in the normal range. Platelet-aggregation inhibition treatment (aspirin/ticlopidin/clopidogrel) was used by 74 patients (13.9%).

The height of the subjects ranged from 140.5 to 183.0 cm, the weight from 45.3 to 146.1 kg, BMIs from 18.9 to 61.6 kg/m², and WCs from 65.0 to 154.0 cm. The values of the correlation coefficients (*r* values) of the anthropometric parameters (n=300) were >0.99. There were minimal differences between the results of the measurements made on different days (intraobserver difference). The difference between the average values of WC measured on two consecutive days was 0.17 cm (Δ), which is 0.17% of the arithmetic mean of the two average values (% Δ). The difference between the measurements made by the two educators (interobserver difference) was significant for height (162.81 vs. 162.67 cm, *p*=0.017) and for WC (96.23 vs. 97.08 cm, *p*<0.0001). The difference between the average values of WC measured by the different educators was 0.85 cm (% Δ =0.879). The average difference

(absolute Δ) of WC measured on two consecutive days was 1.51 cm ($\% \Delta = 1.568$), while that measured by the different educators was 2.15 cm ($\% \Delta = 2.22$). Although the $\% \Delta$ values of WC proved to be 2.5 times (0.176/0.069) and 6.3 times (0.879/0.139) higher than those of BMI, while the $\%$ absolute Δ values were 1.5 times (1.568/1.013) and 2.8 times (2.226/0.784) higher than those of BMI, the differences were small when expressed in absolute values (WC: 0.17-2.15 cm; BMI : 0.02-0.292 kg/m²). There was a strong correlation between BMI and WC in the total cohort ($r=0.853$, $n=150$, measured by educator-1 on day-1). The correlations between the BMI and WC values varied significantly in different BMI categories (BMI <25 kg/m² [$n=37$]: $r=0.616$, BMI 25–30 kg/m² [$n=63$]: $r=0.497$, BMI 30–35 kg/m² [$n=33$]: $r=-0.091$, BMI >35 kg/m² [$n=17$]: $r=0.864$).

As a part of the IDEA investigation, randomly chosen 1,234 adult patients in 41 primary care settings were investigated in Hungary. The final number of patients was 1,199 (men 421 [35%], women 778 [65%], age : 18-80 years, mean age: 53.8±15.6 years, mean BMI: 28.5±5.2 kg/m² ($x \pm SD$)). Among the Hungarian cohort overweight (BMI 25.0 – 29.9 kg/m²) and obesity (BMI ≥ 30.0 kg/m²) were found in 73.9 % of men and 68.0 % of women. Abnormal values of waist circumference were very often found in the cohort (men ATP-III criteria: 44.4 %, IDF criteria: 72.4 %; women ATP-III: 66.3 %, IDF: 83.3 %). The values of both BMI and waist circumference increased with increasing age up to 70 years of age. A close correlation was found between increasing values of obesity (BMI, waist circumference) and the prevalence rate of cardiovascular diseases, lipid abnormalities, hypertension and diabetes mellitus.

In our cross-sectional survey to evaluate the public awareness of the metabolic syndrome among 1001 adults the term 'the metabolic syndrome' was known by 286 subjects (29%). In this group, subjects have learned about the syndrome from acquaintances (40%), media (29%), physicians (26%) or others (5%). Forty-eight percent of the total cohort was regularly cared for by general practitioners. Medical information about the metabolic syndrome provided by physicians and, in addition, general health promotion available nationwide were considered insufficient and superficial by more than half of the subjects questioned. In order to maintain health, regular physical activity and healthy diet were preferred by subjects at younger ages while following the medical instructions for using different drugs was the main preference for elder subjects. Unfortunately, 19% of subjects reported neither regular physical activity nor keeping a healthy diet.

CONCLUSIONS

The metabolic syndrome is a frequent finding in Hungarian adult patients with type 1 diabetes. The prevalence rate of the metabolic syndrome is primarily associated with the higher WC. In order to reduce cardiovascular risk in adult patients with type 1 diabetes, prevention of abdominal obesity is of great importance.

Higher prevalence rate of certain cardiometabolic risk factors was associated with low education level in adult type 1 diabetic patients with relatively long duration of diabetes, therefore, these patients should have priority when preventing cardiovascular complications.

