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ABSTRACTS

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ORAL SESSIONS OF ORIGINAL PAPERS

SESSION OF ORIGINAL PAPERS 1

Chairs: Monika Karczewska-Kupczewska, Marta Wróbel, Edward Franek

The influence of liraglutide on insulin sensitivity and cardiometabolic risk in subjects with overweight or obesity

Anna Krentowska[1], Adrian Kołakowski[1], Michał Zawadzki[1], Krzysztof Waczyński[1], Marta Dobrzycka[1], Błażej Pogorzelski[1], Magdalena Stefanowicz[2], Natalia Matulewicz[2], Lidia Łapińska[1], Dominika Szczepańska[1], Irina Kowalska[1], Monika Karczewska-Kupczewska[1,2]

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Introduction: Overweight and obesity are associated with increased cardiometabolic risk. One of the key factors responsible may be insulin resistance, which can be assessed with direct (i.e., hyperinsulinemic euglycemic clamp – HEC) and indirect methods. Recent studies indicate that glucagon-like peptide receptor agonists are effective in reducing cardiometabolic risk. However, the role of improvement in insulin sensitivity (IS) and related metabolic disturbances in this effect has not been precisely elucidated. The study aimed to assess changes in IS and related cardiometabolic indices after liraglutide treatment in subjects with overweight or obesity.

Material and methods: The study group comprised 57 subjects with overweight or obesity who were randomly assigned to one of the groups: receiving liraglutide s.c. in combination with dietary intervention for 12 weeks (group D + L; $n = 30$) or undergoing dietary intervention only (group D; $n = 27$). All subjects underwent anthropometric measurements, body composition analysis with dual energy X-ray absorptiometry, and HEC before and after the intervention. Oral glucose tolerance test and the assessment of HbA_{1c}, lipid concentrations and liver enzyme activity were performed. Indirect indices of IS and cardiometabolic risk – HOMA-IR, Matsuda index, triglyceride/glucose (TyG) index, visceral adiposity index (VAI), lipid accumulation product (LAP), and cardiometabolic index (CMI) – were calculated.

Results: The studied groups did not differ in age, baseline weight and body composition or IS assessed in HEC (all $p > 0.05$). A comparable improvement in IS measured in HEC was observed in both groups ($p = 0.011$; $p = 0.011$), while HOMA-IR improved only in the D + L group ($p = 0.031$). In the group treated with liraglutide, the decrease in HbA_{1c} ($p = 0.001$), total cholesterol ($p = 0.038$), and triglyceride concentrations ($p = 0.041$) was greater than in the group undergoing dietary intervention only. All indices were significantly correlated with IS assessed in HEC and visceral adipose tissue mass (all $p < 0.05$). Matsuda index, TyG index, VAI, LAP, and CMI improved significantly in both groups, while the improvement in LAP and CMI was greater in the D + L group ($p = 0.03$ and $p = 0.04$, respectively).

Conclusions: Treatment with liraglutide might have an additional beneficial effect on cardiometabolic risk in subjects with overweight and obesity by improving IS and associated metabolic abnormalities.

Source of funding: The study was funded by the Medical University of Białystok; grant no. B. SUB.23.524, B.SUB.24.541, B.SUB.24.558.

The effect of liraglutide on lipid accumulation in skeletal muscle and liver in subjects with overweight/obesity

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Introduction: Increased body weight and excessive lipid accumulation are associated with enhanced production of toxic lipid forms and ineffective oxidization in peripheral tissues. These unfavorable metabolic effects are defined as lipotoxicity, which is an important predictor of metabolic disorders such as type 2 diabetes. It seems that glucagon-like peptide-1 receptor agonists (GLP-1 RAs) represent a new effective alternative for the treatment of lipotoxic effects. However, there is limited knowledge about the precise mechanism of peripheral tissue lipid accumulation reduction after GLP-1 RA treatment. The study aimed to evaluate the effect of 12-week therapy with the GLP-1 RA liraglutide on quantitative lipid content in the liver and skeletal muscles (intramyocellular lipid – IMCL).

Material and methods: The study included 57 overweight/obese subjects with or without prediabetes divided into two groups: patients treated with liraglutide and low-calorie diet (D + L group; $n = 30$) and patients undergoing low-calorie diet only (D group; $n = 27$). Anthropometric measurements, body composition analysis with dual-energy X-ray absorptiometry, and the measurement of serum fetuin A concentrations were performed in all subjects. Quantitative lipid in the liver content and IMCL content were assessed using magnetic resonance spectroscopy. Furthermore, liver steatosis and fibrosis were assessed by elastography (controlled attenuation parameter – CAP), and indirect indices (fatty liver index – FLI, liver fat score – LFS, AST/platelet ratio index, and fibrosis-4, index) calculated from biochemical parameters. All procedures were performed before and after the intervention.

Results: None of the assessed parameters differed significantly between the groups before the start of the intervention ($p > 0.05$). A decrease in body weight after a 12-week intervention was observed in the entire group (D + L: –9.7 kg, $p < 0.001$; D: –7.8 kg, $p < 0.001$). Total and regional fat and lean mass decreased in both groups, and the reduction in total lean mass and appendicular lean mass was greater in the D + L group ($p = 0.018$; $p = 0.016$, respectively). Magnetic resonance spectroscopy analysis showed a significant reduction of intrahepatic lipid (IHL) content in both groups (D + L: $p < 0.001$, D: $p < 0.001$) and a decrease in IMCL content in the D + L group ($p = 0.03$). Moreover, the change in IHL content was significantly greater in the D + L group ($p = 0.01$), independently of weight loss. A decrease in CAP, FLI and LFS, as well as in fetuin A concentrations, was observed in both groups ($p < 0.05$).

Conclusions: The administration of liraglutide decreases lipid content in the liver independently of weight loss. This suggests that liver steatosis is a potential additional indication for liraglutide treatment.

Source of funding: Grants from the Medical University of Bialystok: B.SUB.23.524, B.SUB.24.541, B.SUB.24.558

Survival analysis of patients with type 2 diabetes depending on the occurrence of sleep apnea

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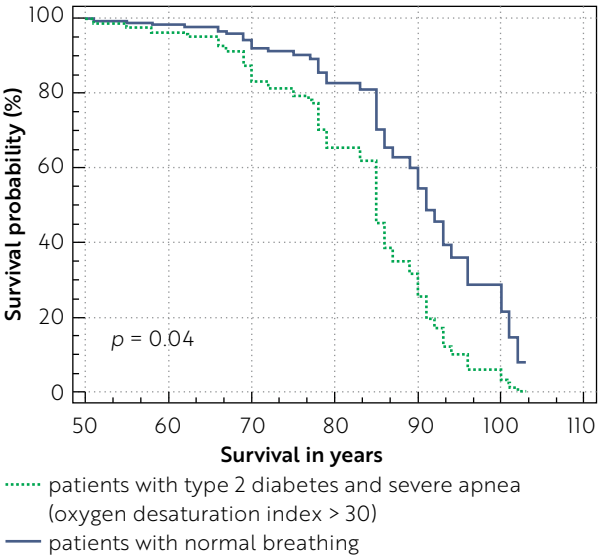

Fig. 1. Cox hazard analysis taking into account oxygen desaturation index, arterial hypertension, HbA_{1c}

Introduction: It is estimated that 70% of patients with type 2 diabetes (T2D) lasting > 5 years have co-occurring obstructive sleep apnea (OSA). There are abundant data documenting increased cardiovascular morbidity and mortality secondary to untreated OSA. However, interventional studies using continuous positive airway pressure (cPAP) therapy and epidemiological data from a subpopulation of elderly people do not provide a clear answer regarding the long-term prognosis of patients with OSA. In the Polish population, no observations of survival of patients with OSA have been conducted so far. The aim of the study was to assess survival depending on the occurrence and severity of OSA in the population of patients with T2D.

Material and methods: The analysis of survival was conducted in the population of patients with T2D who were tested for sleep apnea in 2015. 320 patients diagnosed with T2D were invited to participate in the study, of whom 252 gave their consent (79% of those invited) treated at the Primary Health Care Clinic (female 57.3%). Diagnosis for apnea was based on outpatient polygraphic registration (Embletta X100). The mean age was 65.0 ±11.6 years, body mass index (BMI) 32.4 ±5.45 kg/m^2 (overweight in 30.6%, obesity in 65.1%). The mean duration of diabetes at the time of inclusion in the observation was 7.9 ±7.2 years; HbA_{1c} = 7.1 ±1.8%. Hypertension was found in 87.3%. The survival analysis was conducted until 2025 (10 years). Kaplan-Meier analysis and Cox proportional hazard analysis were performed taking into account oxygen desaturation index (ODI), HbA_{1c}, NT, and BMI.

Results: Based on ODI, 34 patients had severe apnea. Kaplan-Meier analysis showed lower survival in the group with severe OSA; $p = 0.02$. In Cox hazard analysis, patients with severe apnea also had a worse prognosis regardless of metabolic control of diabetes (HbA_{1c}) and the presence of hypertension (Fig. 1). Taking into account BMI weakened this relationship.

Conclusions: In the group of Polish patients with optimally treated type 2 diabetes, untreated sleep apnea is a significant risk factor for early death, regardless of the cause.

Accuracy of Dexcom One+ in patients with hyperglycemia hospitalized in cardiac intensive care unit

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Introduction: Continuous glucose monitoring (CGM) systems may support glucose control in patients in a cardiac intensive care unit (CICU). We aimed to assess the accuracy, feasibility and tolerability of CGM Dexcom One+ compared to standard blood glucose measurements.