The attainment of therapeutic goal of cardiovascular risk factors proved to be difficult in a substantial section of patients. Further efforts are needed for attaining and maintaining the established goal of cardiovascular risk management during regular care of adult patients with type 1 diabetes.

Obesity characterised by BMI and abnormal WC is very common among Hungarian adult patients screened in primary care settings. Because of the close correlation found between increasing values of anthropometric parameters (BMI, WC) and the prevalence rate of cardiovascular risk factors further efforts are necessary to prevent obesity.

Waist circumference is a useful and relevant parameter for assessing abdominal obesity. Measuring WC in the clinical practice is recommended. There is a weak correlation between BMI and WC in the most common BMI categories (BMI 25-35 kg/m²). Consequently, measuring both parameters is useful to find people at high cardiovascular risk.

The term 'metabolic syndrome' is not well known by the Hungarian population and the main source of knowledge was not medical information. In order to increase the public awareness, extensive public information campaigns should be implemented by health care providers as well as by written and electronic media focusing on the metabolic syndrome.

PUBLICATIONS

PUBLICATIONS DIRECTLY RELATED TO THE THESIS

1. **Nádas J**, Putz Z, Fövényi J, Gaál Z, Gyimesi A, Hídvégi T, Hosszúfalusi N, Neuwirth G, Oroszlán T, Pánczél P, Széles G, Vándorfi G, Winkler G, Wittmann I, Jermendy G: Cardiovascular risk factors characteristic for the metabolic syndrome in adult patients with type 1 diabetes. *Exp Clin Endocrinol Diabetes* 117: 107-112, 2009.

IF: 1,896

2. **Nádas J**, Putz Zs, Fövényi J, Gaál Zs, Gyimesi A, Hídvégi T, Hosszúfalusi N, Neuwirth Gy, Oroszlán T, Pánczél P, Vándorfi Gy, Winkler G, Wittmann I, Jermendy Gy: A metabolikus szindrómára jellemző kardiovaszkuláris kockázati tényezők előfordulása 1-es típusú diabetesben szenvedő, felnőtt cukorbetegség körében. *Diabetologia Hungarica* 17: 3-13, 2009.

3. **Nádas J**, Putz Z, Fövényi J, Gaál Z, Gyimesi A, Hídvégi T, Hosszúfalusi N, Neuwirth G, Oroszlán T, Pánczél P, Vándorfi G, Winkler G, Wittmann I, Jermendy G: Cardiometabolic risk and educational level in adult patients with type 1 diabetes. *Acta Diabetol* 46: 159-162, 2009.

IF: 0,926

4. **Nádas J**, Putz Zs, Fövényi J, Gaál Zs, Gyimesi A, Hídvégi T, Hosszúfalusi N, Neuwirth Gy, Oroszlán T, Pánczél P, Vándorfi Gy, Winkler G, Wittmann I, Jermendy Gy: A kardiometabolikus kockázati tényezők és az iskolázottsági szint közötti összefüggés vizsgálata felnőtt, 1-es típusú cukorbetegség körében. *Magyar Belorv Arch* 62: 25-29, 2009.

5. **Nádas J**, Putz Z, Fövényi J, Gaál Z, Gyimesi A, Hídvégi T, Hosszúfalusi N, Neuwirth G, Oroszlán T, Pánczél P, Vándorfi G, Winkler G, Wittmann I, Jermendy G: A kardiometabolikus kockázati tényezők kezelésének eredményessége 1-es típusú diabetesben. *Orv Hetil* 27: 1263-1269, 2008.

6. **Nádas J**, Jermendy G: A metabolikus szindrómától a kardiometabolikus kockázat fogalmáig. Orv Hetil 150: 821-829, 2009.

7. **Nádas J**, Putz Zs, Kolev G, Nagy S, Jermendy Gy: A haskörfogat mérésének megbízhatósága. Diabetologia Hungarica 14: 243-248, 2006.

8. **Nádas J**, Putz Zs, Kolev G, Nagy S, Jermendy G: Intraobserver and interobserver variability of measuring waist circumference. Med Sci Monit 14: CR15-18, 2008.

IF: 1,514

9. **Nádas J**, Jermendy Gy: A haskörfogat mérésének jelentősége háziiorvosi praxisokban végzett felmérés eredménye alapján. Magyar Belorv Arch 62: 135-140, 2009.

10. Jermendy Gy, **Nádas J**, Putz Zs, Hídvégi T: A metabolikus szindrómával kapcsolatos ismeretek a hazai lakosság körében. Diabetologia Hungarica 13: 27-33, 2005.

Correspondence:

1. **Nádas J**, Putz Zs, Jermendy Gy, Hídvégi T: Public awareness of the metabolic syndrome. Diab Res Clin Pract 76: 155-156, 2007.

IF: 1,823

PUBLICATIONS NOT DIRECTLY RELATED TO THE THESIS

1. Hernandez E, Pál B, Óry I, **Nádas J**, Winkler G, Jermendy Gy: A cardiovascularis reflex-tesztek reprodukálhatóságának vizsgálata diabetes mellitusban. Diabetologia Hungarica 2: 18-20, 1994.

2. Jermendy Gy, Hernandez E, **Nádas J**: Diabeteses és alkoholos eredetű sensoros polyneuropathia Milgamma-N kezelésével szerzett tapasztalatok. Medicus Universalis 28: 217-220, 1995.

3. Jermendy Gy, Ferenczi J, Hernandez E, **Nádas J**: Cirkadián vérnyomásváltozások vizsgálata tünetmentes autonóm neuropathiában szenvedő, nem insulindependens cukorbetegekben. Magyar Belorv Arch 48: 197-201, 1995.

4. Jermendy Gy, Ferenczi J, Hernandez E, Farkas K, **Nádas J**: Day-night blood pressurevariation in normotensive and hypertensive NIDDM patients with asymptomatic autonomic neuropathy. Diab Res Clin Pract 34: 107-114, 1996.

IF: 0,524

5. Jermendy Gy, Ferenczi J, Farkas K, **Nádas J**, Noll É: Az antihypertensív kezelés jellegzetességei alapellátásban nyilvántartott nem-insulin-dependens cukorbetegköreben. Diabologia Hungarica 5: 21-26, 1997.

6. Pátkai G, Perényi J, Farkas K, **Nádas J**, Hernandez E, Jermendy Gy: Nem inzulindependens cukorbeteg elektrofiziológiai vizsgálatának tapasztalatai. Magyar Belorv Arch 50: 407-411, 1997.

7. Jermendy Gy, Farkas K, Ferenczi J, **Nádas J**, Noll É: A hypertonia kezelésének jellegzetességei és eredményessége háziorvosi praxisban nyilvántartott nem-insulindependens cukorbeteg körében. Orvostovábbképző Szemle őszi különszám 15-22, 1997.

8. Jermendy Gy, Farkas K, **Nádas J**: Gyors hemoglobin A_{1c} -meghatározás (új lehetőség a cukorbeteg-gondozásban). Orv Hetil 140: 1251-1254, 1999.

9. Jermendy Gy, Farkas K, **Nádas J**, Daróczy A, Péterfai É: A microalbuminuria vizsgálatának gyakorlati vonatkozásai diabetes mellitusban. LAM 10: 482-488, 2000.

10. Jermendy Gy, **Nádas J**, Sági Z: Humán inzulin okozta lipoatrophia. Orvosi Hetilap 141: 2393-2396, 2000.

11. Jermendy Gy, Farkas K, **Nádas J**, Daróczy A, Péterfai É: Mit tekintünk az albumin-creatinin hányados alapján a microalbuminuria határértékének? Diabetologia Hungarica 8: 189-190, 2000.

12. Jermendy Gy, Farkas K, **Nádas J**, Daróczy A, Péterfai É: Practical aspects of measuring microalbuminuria in diabetic patients. Diab Nutr Metab 14: 195-200, 2001.

IF: 0,728

13. **Nádas J**, Farkas K, Hernandez E, Jermendy Gy: Észrevétlenül elszenvedett súlyos égési sérülés előrehaladott diabeteses neuropathia talaján. Diabetologia Hungarica 9: 81-84, 2001.

14. **Nádas J**, Jermendy Gy: Cardiovascularis morbiditás és mortalitás diabetes mellitusban. Praxis 11: 33-36, 2002.

15. **Nádas J**: Elhízás, metabolikus szindróma, 2-es típusú diabetes mellitus-Az életmódterápia jelentősége. Praxis 15: 21-27, 2006.