Material and methods: From September to December 2024, we included patients with known diabetes or hyperglycemia at admission (blood glucose >140 mg/dl) hospitalized in the CICU due to acute coronary syndrome and/or heart failure. Measurement accuracy was assessed using the mean absolute relative difference (MARD). Clinical performance was assessed using consensus error grid analysis. Feasibility outcome included the number of early sensor detachments and sensor failures. Safety outcomes included skin reactions.

Results: We obtained 567 paired samples from 27 patients (15 males), aged 72.3 ±11.4 years. Among participants there were 22 patients with previously diagnosed type 2 diabetes. The mean HbA_{1c} was 7.3 ±1.4%. Overall, 419 paired samples were obtained during oxygen therapy, and 199 during vasopressor infusion. Continuous glucose monitoring use duration was 4.4 ±3.2 days. There were 2 reference readings < 70 mg/dl, 352 within the 70–180 mg/dl range, and 213 >180 mg/dl. Clinical accuracy is summarized in Table 1. We observed 1 mild hematoma at the insertion site, 1 sensor failure and 2 early detachments.

Table 1. Dexcom One+ performance

Characteristic	All patient, *N* = 27
Number of paired blood glucose and CGM	567
Overall MARD	12.3% (95% CI: 11.4–13.2)
Within 15 mg/dl, < 70 mg/dl	0/4
Within 15%, 70–80 mg/dl	247/349/ (70.8%)
Within 15%, > 180 mg/dl	151/214 (70.6)
Within 40 mg/dl, < 70 mg/dl	1/4
Within 40 mg/dl, 70–180 mg/dl	341/349 (97.7%)
Within 40 mg/dl, > 180 mg/dl	213/214 ((99.5%)
Within 20%	460/567 (81.1%)
CGM < 70 mg/dl, ref. >180 mg/dl	0
CGM < 180 mg/dl, ref. > 70 mg/dl	0
CEG zone A + B	99.6%
CEG zone C	0.4%
CEG zone D	0.0%
CEG zone E	0.0%

CEG – consensus error grid, CGM – continuous glucose monitoring, MARD – mean absolute relative difference
Reference: blood glucose level measured using Cobas Pulse glucometer (Roche Diagnostic) as part of standard care

Conclusions: In patients in the CICU, the Dexcom One+ system demonstrated acceptable accuracy and could facilitate glucose monitoring.

Source of funding: Jagiellonian University *Collegium Medicum*

Modern biomarkers in assessing empagliflozin therapy in patients with acute myocardial infarction

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Introduction: Evaluating the response to pharmacological interventions is crucial for understanding the efficacy of treatment, including SGLT2 inhibitors, widely used in diabetology, cardiology, and nephrology. This study focuses on the expression of sirtuin (SIRT) and micro RNA (miRNA) as potential biomarkers for the response to empagliflozin in patients after acute myocardial infarction (AMI).

Material and methods: Within the framework of a multicenter clinical trial, we gained access to plasma samples from patients hospitalized due to AMI (n = 227), who were randomized to either empagliflozin or placebo. Plasma samples were collected at the beginning of the study and after 26 weeks of therapy. The expression of SIRT and selected miRNAs, based on in silico analysis, was quantified. Statistical analysis included receiver operating characteristic curve analysis to determine the predictive capability of these biomarkers in relation to changes in left ventricular ejection fraction (LVEF).

Results: Treatment with empagliflozin significantly affected the expression levels of SIRT2 (AUC: 0.831, 95% CI: 0.74–0.93, $p < 0.001$) and SIRT4 (AUC: 0.792, 95% CI: 0.62–0.97, $p = 0.005$), as well as miR-182-5p (AUC: 0.720, (95% CI: 0.60–0.83, $p = 0.002$) and miR-302a-3p (AUC 0.749, 95% CI: 0.59–0.91, $p = 0.004$), which correlated with unfavorable LVEF changes. Combining these biomarkers into a single panel increased their predictive ability (AUC: 0.885, 95% CI: 0.82–0.95; $p < 0.0001$), suggesting a clear advantage in predicting LVEF deterioration. This panel also showed greater predictive accuracy than any individual biomarker alone, significantly impacting risk management in post-AMI patients treated with empagliflozin.

Conclusions: Our findings demonstrate that novel biomarkers such as SIRT and specific miRNAs can play a key role in personalized medicine, particularly in the context of SGLT2 inhibitor therapy such as empagliflozin. Precise monitoring of these new biomarkers can significantly contribute to the development of targeted treatment strategies that better meet individual patient needs, thereby enhancing the effectiveness of pharmacological interventions and improving long-term prognosis. Our study represents a step towards the application of personalized medicine, where clinical decisions are made based on a comprehensive molecular analysis of the patient's profile.

Source of funding: NCN: 2022/45/N/NZ7/0246; EMPATHY trial-2019/ABM/01/00037

Sodium glucose cotransporter 2 inhibitors increase the odds of urinary tract infection in patients with cancer during radiotherapy: insights from public provider data

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Introduction: Sodium glucose cotransporter 2 inhibitors (SGLT2-i) are used for multiple indications, with growing data on their likely association with urinary tract infections (UTIs), particularly in patients with comorbidities. One such group is that of patients with cancer receiving radiotherapy (RT), especially targeted at the pelvic region. The study aimed to estimate the risk of recording a UTI event in patients diagnosed with cancer undergoing RT depending on the use of SGLT2-i.

Material and methods: We performed a population-based retrospective cohort study using real-life data collected by the public healthcare provider (National Health Fund – NFZ) in Poland. We included people with a cancer diagnoses (ICD10 code C) who received RT (ICD9 code 92.2, 92.3, 92.4) between July 2020 and December 2023. Exposure to SGLT2-i was defined as reimbursement of ≥ 1 prescription (ATC-A10BK) between 6 months prior to RT start up to 30 days after RT end. Additional collected data included sex, age, cancer location and diabetes status. RT-associated UTI was defined as the occurrence of any of the following events during or up to 30 days after RT: diagnosis by ICD10 (N30, N12, N10, N39.0), urine culture (ICD9 91.33 or 91.32) or antibacterial/antimycotic therapy (ATC-J01 or J02A). The data were extracted and processed by the NFZ in collaboration with the authors. Odds ratios (OR) and 95% CI were calculated for the main outcome in the whole cohort and relevant subgroups. Finally, multivariable logistic regression was used to account for covariates.

Results: The study included 230,118 patients (mean age 65.7 ±12.4 years, 48% male, 38.2% with pelvic cancer, 19.2% with diabetes, 1.3% SGLT2-i users). Among them, RT-associated UTI was noted in 17.8%, with significantly higher rates in SGLT2-i users [N = 664 (22.8%) vs. N = 40398 (17.8%), OR = 1.36 (95% CI: 1.25–1.49), $p < 0.0001$]. The observed effect was similar in those with cancer in the pelvic region [OR =1.35 (1.20–1.53), $p < 0.0001$] and elsewhere [OR =1.34 (1.18–1.5), $p < 0.0001$)]. In the multivariable model adjusted for age, sex, cancer localization and presence of diabetes, SGLT2-i use was also associated with increased odds of RT-associated UTI [1.23 (1.13–1.35), $p < 0.0001$).

Conclusions: Public healthcare data suggest that people with cancer undergoing RT who are treated with SGLT2-i develop UTIs more often than those not using those drugs. Physicians are advised to increase UTI vigilance when supervising RT in SGLT2-i users. However, given the limitations of the current study and well-evidenced benefits SGLT2-i, the treatment should not be paused for RT, and more research is needed.

The relationship between olfactory, taste and hearing disorders and peripheral neuropathy and urine albumin-to-creatinine ratio in diabetes

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Introduction: The incidence of diabetes is constantly increasing. Poor metabolic control of diabetes leads to development of numerous complications, one of which is peripheral and central diabetic neuropathy. The aim was to assess occurrence of olfactory, taste and hearing disorders in people with diabetes compared to a control group.

Material and methods: The study group consisted of 50 people with diabetes (18 with type 1, 17 men), and the control group consisted of 50 people without diabetes matched for age and sex. Medical history of the study participants was obtained (including for COVID-19). Venous blood was collected for laboratory tests: hematology, fasting blood glucose, lipid profile, liver enzymes, creatinine concentration with estimated glomerular filtration rate (eGFR) calculation and urine test with urine albumin-to-creatinine ratio (UACR) analysis. Also, anthropometric measurements were performed: body weight, height, waist circumference with body mass index and waist-to-height ratio (WtHR) calculation. Directly before taste, smell (threshold test) and hearing tests (threshold tone audiometry), blood pressure and capillary blood glucose were measured.

Results: In the olfactory test, a non-significant difference between study and control groups was found: 7.19 ±1.97 vs. 7.87 ±2.05, $p = 0.097$. However, the number of people below the 10th and 25th percentile according to the norm for gender and age was significantly higher in the diabetic (10 and 9, respectively) than in the control group (4 and 3), $p = 0.023$. Hearing impairment was found in half of the diabetics and 26% of the control group, $p = 0.023$; the hearing threshold was significantly higher in the study group in almost the entire tested spectrum (Figure 1). Taste measurements were not significantly different between study and control groups: 11.28 ±1.76 vs. 11.76 ±1.84, $p = 0.185$; only the perception of bitter taste was significantly weaker in the study group: 2.54 ±0.68 vs. 2.82 ±0.60, $p = 0.047$. In the study group, also significantly larger waist circumference, higher WtHR, higher prevalence of hypertension, higher systolic blood pressure, higher glycemia, lower total and LDL cholesterol, lower creatinine level, and higher eGFR were found. In the diabetic group, a highly significant negative linear correlation was observed between the hearing threshold and vibration sensation, a positive correlation between UACR and glucose and triglyceride levels, and a negative correlation between UACR and HDL cholesterol levels. Patients with neuropathy had significantly higher UACR compared to those without neuropathy: 9.17 ±10.21 mg/g vs. 38.16 ±88.29 mg/g, $p = 0.035$.

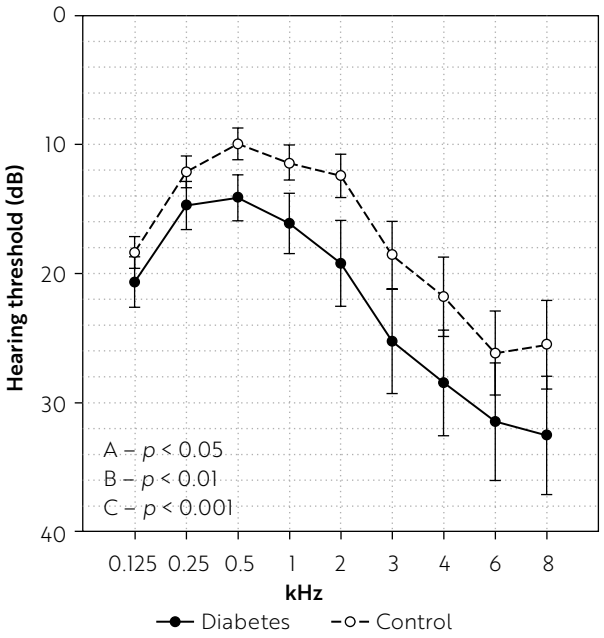

Fig. 1.

Conclusions: These results indicate the presence of central neuropathy, particularly noticeable in hearing tests, and correlations between symptoms of central and peripheral neuropathy and UACR with neuropathy and metabolic parameters in the diabetic subgroup.

Source of funding: Scientific grant from the College of Medical Sciences, University of Rzeszów

Assessment of expression of selected cellular senescence genes in subcutaneous adipose tissue and their relationship to insulin resistance and metabolic syndrome in individuals with obesity

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Introduction: Obesity significantly increases the risk of developing type 2 diabetes, dyslipidemia, hypertension and cardiovascular diseases. Body fat accumulation is a key factor in causing insulin resistance and the development of metabolic syndrome (MS). An important role in the development of these complications may be played by impaired adipogenesis – among other things, the inability of adipose tissue precursor cells to form new adipocytes. Recent studies indicate that fat cell senescence may be linked to impaired adipogenesis. The study aimed to evaluate the expression of selected genes associated with subcutaneous adipose tissue (SAT) senescence in individuals with obesity, with and without MS.

Material and methods: The study included 28 patients (18–50 years): 8 normal-weight individuals without metabolic disorders undergoing planned abdominal surgery and 20 individuals with obesity (with body mass index 42 ±3.9 kg/m^2) undergoing planned metabolic surgery: 12 with metabolic syndrome (MS+) and 8 without metabolic syndrome (MS–). Anthropometric measurements were performed and blood was drawn to determine the concentrations of selected biochemical parameters. The obtained results were used to calculate the indirect indicators of insulin sensitivity HOMA-IR and FLAIS. During the procedures, 2 g of abdominal SAT was taken from all individuals. Gene expression analysis of selected markers of cellular senescence (*TP53*, *CDKN1A*, *CDKN2A*, *GLB1*) and genes related to adipogenesis (*CEBPA*, *CEBPB*, *PPARG*, *ADIPOQ*) and insulin signaling (*IRS1*, *IRS2*, *AKT2*, *SLC2A4*) was then performed with the quantitative polymerase chain reaction method.

Results: Insulin sensitivity assessed by FLAIS and adiponectin concentration were statistically significantly lower in the group with obesity (all $p < 0.003$). In subjects with obesity, fasting glucose level, C-peptide, triglyceride concentrations and HOMA-IR were significantly higher in MS+ individuals compared to MS– individuals (all $p < 0.05$). In the SAT we noted higher expression of *CDKN1A*, *CDKN2A*, *GLB1* (all $p < 0.003$) and lower expression of *CEBPA*, *PPARG*, *SLC2A4* (all $p < 0.05$) in individuals with obesity compared to the normal-weight group. In the SAT of MS+ individuals we noted higher expression of *TP53* and lower expression of *CEBPA*, *PPARG* (all $p < 0.05$) compared to MS– subjects. In the whole study population, expression of *CDKN1A* and *GLB1* in the SAT negatively correlated with adiponectin levels, FLAIS and *SLC2A4* expression in the SAT (all $p < 0.05$) and positively correlated with C-peptide and triglyceride levels (all $p < 0.05$).

Conclusions: The results suggest that processes related to cellular senescence in SAT may be associated with impaired adipogenesis and the development of metabolic disorders in human obesity.

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Periodontitis and oral hygiene in patients with diabetes mellitus type 2 and diabetic foot syndrome: a preliminary study

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Introduction: Type 2 diabetes mellitus (T2D) and periodontitis are chronic conditions that frequently co-occur. Type 2 diabetes mellitus increases the risk of periodontitis due to immune dysfunction and elevated glycemia. Conversely, periodontitis may affect insulin sensitivity and worsen glycemic control. Uncontrolled diabetes may lead to complications, such as diabetic foot syndrome (DFS). Our study aimed to investigate the relationship between metabolic control of diabetes, the occurrence of periodontal disease, and adherence to dental recommendations in patients with T2D and DFS.

Material and methods: The cross-sectional study included two groups of T2D patients: those with and those without DFS. We collected the baseline characteristics, including medical history, physical examination, and laboratory tests. A survey on oral health and hygiene was conducted. We performed a complete periodontal examination on patients who did not meet the exclusion criteria (lack of teeth). The periodontal examination involved the assessment of the periodontal disease stage and indicators, such as clinical attachment loss, pocket depth, and bleeding on probing.

Results: 96 patients were included: 54 with DFS and 42 without this complication.

Table 1 shows summarized results of the questionnaire. There were no statistically significant differences between the groups regarding age, body mass index, and HbA_{1c}%. The duration of T2D was longer in patients with DFS ($p = 0.01$). Patients with DFS were more likely to be edentulous (24.1% vs. 4.73% in the control group, $p = 0.047$). Patients with DFS tended to brush their teeth less frequently ($p = 0.037$). 23 patients provided informed consent

Table 1. Oral health and hygiene questionnaire results

Parameters	Diabetes type 2		Diabetic foot syndrome		*p*-value
	N	%	*N*	%	
Sex					0.03244
Female	15	35.7	8	14.8	
Male	27	64.3	46	85.2	
Lost teeth					0.0467
No	3	7.14	2	3.70	
1–4	9	21.4	7	13.0	
≥ 5	28	66.7	32	59.3	
All	2	4.73	13	24.1	
Reason					0.4736
Only periodontitis	8	19.0	13	24.1	
Only caries	18	42.9	24	44.4	
Periodontitis and caries	13	31.0	14	25.9	
< 0.001 Orthodontic	2	4.76	0	0.0	
Education					< 0.001
Elementary	5	11.9	1	1.85	
Vocational	5	11.9	15	27.8	
Secondary	17	33	33	61.1	
High	15	5	5	9.26	
Brushing the teeth					0.03716
No	3	7.14	4	7.41	
Once a day	7	16.7	23	42.6	
Twice a day	28	66.7	22	40.7	
> twice a day	4	9.52	5	9.26	
Flossing the teeth					0.0594
No	33	77.1	50	92.7	
Once a day	3	5.71	3	4.88	
Twice a day	6	17.1	1	2.44	
Visiting a dentist					0.4753
Never	5	11.9	6	11.1	
< once a year	15	35.7	26	48.1	
≥ once a year	22	22.4	22	40.7	
Gingival bleeding					0.3774
Yes	9	76.2	47	87.0	
No	32	21.4	7	13.0	
Smoking					0.7481
Active	6	14.3	8	14.8	
Former	23	54.8	33	61.1	
Never	13	31.0	13	24.1	

and met the inclusion criteria for the periodontal examination. The groups did not differ in terms of periodontal disease indicators. 14 patients (60.9%) had active periodontitis and 8 patients (34.8%) had clinical gingival health on a reduced periodontium (Table 2).

Only one patient (4.3%) had no signs of active or past periodontitis.

Conclusions: Our study highlights the importance of dental education in patients with T2D. The vast majority of examined patients exhibited active or past periodontitis as well as significant tooth loss. The survey revealed considerable neglect of oral hygiene among patients. Despite the poorer results of the DFS group in the oral hygiene survey, the periodontal examination did not show significant differences between the DFS and T2D groups. The results may be biased because most DFS patients were excluded due to the lack of teeth and DFS patients who agreed to the examination mostly followed dental recommendations.