16. **Nádas J**: A diabéteszes láb. Praxis 16: 171-178, 2007.

17. **Nádas J**, Jermendy Gy: Öngyilkossági kísérlet inzulinnal. Diabetologia Hungarica 16: 281-283, 2008.

18. Jermendy Gy, **Nádas J**, Szigethy E, Széles Gy, Hidvégi T, Paragh Gy, Ádány R: A cukorbetegség és az emelkedett éhomi vércukor prevalenciája a hazai felnőtt korú (20-69 éves) lakosság körében: reprezentatív keresztmetszeti szűrővizsgálat eredményei. Magyar Belorv Arch 61: 203-207, 2008.

19. Putz Zs, **Nádas J**, Jermendy Gy: Severe but preventable foot burn injury in diabetic patients with peripheral neuropathy. Med Sci Monit 14: CS89-91, 2008.

IF: 1,514

20. Hidvégi T, Hetyési K, Bíró L, **Nádas J**, Jermendy Gy: Kisebbségi népcsoportban végzett metabolikus szindróma szűrésének tapasztalatai. Metabolizmus 7: 161-165, 2009.

21. **Nádas J**: Inzulinkezelés 2-es típusú diabetesben. Praxis 18: 17-26, 2009.

Correspondence:

1. Jermendy Gy, **Nádas J**, Sápi Z: Lipoblastoma-like lipotrophia induced by human insulin Morphological evidence for local dedifferentiation of adipocytes? Diabetologia 43: 955-956, 2000.

IF: 5,721

ABSTRACTS DIRECTLY RELATED TO THE THESIS

1. **Nádas J**, Putz Zs, Kolev G, Nagy S, Jermendy Gy: A haskörfogat mérésének megbízhatósága (meeting abstract). Diabetologia Hungarica 14 Suppl 2: 117-118, 2006.

2. **Nádas J**, Putz Zs, Kolev G, Nagy S, Jermendy Gy: A haskörfogat mérésének megbízhatósága (meeting abstract). Cardiologia Hungarica 36 Suppl 1: A74, 2006.

3. Jermendy Gy, **Nádas J**, Putz Zs: Intraobserver and intraobserver reliability of measuring waist circumference and body mass index (meeting abstract). Diabetes 55 Suppl 1: A395, 2006.

IF: 7,955

4. Hidvégi T, **Nádas J**, Putz Zs, Jermendy Gy: Public awareness of the metabolic syndrome (meeting abstract). Diabetes 55 Suppl 1: A196, 2006.

IF: 7,955

5. Jermendy Gy, **Nádas J**, Putz Zs, Hidvégi T: Public awareness of the metabolic syndrome (meeting abstract). J Hypertens 24 Suppl 4: S228, 2006.

IF: 4,021

6. Hidvégi T, **Nádas J**, Putz Zs, Jermendy Gy: Public awareness of the importance of cardiovascular risk factors characteristic for the metabolic syndrome (meeting abstract). Diabetologia 49 Suppl 1: 556, 2006.

IF: 5,247

7. **Nádas J**, Putz Zs, Fövényi J, Gaál Zs, Gyimesi A, Hidvégi T, Hosszúfalusi N, Neuwirth Gy, Oroszlán T, Pánczél P, Vándorfi Gy, Winkler G, Wittmann I, Jermendy Gy: Metabolikus szindrómára jellemző cardiovascularis kockázati tényezők előfordulása 1-es típusú diabetesben szenvedő felnőtt cukorbetegek körében (meeting abstract). Magyar Belorv Arch 41 Suppl: 93, 2006.

8. Hidvégi T, **Nádas J**, Putz Zs, Jermendy G: Public awareness of the metabolic syndrome (meeting abstract). Diabetic Medicine 23 Suppl 4: 594, 2006.

IF: 2,484

9. Jermendy G, **Nádas J**, Putz Z: Assessing the reliability of measuring waist circumference (meeting abstract). Diabetic Medicine 23 Suppl 4: 736, 2006.

IF: 2,484

10. **Nádas J**, Putz Zs, Fövényi J, Gaál Zs, Gyimesi A, Hidvégi T, Jermendy Gy: Metabolikus szindrómára jellemző kardiovaszkuláris kockázati tényezők előfordulása 1-es típusú diabetesben szenvedő felnőtt cukorbetegek körében (meeting abstract). Cardiologia Hungarica 37 Suppl A: A63, 2007.