Source of funding: SKN/SP/601419/2024, SKN32 "Studenckie koła naukowe tworzą innowacje", Ministry of Science and Higher Education, Poland

Table 2. Periodontal examination in diabetic foot syndrome and type 2 diabetes mellitus group: consolidated results

Parameters	Median	IQR
Lost teeth	14	13.5
CAL max	7	3.5
PD max	4	2
BOP (%)	4	8
Plaque (%)	31	25
Periodontitis, *n* (%)		
No	1	4.35
Stage I	0	0
Stage II	0	0
Stage III	2	8.7
Stage IV	12	52.2
Gingival health on reduced periodontium	8	34.8

BOP – bleeding on probing, CAL max – maximal clinical attachment loss, IQR – interquartile range, PD max – maximal pocket depth

SESSION OF ORIGINAL PAPERS 2

Chairs: Agnieszka Szypowska, Hanna Kwiendacz, Agnieszka Zubkiewicz-Kucharska

From pediatric to adult diabetes care: experience of the organized transition process of youth with type 1 diabetes

Elżbieta Niechciał[1], Paulina Wais[1], Dorota Lenartowska[2], Andrzej Kędzia[1], Maria Izbaner[2], Monika Pietrzak[2], Katarzyna Cyranka[3,4,5], Dorota Zozulinska-Ziolkiewicz[6], Aleksandra Araszkiewicz[6]

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Introduction: The transition from pediatric to adult diabetes care is a critical phase for youth with type 1 diabetes (T1D), as it significantly impacts long-term health outcomes. The main aim of this study was to implement a structured transition process for adolescents with T1D to adult diabetes care.

Material and methods: Adolescents up to 18 years of age were enrolled in a transition program designed to facilitate their referral from pediatric to adult healthcare service. Patients under the care of the diabetes outpatient clinic in Greater Poland were referred to the Department of Pediatric Diabetes for final hospitalization before adulthood. The hospitalization included collection of data from therapy-supporting devices, laboratory tests, and assessment of health-related quality of life (HRQoL) using the validated KIDSCREEN-27 questionnaire and diabetes distress (DD) using the age-specific Problem Areas in Diabetes questionnaire (PAID). The stay at the hospital was concluded with the issuance of a Diabetes Care Information Card, a referral, and the scheduling of the first visit to the adult diabetes clinic.

Results: The study cohort comprised 68 patients (37 boys) with a mean T1D duration of 8 years. Most patients were treated with continuous subcutaneous insulin infusion (n = 47), and all used continuous glucose monitoring for blood glucose monitoring. The mean time in range (TIR) and HbA_{1c} were 60% and 7.3%, respectively. Participants obtained significantly lower scores on the physical well-being dimension in comparison to scores on the remaining four dimensions in the KIDSCREEN-27 questionnaire. Girls reported notably lower scores on all dimensions of HRQoL than boys. Type 1 diabetes duration < 5 years was associated with the worst scores on physical and psychological well-being dimensions, while scoring on autonomy and parental relation dimensions was the lowest among those with T1D duration 5–10 years. Almost 12% (n = 8) of youth reported high levels of DD measured via PAID; it mainly concerned girls (62%, n = 5). A slight increase in DD levels was noted, along with a decrease in TIR values. Around 14% of adolescents with TIR < 70% had a mean score above 40, suggesting high emotional distress regarding the disease. Eight youths from the poorly controlled group had a mean score of less than 10, which may suggest denial. The mean PAID score was comparable between both sexes.

Conclusions: Youth with T1D have insufficient metabolic control of the disease. HRQoL is decreased, mainly in the physical well-being dimension. Diabetes distress is quite a common issue, especially among those with higher TIR values.

Sexual dysfunction in the young population of people with type 1 diabetes

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Introduction: Sexual dysfunctions of varying severity are one of the complications of diabetes and affect the general well-being of many patients. The aim of this study was to examine the impact of type 1 diabetes (T1D) on the quality of sexual life of young women and men in terms of demographic, clinical and social factors. To our knowledge, there have been few studies that have analyzed sexual dysfunctions among young people with T1D. However, none of them describes this type of difficulties in sociodemographic terms.

Material and methods: The study used the Changes in Sexual Functioning Questionnaire (CSFQ-14) in a version for women and men. At the end of the survey, additional questions regarding demographic data, duration, self-control and treatment of T1D were included, designed by the authors for the purposes of this study, in order to better understand and differentiate the problem. 334 individuals participated in the study, including 329 sexually active people, among whom there were 177 people with T1D, aged 20 to 60 (average age in the T1D group was 31.31). The remaining 152 people constituted the control group (average age was 35.43). Anonymous respondents answered questions in an online survey regarding the quality of their sexual life.

Results: 34.4% of men and 28.4% of women with T1D reported sexual dysfunctions. Men with T1D most frequently reported difficulties in achieving orgasm, while women with T1D reported lower levels of arousal. Among people with T1D, age did not affect the incidence of sexual dysfunctions.

Conclusions: Type 1 diabetes increases the incidence of sexual disorders in terms of desire, arousal, pleasure, and orgasm.

The underexplored realities of aging with type 1 diabetes: quality of life, diabetes distress, and cognitive function in elderly patients

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Introduction: Due to the limitations of previously available therapeutic options, many people with type 1 diabetes (T1D) died prematurely. Among those who have lived beyond the age of 65, a high prevalence of diabetes-related complications is commonly observed. Consequently, this population remains notably under-researched in terms of quality of life (QoL), diabetes distress (DD), fear of hypoglycemia (FoH), and cognitive parameters. The study aimed to assess psychological parameters of a unique population of patients with T1D aged 65 and found eligible to participate in a clinical randomized trial using the MiniMed 780G advanced hybrid closed loop (AHCL) system.

Material and methods: A total of 34 patients (18 females, 52.9%) aged over 65 years (M = 69.21, standard deviation – SD = 4.64) mostly on MDI and continuous glucose monitoring (only one on insulin pump) with T1D (M = 31.29 years, SD = 16.64; HbA_{1c} M = 7.43%, SD = 0.89) with no prior experience with AHCL underwent psychological assessment before they were randomized to either the AHCL or control group. Quality of life and depressiveness were assessed with the World Health Organization-Five Well-Being Index, diabetes distress with the DDS17 questionnaire, FoH with the HFS-II survey and cognitive functions with Montreal Cognitive Assessment (MoCA). The study will continue for 12 months, at which point assessments of changes in psychological parameters will be conducted.

Results: 44.1% (*n* = 15) of patients were below the cutoff point for depression and lowered QoL (13 points), with the mean result for the examined group also below the threshold (M = 11.85, DS-3.92). Severe DD was observed in 11.8% (*n* = 4) of patients, moderate DD in as many as 47.1% (*n* = 16) and low distress in only 41.2% (*n* = 14) of patients, with the mean result for the group at the moderate level of DD (M = 2.16; SD = 0.74). 70.6% of the patients (*n* = 24) experienced FoH, applying various strategies to avoid hypoglycemia. In the MOCA test, only 41.2% (*n* = 14) achieved a result within the normal range, which indicates mild cognitive impairment in as many as 20 patients, with also 41.2% (*n* = 14) having higher education.

Conclusions: Most of the patients experience psychological difficulties, which should be taken into account in the complex, multidisciplinary care. Further investigation into these domains is essential to better understand and address the unique challenges faced by elderly individuals with T1D. In addition, the 12-month clinical trial will indicate whether the introduction of AHCL will help in improving psychological parameters in comparison to the control group.

Source of funding: Medtronic grant

Glycemic control in children with type 1 diabetes treated with the MiniMed 780G system: 3-year prospective, observational, two-center study

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Introduction: The MiniMed 780G was the first commercially available automated insulin delivery (AID) system in Poland.

The aim of this study was to analyze glycemic control and anthropometric parameters in children and adolescents with type 1 diabetes (T1D) after three years of using the AID system.

Material and methods: Prospective data collection included anthropometric measurements, information from insulin pumps, and continuous glucose monitoring from 50 children with T1D (mean age: 9.9 ±2.4 years; T1D duration at study start: 3.9 ±2.56 years; 24 boys, 48%) using the AID system. Two-week data from the AID system collected at initiation were compared with data at 6, 12, 24, and 36 months after starting AID use. HbA_{1c} levels and time in tighter range (TITR) of 70–140 mg/dl were also assessed at baseline and after 3 years.

Results: HbA_{1c}, TITR, and body mass index *Z*-scores at baseline and after 3 years were comparable ($p > 0.05$). Time in range (70–180 mg/dl) worsened after 3 years of observation ($p = 0.03$) compared to peak values at 6 and 12 months (81.16 ±7.83% and 80.40 ±8.25%, respectively), but was comparable to baseline values (79.28 ±8.12% vs. 77.74 ±7.65% after 3 years; $p = 0.22$). The percentage of auto-correction in total daily insulin dose increased significantly ($p < 0.001$).

Conclusions: Maintaining optimal glycemic control with the MiniMed 780G system after 3 years, despite deterioration and the study group entering adolescence, remained within recommended target values, most likely due to auto-correction boluses.

Incidence of type 1 diabetes in Polish children: the 33-year-long, observational, multicenter PolPeDiab study

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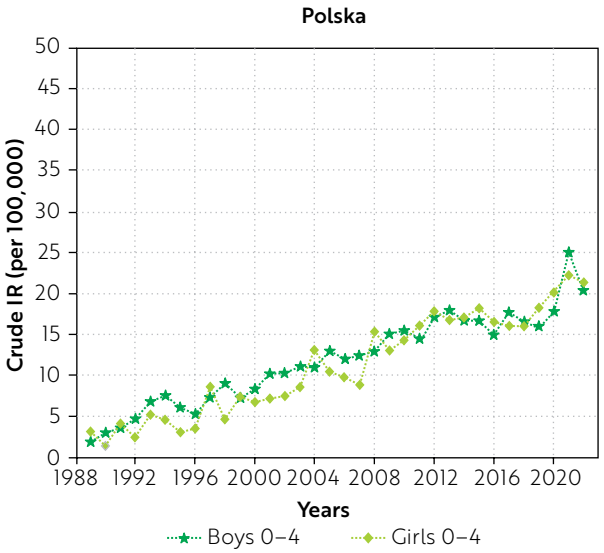
Introduction: Type 1 diabetes (T1D) is a common autoimmune disease in children, and its incidence changes over time. Long-term epidemiological studies are crucial for understanding the disease and effective healthcare planning. The study aimed to analyze the current changes in the incidence of T1D in children over a 33-year period in Poland.

Material and methods: A multicenter observational study was conducted, including children up to 15 years of age with newly diagnosed T1D within the PolPeDiab group. The database included epidemiological information from 14 Polish voivodeships, collected prospectively in the years 1989–2022. The incidence rate was analyzed in relation to calendar year, age (0–4, 5–9, 10–14 years) and gender.

Results: In 2020, the incidence of T1D among children aged 0–14 years averaged 29.65 per 100,000 per year in the analyzed regions, which is approximately a 50% increase in new cases compared to 2010, when the incidence rate was 19.53/100,000 per year and more than a 6-fold increase since 1989 (4.66/100,000/year). Higher incidence rates were observed in the age groups 5–9 and 10–14 years.

Conclusions: Over the past 33 years, there has been a steady, significant increase in the incidence of T1D among children up to 15 years of age in Poland, which concerns both sexes and all age groups.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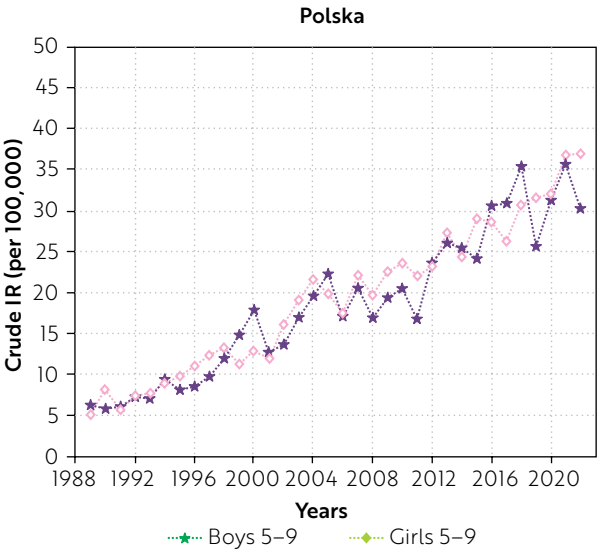
Years
Boys 0–4
Girls 0–4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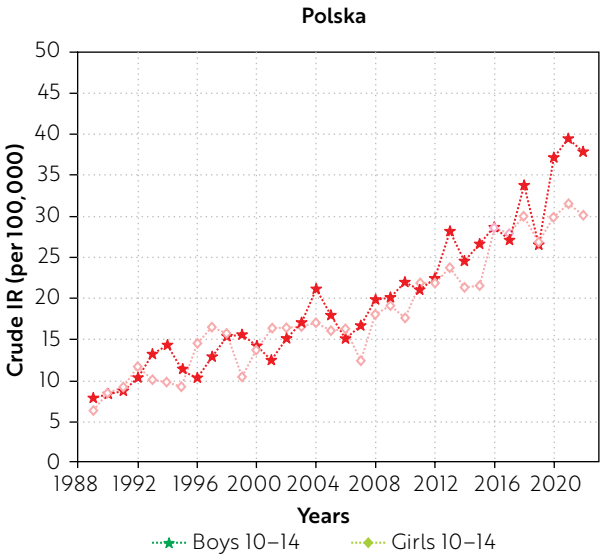
Girls 5–9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Years
Boys 10–14
Girls 10–14

Polish population of first-degree relatives of people living with type 1 diabetes based on the INNODIA screening for early stage type 1 diabetes program

Magdalena Małachowska[1,3], Kamil Kosiorowski[1,4], Paulina Pokrywka[1], Eliza Skała-Zamorowska[2], Ewa Rusak[2], Halla Kamińska[2], Sebastian Seget[2], Aleksandra Pyziak-Skupień[5], Grażyna Deja[2], Przemysława Jarosz-Chobot[2]

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Introduction: Nowadays, identification of people with the early stages of type 1 diabetes (T1D) has become a leading goal in diabetic care. Studies regarding T1D focus on the detection of early-stage T1D in order to decrease the risk of developing diabetic ketoacidosis (DKA) at clinical onset of T1D (stage 3) as well as to facilitate and enable development of disease-modifying therapies. INNODIA EU115797 (2015–2023) performed a European screening of people with T1D (< 6 weeks) and their first-degree relatives (aged 1–45). We aimed to describe the risk of T1D development in the first-degree relatives of people living with T1D based on the INNODIA project results from a Polish center.

Material and methods: Data regarding autoantibody incidence was recruited from the database of the INNODIA project platform. The analysis included first-degree relatives of people living with T1D aged 1–45 who met the inclusion criteria and were recruited in a Polish center. The samples were collected at the Polish center, in accordance with the guidelines of the INNODIA program. The analysis included age, sex, autoantibodies (GAD65, IAA, IA-2A, ZnT8), and first-degree familial relationships from the INNODIA database. Participants were grouped based on the number of autoantibodies (1 or ≥ 2). Data were used to assess autoantibody prevalence across age groups and familial relationships.

Results: Out of 817 individuals screened, 65 (7.96%) were identified with autoantibodies: 48 (5.88%) had 1 autoantibody, and 17 (2.08%) had ≥ 2 autoantibodies. The highest prevalence of autoantibodies was observed in the 10–23 age group (27.7%, 18 out of 65). Within this age category, 11.04% (18 out of 163) tested positive for autoantibodies, while the prevalence in other age groups (1–9, 24–36, 37–40, 41–45) was in the range 5.98–8.97%. GAD65 (5.51%) and IAA (3.43%) autoantibodies were most frequent. Individuals with 1 autoantibody were mostly parents of children with T1D (32, 66.67%), while positivity for ≥ 2 autoantibodies was more common in siblings (13, 72.22%). Two individuals developed stage 3 T1D (clinical onset) during the study.

Conclusions: In the INNODIA study of the Polish population of first-degree relatives of individuals with type 1 diabetes, the prevalence of autoantibodies was 7.96%. Screening for early stage T1D is essential for the implementation of new therapeutic options and for reducing the frequency of severe complications at the time of clinical onset of T1D, such as DKA.

Source of funding: Translational Approaches to Disease-Modifying Therapy of T1D: An Innovative Approach Towards Understanding and Arresting T1D (2015–2023; EU115797)

The association between continuous glucose monitoring-derived metrics and diabetic peripheral neuropathy in people with type 1 diabetes

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Introduction: Diabetic neuropathy is a prevalent chronic complication in patients with diabetes, contributing to reduced quality of life. Sudomotor dysfunction, measured by SUDOSCAN based on feet electrochemical skin conductance (FESC), is an early manifestation of diabetic peripheral neuropathy (DPN). While hyperglycemia is a key risk factor in DPN progression, emerging data suggest that certain continuous glucose monitoring (CGM) metrics – especially time in range (TIR) and nocturnal TIR – may be associated with DPN independently of traditional markers such as HbA_{1c}. This study aimed to assess the relationship between selected indicators of glucose control and variability and the prevalence of DPN.

Material and methods: The inclusion criteria were age 18–50 years and a confirmed type 1 diabetes (T1D) diagnosis (positive autoantibodies) for at least 5 years. The exclusion criteria were infection, pregnancy, cardiovascular disease, and hypertension. We collected demographic and laboratory data, as well as CGM-derived glycemic metrics using GlyCulator 3.0 (TIR, nocturnal TIR, high blood glucose index [HBGI], M100, J-index) from 30–90-day periods before DPN assessment. Diabetic peripheral neuropathy status was determined by FESC (< 60 µS) on SUDOSCAN (Impeto Medical, Paris, France).

Results: A total of 116 individuals with T1D (88 without neuropathy, 28 with neuropathy) were included, with a median age of 34.5 (24.7–41.1) years and diabetes duration of 14 (10–21) years; 56.9% were men. Individuals with DPN were older [42.3 (29.2–46.8) vs. 33.6 (24.4–39.5) years]. 30-day CGM metrics showed no significant differences between groups. However, those with DPN had significantly lower 90-day TIR (46.5 ±18.6% vs. 54.5 ±17.7%; $p = 0.046$) and time in tighter range (TITR) [26.9 (19.6–30.9) vs. 31.6 (23.3–44.5); $p = 0.03$], as well as higher HBGI [12.0 (9.2–14.7) vs. 9.0 (5.5–13.9); $p = 0.04$], M100 [263.3 (235.1–294.5) vs. 223.0 (168.7–282.8); $p = 0.02$], and J-index [72.6 (55.7–83.3) vs. 55.0 (36.7–77.4); $p = 0.02$] compared to those without neuropathy. In multivariable analyses, TIR (OR 0.90, 95% CI: 0.84–0.96, $p = 0.002$) and TITR (OR 0.85, 95% CI: 0.78–0.93, $p < 0.001$) were negatively associated with DPN, whereas HBGI (OR 1.27, 95% CI: 1.06–1.51, $p = 0.01$), M100 (OR 1.03, 95% CI: 1.01–1.05, $p = 0.001$), and J-index (OR 1.04, 95% CI: 1.01–1.08, $p = 0.02$) were positively associated with DPN, all independent of HbA_{1c}, age, and albumin-creatinine ratio.