11. Szigethy E, Voko Z, Jermendy G, **Nádas J**, Paragh G, Blaskó G, Kardos L, Hidvégi T, Horváth A, Ádány R, Széles G: The epidemiology of metabolic syndrome in the Hungarian adult population (meeting abstract). Diab Vasc Dis Res 4 Suppl 1: S94, 2007.

12. **Nádas J**, Putz Z, Fövényi J, Gaál Z, Gyimesi A, Hidvégi T, Hosszúfalusi N, Neuwirth G, Oroszlán T, Pánczél P, Vándorfi G, Winkler G, Wittmann I, Jermendy G: Metabolic syndrome among patients with type 1 diabetes mellitus (meeting abstract). J Hypertension 25 Suppl 2: S76, 2007.

IF: 4,364

13. **Nádas J**, Putz Z, Fövényi J, Gaál Zs, Gyimesi A, Hidvégi T, Hosszúfalusi N, Neuwirth G, Oroszlán T, Pánczél P, Vándorfi G, Winkler G, Wittmann I, Jermendy G: Cardiovascular risk factors characteristic for the metabolic syndrome in patients with type 1 diabetes (meeting abstract). *Diabetes* 56 Suppl 1: A179, 2007.

IF: 8,261

14. Széles G, Szigethy E, Vokó Z, Kardos L, Horváth A, Hidvégi T, **Nádas J**, Jermendy G, Paragh G, Blaskó G, Ádány R: The epidemiology of metabolic syndrome in the Hungarian adult population: a representative survey (meeting abstract). *Diabetes* 56 Suppl 1: A626, 2007.

IF: 8,261

15. **Nádas J**, Putz Z, Fövényi J, Gaál Zs, Gyimesi A, Hidvégi T, Hosszúfalusi N, Neuwirth G, Oroszlán T, Pánczél P, Vándorfi G, Winkler G, Wittmann I, Jermendy G: Cardiovascular risk factors characteristic for the metabolic syndrome in patients with type 1 diabetes (meeting abstract). *Diabetologia* 50 Suppl 1: S347, 2007.

IF: 5,822

16. **Nádas J**, Fövényi J, Gaál Zs, Gyimesi A, Hidvégi T, Hosszúfalusi N, Neuwirth Gy, Oroszlán T, Vándorfi Gy, Winkler G, Wittmann I, Jermendy Gy: A kardiometabolikus kockázati tényezők kezelésének eredményessége 1-es típusú diabetesben szenvedők körében (meeting abstract). *Diabetologia Hungarica* 16 Suppl 1: 87, 2008.

17. **Nádas J**, Fövényi J, Gaál Zs, Gyimesi A, Hidvégi T, Hosszúfalusi N, Neuwirth Gy, Oroszlán T, Vándorfi Gy, Winkler G, Wittmann I, Jermendy Gy: A kardiometabolikus kockázati tényezők kezelésének eredményessége 1-es típusú diabetesben szenvedők körében (meeting abstract). *Cardiologia Hungarica* 38 Suppl B: B64, 2008.

18. **Nádas J**, Putz Zs, Fövényi J, Gaál Zs, Gyimesi A, Hidvégi T, Hosszúfalusi N, Neuwirth Gy, Oroszlán T, Vándorfi Gy, Winkler G, Wittmann I, Jermendy Gy: Cardiometabolic goal attainment during regular care of adult patients with type 1 diabetes (meeting abstract). *Diabetes* 57 Suppl 1: A135, 2008.

IF: 8,398

19. Jermendy Gy, **Nádas J**, Putz Zs, Fövényi J, Gaál Zs, Gyimesi A, Hidvégi T, Hosszúfalusi N, Neuwirth Gy, Oroszlán T, Vándorfi Gy, Winkler G, Wittmann I: Cardiometabolic risk and education level in adult patients with type 1 diabetes (meeting abstract). *Diabetes* 57 Suppl 1: A177, 2008.

IF: 8,398

20. Jermendy Gy, Putz Zs, **Nádas J**: Cardiometabolic goal attainment during regular care of adult patients with type 1 diabetes (meeting abstract). *J Hypertens* 26 Suppl 1: S191, 2008.

IF: 5,132

Cumulative IF: 7, 102