Conclusions: Spending more time within the target glycemic range and lower glycemic variability are associated with a reduced risk of DPN.

Body composition-related cardiometabolic risk among young adults with newly diagnosed type 1 diabetes: the prospective cohort study InLipoDiab1

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Introduction: The assessment of body composition in type 1 diabetes (T1D) and the fat mass-to-muscle ratio (FMR) may help identify early cardiometabolic risk in T1D. We explored changes in FMR and factors contributing to FMR over time in a cohort of young adults with newly diagnosed T1D. We also aimed to determine whether participants' sex modifies the effect size of the association between FMR and cardiometabolic characteristics in the cohort.

Material and methods: A complete-case, secondary analysis of data collected from the *n* = 142 participants recruited to the Insulin Therapy and Lipoproteins Profile in Type 1 Diabetes (InLipoDiab1) study. We used the Tanita BI analyser to calculate the FMR at baseline (V0) and follow-up visits after 12 months and 24 months (V12, V24). In the multivariate analysis, we explored whether the following participants' baseline characteristics contributed to these changes: age at the diagnosis, sex, physical activity and smoking.

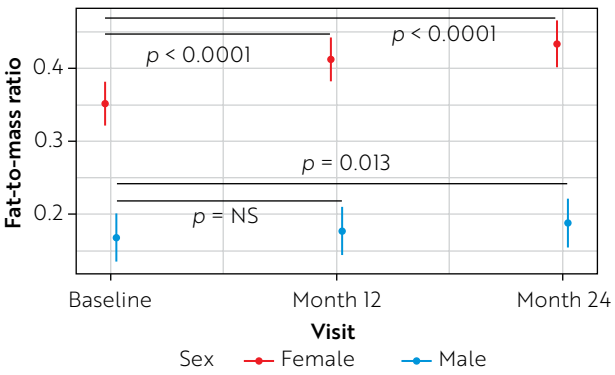

Fig. 1. Change in fat-to-mass ratio over the observation time

NS – not significant

Results: Baseline characteristics: female/male: 80/62; age:26.7 ±6.0 years; body mass index:21.9 ±4.1 kg/m^2; HbA_{1c}:11.2 ±2.1%; WHR:0.83 ±0.1, eGDR:8.20 ±1.82 mg × kg; MetS: 24.2%; HDL cholesterol: 1.24 ±0.37 mmol/l; LDL cholesterol: 2.42 ±0.97 mmol/l; non-HDL cholesterol: 3.30 ±0.99 mmol/l; triglycerides: 1.34 ±0.85 mmol/l. Results of the multivariate analysis after controlling for age and sex: FMR was significantly lower in men than women over the study period [β: −0.2 (95% CI: −0.24 to 0.14), $p < 0.0001$], with no association between FMR and age at baseline ($p = 0.953$). The fat mass-to-muscle ratio remained stable over the first two years of treatment ($p = 0.342$ for ANOVA, comparing means for V0, V12, V24). The fat mass-to-muscle ratio was significantly inversely associated with HbA_{1c} (β: −0.009 (95% CI: −0.012 to −0.007), $p < 0.0001$), LDL cholesterol [β: −0.045 (95% CI: −0.068 to −0.020), $p = 0.0001$] and non-HDL cholesterol [β [mg/dl]: −0.001 (95% CI: −.0016 to −0.00049), $p < 0.0001$] during the observation period. Male sex significantly modified the change in FMR over time ($p = 0.001$ for the interaction term V12 × male sex; $p < 0.001$ for the interaction term V24 × male sex) and the association between FMR and the explanatory covariates ($p < 0.0001$, $p = 0.009$ and $p = 0.001$ for the interaction terms: HbA_{1c} × male sex; LDL-chol × male sex and non-HDL chol × male sex, respectively).

Conclusions: Our data indicate an association between FMR and important measures of cardiometabolic risk in the population of young adults with a short history of T1D treatment. Furthermore, this association differs between sexes, revealing that, despite a comparable rate of glycemic improvement, women experience a worsening fat-to-muscle mass ratio compared to men.

Figure 1 shows the change in the FMR over the study period in the cohort split into men and women. The figure indicates a significantly different pattern in the FMR change over time in men compared to women. In male participants, there was a slight, linear increase in FMR: by 0.011 to V12 and by 0.022 from the baseline to V24 (p for trend = 0.624).

In contrast, there was a significant increase in FMR in female participants: by 0.06 to V12 and by 0.081 to V24 ($p = 0.013$ for trend). If expressed as a percentage, the proportion of fat tissue in females increased, on average, by 6.0% over the first year of treatment and by 8.1% over two years of treatment.

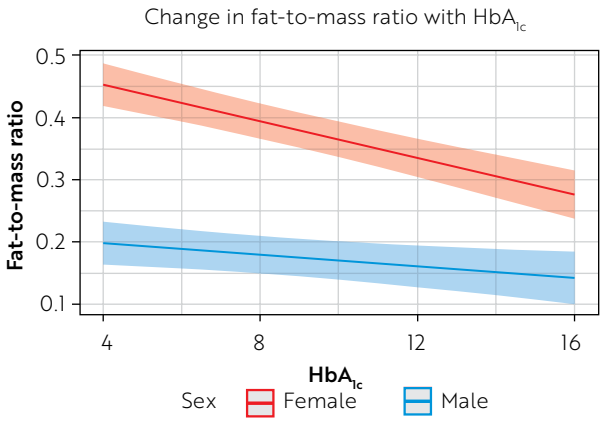

Fig. 2. Association between HbA_{1c} and fat mass-to-muscle ratio in the cohort adjusted for age at type 1 diabetes diagnosis, by participants' sex ($p < 0.0001$ for the interaction term HbA_{1c} × sex)

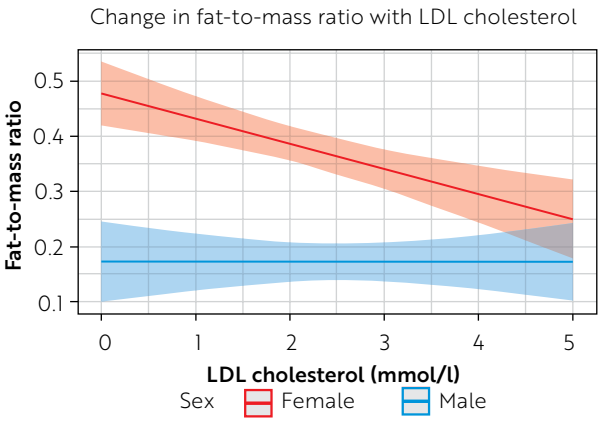

Fig. 3. Association between LDL cholesterol and fat mass-to-muscle ratio in the cohort adjusted for participants' age at type 1 diabetes diagnosis, by participants' sex ($p = 0.009$ for the interaction term LDL cholesterol × sex)

Figures 2–4 present the modifying effect of the participants' sex on the association between the explanatory covariates and the FMR in the InLipoDiab1 cohort. Regression curves for the multivariate analysis adjusted for participants' age at diagnosis are shown separately for women and men.

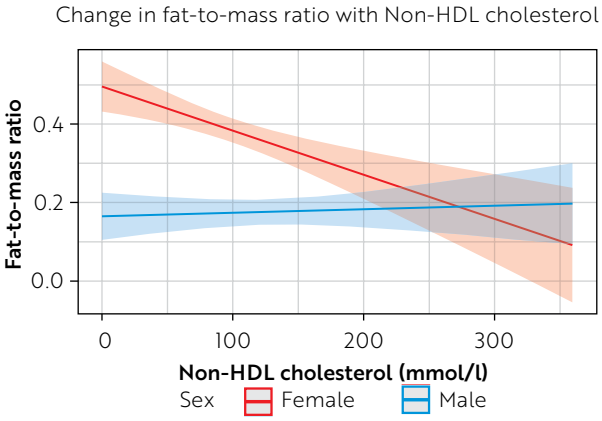

Fig. 4. Association between non-HDL cholesterol and fat mass-to-muscle ratio in the cohort adjusted for participants' age at type 1 diabetes diagnosis, by participants' sex ($p = 0.001$ for the interaction term non-HDL cholesterol × sex)

The association between platelet morphological parameters and diabetic peripheral neuropathy in people with type 1 diabetes

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Introduction: Diabetic neuropathy is a common complication among individuals with diabetes contributing to reduced quality of life. One of its early markers is sudomotor dysfunction (SD), which can be quantified using SUDOSCAN based on feet' electrochemical skin conductance (FESC). People with diabetes often exhibit increased mean platelet volume (MPV) and platelet distribution width (PDW). Both MPV and PDW have been linked to various diabetic complications, such as arterial stiffness and erectile dysfunction. Although an association between higher MPV and neuropathy has been described in people with type 2 diabetes, corresponding data in type 1 diabetes (T1D) remain scarce. The study aim was to evaluate the relationship between platelet morphology parameters (MPV, PDW) and sudomotor dysfunction in individuals with T1D.

Material and methods: We enrolled 119 participants with T1D mellitus. The inclusion criteria were age 18–50 years and a confirmed T1D diagnosis (positive autoantibodies) for at least 5 years. Exclusion criteria included infection, pregnancy, cardiovascular disease, hypertension, and platelet count or hemoglobin outside the reference range. Demographic and laboratory data were collected, including MPV and PDW measurements performed on a Sysmex XN1000 analyzer (Sysmex Corporation, Japan) within 120 minutes of blood collection. Sudomotor dysfunction was defined by FESC below 60 µS, measured with a SUDOSCAN device (Impeto Medical, Paris, France).

Table 1. Multivariable logistic regression model with mean platetelet volume

Parameters	OR (95% CI)	*p*-value
Diabetes duration (years)	1.05 (95% CI 0.99–1.22)	0.13
MPV (fl)	2.14 (95% CI 1.23–3.73)	0.01
HbA_{1c} (%)	1.61 (95% CI 1.00–2.60)	0.05
Age (years)	1.09 (95% CI 1.02–1.15)	0.01

MPV – mean platelet volume
The dependent variable: presence of sudomotor dysfuntion (coded as 1) vs. lack of distal peripheral neropathy (coded as 0).

Table 2. Multivariable logostic regression model with platelet distribution widh

Parameters	OR (95% CI)	*p*-value
Diabetes duration (years)	1.05 (95% CI 0.99–1.12)	0.09
PDW (fl)	1.33 (95% CI 1.08–1.63)	0.01
HbA_{1c} (%)	1.71 (95% CI 1.06–2.75)	0.03
Age (years)	1.09 (95% CI 1.02–1.15)	0.01

PDW – platelet distribution width
The dependent variable: presence of sudomotor dysfunction (coded as 1) vs. lack of distal peripheral neuropathy (coded as 0).

Results: The median age of the participants was 34.0 [24.6–41.3] years, and the median duration of diabetes was 16 [10–23] years. In the study group, 59 (49.6%) were male. Sudomotor dysfunction was diagnosed in 26 out of 119 participants (21.8%). Individuals with SD were older [42.6 (30.0–46.9) vs. 33.6 (24.4–39.7) years] and had higher MPV values, but not PDW. Both MPV and PDW correlated with hands but did not correlate significantly with FESC. In multivariate models, adjusting for age, duration of diabetes, and HbA_{1c} levels, both PDW (OR 1.33; 95% CI: 1.08–1.63; $p = 0.01$) and MPV (OR 2.14; 95% CI: 1.23–3.73; $p = 0.01$) were significantly associated with SD.

Conclusions: These findings suggest that elevated platelet morphology parameters, particularly MPV and PDW, may serve as important correlates of diabetic peripheral neuropathy in T1D, highlighting a potential role for platelet indices in early risk assessment.

SESSION OF ORIGINAL PAPERS 3

Chairs: Mariusz Dąbrowski, Beata Mianowska, Bartłomiej Matejko

Lipoprotein(a) in adults with type 1 diabetes: insulin and lipoproteins in type 1 diabetes study

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Introduction: Type 1 diabetes (T1D) is associated with elevated risk of cardiovascular complications, primarily driven by premature atherosclerosis. Assessment of cardiovascular risk, along with implementation of preventive strategies and early detection of chronic diabetes complications, is crucial in T1D. Elevated lipoprotein(a) [Lp(a)] levels have emerged as independent risk factor for cardiovascular disease. We aimed to evaluate the concentration of Lp(a) in a cohort of people with T1D.

Material and methods: We analyzed data from 47 participants of Insulin Therapy and Lipoproteins Profile in Type 1 Diabetes, a single-center, prospective, observational study.

Results: 31 (66%) males and 16 (34%) females with a median age of 31 years (LQ–UQ: 26–35) were evaluated 7 years after T1D diagnosis. Elevated Lp(a) levels (≥ 50 mg/dl) were identified in 10 persons (21%), with a median Lp(a) level of 10.2 (3.48–43.1) mg/dl in the whole studied group. Median HbA_{1c} was 7.65 (6.3–8.5)%, body mass index 25.4 (22.3–27.2) kg/m², systolic blood pressure 120 (110–128) mm Hg, diastolic blood pressure 78 (70–80) mm Hg, and high-sensitivity C-reactive protein 0.81 (0.4–2.17) mg/l.

Lipid profiles showed median total cholesterol 182 (158–222) mg/dl, HDL cholesterol 68 (57–82) mg/dl, LDL cholesterol 89.9 (74.5–124.5) mg/dl, and triglycerides 86.6 (59.6–133.1) mg/dl.

Lipoprotein(a) levels were significantly lower in people with a positive family history of T1D compared to those with a negative family history [3.28 (2.34–14.02) vs. 11.9 (5.45–44.5) mg/dl, $p = 0.0304$]. Similarly, Lp(a) levels were reduced in people with a positive family history of T2D compared to those with no family history of T2D [3.26 (2.32–10.5) vs. 14 (9.59–48) mg/dl, $p = 0.004$].

Current smokers exhibited elevated Lp(a) levels compared to non-smokers [90.8 (70.2–104) vs. 11 (5.07–43.1) mg/dl, $p = 0.027$].

Conclusions: The observed prevalence of increased Lp(a) concentration in individuals with T1D was 21%, a proportion consistent with the prevalence reported in the general Polish population. Family history of T1D or T2D was associated with lower Lp(a) levels. Conversely, smoking was strongly associated with markedly higher Lp(a) concentrations.

Should you disconnect your MiniMed 780G during exercise? Results from a pilot randomized study in adolescents with type 1 diabetes during a holiday camp

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Introduction: Optimizing the performance of the advanced hybrid closed loop (AHCL) around exercise in adolescents with type 1 diabetes (T1D) is challenging. Despite being a common practice, the impact of disconnecting the pump on both the safety and effectiveness of glycemic control has not been extensively studied. We tested the effectiveness and safety of temporarily disconnecting the Medtronic MiniMed 780G insulin pump during exercise, compared to keeping it connected, in physically active adolescents with T1D.

Material and methods: This prospective, randomized, controlled pilot study was conducted during a 7-day holiday conditioning camp co-organized by a patient organization and clinicians in July 2024 in Poland. Participants were randomized to follow one of two strategies during planned workouts throughout the camp: (A) keeping the insulin pump connected and active in auto mode vs. (B) disconnecting it and stopping insulin delivery. During the camp, one or two sessions were scheduled daily, each lasting 1–1.5 h and starting 2–2.5 hours after breakfast and lunch. Irrespective of the randomized strategy, meal insulin boluses were administered without reduction based on AHCL recommendations. For 60–90 minutes before each session, all participants set a temporary glucose target of 150 mg/dl. The effectiveness and safety of the glucose management strategy were measured with continuous glucose monitoring. Continuous glucose monitoring data from the 7-day camp period were analyzed using GlyCulator 3.0. The primary comparison evaluated whether the pump disconnection resulted in a clinically significant change in time in range, tight range, and below range (time in range – TIR, 70–180 mg/dl; time in tighter range (TITR) 70–140 mg/dl; time below range (TBR), < 70 mg/dl and < 54 mg/dl).

Results: We recruited 15 adolescents [median age 11 (10–11) years, diabetes duration 1.6 (0.7–6.0) years, HbA_{1c} 6.4 (6.05–7.3)%, median body mass index *Z*-score –0.25 (–0.53 to 1.36)] and randomized 8 and 7 to strategy A (connected) and B (disconnected), respectively.

Disconnecting the system resulted in non-inferior TIR compared with the other strategy [connected: 84.36 ±8.05%; disconnected: 84.62 ±10.12%; +0.26 ±10.24% point difference, $p = 0.1677$] and TITR [connected: 68.43 ±13.06%; disconnected: 63.41 ±15.47%; –5.02 ±15.90% point difference, $p = 0.0982$].

The disconnection significantly reduced TBR < 70 mg/dl (connected: 4.08 ±3.50%; disconnected: 1.17 ±0.63%, mean + standard deviation; –2.91 ±2.91%point difference, $p = 0.0250$) but not TBR < 54 mg/dl (connected: 0.51 ±0.82%; disconnected: 0.12 ±0.15%; –0.39 ±0.68% point difference, $p = 0.0602$). No acute or adverse events were observed.

Conclusions: Temporarily disconnecting the AHCL pump during exercise is safe and provides comparable TIR and TITR while significantly reducing the risk of hypoglycemia in physically active adolescents with T1D.

The effect of creatine supplementation and extended eccentric-phase training under normoxic and normobaric hypoxic conditions on muscle strength, maximal oxygen uptake, metabolic control and asprosin concentration in men with type 1 diabetes

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Introduction: Creatine supplementation enhances muscle strength and performance by increasing phosphocreatine stores and boosting ATP resynthesis. It may support glycogen replenishment. Normobaric hypoxia is an adaptive method capable of improving exercise capacity, but its effect on type 1 diabetes (T1D) is not well recognized. There are, however, some indications in the literature that hypoxia may influence levels of asprosin – a molecule responsible for stimulating hepatic glucose production – although conclusive evidence is lacking. This study evaluated the impact of creatine supplementation and extended eccentric-phase training under normoxic and normobaric hypoxic conditions on muscle strength, maximal oxygen uptake (VO_2 max), metabolic control, asprosin concentration in men with T1D.

Material and methods: Twenty-eight men (age 37 ±6 years) with T1D (disease duration: 19 ±8 years), body mass index 26 ±2.8 kg/m², and HbA_{1c} of 6.5% were enrolled. Participants were randomly assigned to training groups (normoxia vs. hypoxia) and supplementation groups (creatine vs. no supplementation). The subjects completed a 60-minute training session twice weekly for 10 weeks. Each session involved exercises with an extended eccentric phase (barbell bench press with hip raise, dumbbell squats, and dumbbell lunges) at 3010 tempo. Maximal oxygen uptake and lactate concentrations were measured during an incremental exercise test. Muscle strength, HbA_{1c}, parameters of continuous glucose monitoring and asprosin concentration were assessed.

Results: After 10 weeks of training, the creatine-supplemented group showed a significantly greater increase in strength:

- bench press: +35.1 ±3.8 kg vs. +20.8 ±4.6 kg ($p < 0.001$),
- squats: +21.5 ±2.7 kg vs. +15.9 ±4.0 kg ($p < 0.001$),
- lunges: +23.9 ±1.7 kg vs. +14.6 ±3.4 kg ($p < 0.001$).

No significant between-group differences were observed in VO_2 max. In the hypoxia-training group, lactate values at the 10th minute of the exercise test were higher (5.48 vs. 3.87 mmol/l, $p = 0.07$) yet decreased more rapidly during the recovery phase. In the creatine group, there was a non-significant decrease in asprosin concentration (for baseline 1.453: $\Delta = -0.628$ ng/ml vs. baseline 1.433: $\Delta = -0.226$ ng/ml in the non-supplemented group; $p = 0.06$). An increase in time in range of 70–180 mg/dl was observed in the hypoxia group ($p = 0.05$).

Conclusions: Creatine supplementation increases muscle strength in individuals with T1D. Training under hypoxic conditions may improve lactate metabolism, although further research is needed. The observed reduction in asprosin in the creatine group also warrants additional investigation.

The impact of modern hypoglycemic treatment with GLP-1 receptor agonists on plasma cardiovascular risk factors and the development of atherosclerotic plaque in carotid arteries

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Introduction: The rise in global diabetes cases has been staggering. Macrovascular complications account for over 50% of diabetes-related deaths. Atherosclerosis plays a key role in the development of cardiovascular diseases and is strongly associated with endothelial dysfunction induced by hyperglycemia in diabetic patients. The atherogenic process can be divided into several key stages: initiation, progression of the atherosclerotic plaque, and instability leading to rupture and acute vascular incidents. Numerous cytokines and chemokines participate in each of these stages. In randomized clinical trials, glucagon-like peptide-1 receptor agonists (GLP-1 RA) have shown promise in reducing the incidence of major adverse cardiovascular events, sparking interest in their impact on atherogenesis. The aim of this study was to examine whether GLP-1 receptor agonist therapy affects changes in plasma levels of cardiovascular risk factors such as interleukin 1(IL-1β), tumor necrosis factor α (TNF-α), oxidized low density lipoproteins (oxLDL), monocyte chemoattractant protein-1 (MCP-1), intercellular adhesion molecule 1, L-selectin, pentraxin 3 (PTX3), copeptin, matrix metalloproteinases 9 (MMP-9) and lipoprotein(a) (Lp(a)).

Material and methods: The study included 50 patients aged 41–81 years (mean age: 60.7 years) diagnosed with type 2 diabetes (median HbA_{1c} level of 8.8%), dyslipidemia, and confirmed carotid artery atherosclerosis using ultrasonography. All patients who met the inclusion criteria were eligible to start treatment with one of the GLP-1 receptor agonists: semaglutide (n = 16) or dulaglutide (n = 34). Anthropometric measurements, biochemical tests, and levels of the studied cytokines and chemokines were measured at the beginning and end of the experiment. The intervention period was 180 days.

Results: The therapeutic intervention showed that treatment with GLP-1 receptor agonists for 180 days led to statistically significant reductions in body weight, waist circumference, blood pressure, and HbA_{1c} levels – an average reduction of 1.1% ($p < 0.001$). There were also statistically significant decreases in plasma levels of cardiovascular risk factors such as IL-1β, TNF-α, oxLDL, MCP-1, L-selectin, PTX3, MMP-9 ($p < 0.001$), and Lp(a) ($p < 0.05$). The changes in levels of these cytokines and chemokines were not correlated with changes in biochemical and anthropometric indicators.

Conclusions: GLP-1 receptor agonists may play a role in inhibiting atherogenesis at various stages, which could lead to improved cardiovascular outcomes in individuals with type 2 diabetes. Their beneficial effects on anthropometric, metabolic, and plasma cardiovascular risk factors make them promising drugs in the comprehensive therapy of patients with diabetes and increased cardiovascular risk.

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Good metabolic control is associated with decreased circulating factor VIIa-antithrombin complexes in type 2 diabetes. A cross-sectional study

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Introduction: Diabetes is associated with a prothrombotic state contributes to cardiovascular (CV) events in type 2 diabetes (T2D). Activated factor VII (FVIIa)- antithrombin (AT) complexes are indicative of tissue factor (TF) exposure and have been associated with thromboembolic risk in coronary artery disease. To our knowledge there have been no reports on FVIIa-AT complexes in T2D; therefore we assessed factors that determine FVIIa-AT complexes in this disease and the impact of higher complexes on a prothrombotic state.

Material and methods: In 108 T2D patients (mean age 63.8 years, 52.8% men, median HbA_{1c} of 6.9 [interquartile range 6.1–8.2]%) and 83 age- and sex-matched non-diabetic subjects, we measured FVIIa-AT complexes. Metabolic control of T2D involved fasting glucose, HbA_{1c}, albumin/creatinine ratio (ACR) and lipid levels. To characterize a prothrombotic state, we determined thrombin generation parameters, fibrinolysis markers, and plasma fibrin clot properties.

Results: Activated factor VII-AT complex in T2D patients was similar to controls (73.6 [56.4–91.7] vs. 79.6 [59.2–97.1] pM, respectively, $p = 0.30$). Type 2 diabetes mellitus patients with FVIIa-AT in the upper vs. the lower quartile had a larger prevalence of active smoking and insulin use, along with higher fasting glucose (+36.4%), HbA_{1c} (+27.4%), ACR (+72.8%), total cholesterol (+34.5%), and LDL cholesterol (+80%). Activated factor VII-AT complexes showed no associations with *in vitro* thrombin generation potential, plasma fibrin clot properties, or fibrinolysis variables. On multivariable analysis HbA_{1c}, ACR, and total cholesterol remained independently associated with FVIIa-AT complexes in T2D.

Conclusions: This is the first study to show that, in T2D, higher FVIIa-AT complexes are associated with markers of dyslipidemia and glycemic control, indicating that TF-induced coagulation activation could be suppressed by achieving treatment targets.

The relationship between volumes of limbic system structures and body weight gain in women during the last year

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Introduction: The limbic system plays a crucial role in appetite regulation. Neurotransmission disturbances in the limbic system affect eating behavior and systemic metabolism regulation. According to the literature, body weight fluctuations are connected with higher risk of cardiovascular, metabolic and psychological complications. Previous studies have focused mainly on the association between weight loss and brain structures' volumes. The study aimed to examine the association of the volumes of limbic system structures with body weight gain in women during the last year.

Material and methods: The analysis included 505 women aged 20–70 years. Current use of antidepressive and/or antipsychotic medications, stroke, decompensated thyroid disease, and glucocorticosteroid use were the main exclusion criteria. Clinical examination and assessment of body composition by dual-energy X-ray absorptiometry were performed. Women underwent brain magnetic resonance imaging scanning, and morphometric analysis of the amygdala, nucleus accumbens, cingulate gyrus, hippocampus, thalamus and hypothalamus was conducted with the Freesurfer program. Brain structure volumes were normalized to estimated intracranial volume. Based on information from the medical history, we divided all participants into the study group (women with body weight gain during last year, n = 212) and comparison group (women without body weight gain during last year, n = 293).

Results: Study and comparison groups did not differ in age (45 vs. 45 years, p = 0.868). Median reported percentage of body weight gain in the study group was 7%. Women with body weight gain during the last year had a higher body mass index (BMI) (25.93 vs. 23.54 kg/m^2, p < 0.001), higher severity of depressive symptoms on the Beck scale (9 vs. 7 points, p = 0.006) and lower normalized volume of left nucleus accumbens (0.00036 vs. 0.00037, p = 0.016). Analysis of multivariate linear regression showed that volumes of left and right nucleus accumbens were associated with body weight gain during the last year after adjustment for age, BMI, right-handedness and education years (β = –0.12, p = 0.003, β = –0.09, p = 0.027). Including severity of depressive symptoms on the Beck scale, hours of sleep, alcohol intake, current smoking, and the presence of diabetes in the models did not significantly affect the relationship between left nucleus accumbens volume and body weight gain. Analysis of body composition parameters showed that right nucleus accumbens volume was associated with visceral fat mass and body weight gain during the last year after adjustment for age, right-handedness, and education years (β = –0.11, p = 0.020, β = –0.08, p = 0.041).

Conclusions: Difficulties in maintaining stable body weight in women may result from disturbances in the mesolimbic dopaminergic pathway.

Impact of diet and nutritional status on gingival crevicular fluid metabolome and microbiome in people with type 1 diabetes: a case-control study

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Introduction: People with type 1 diabetes (PwT1D) are at higher risk of developing periodontal diseases. The impact of diet on the oral microbiome remains under-researched, even though it is known that diet is an important factor affecting the oral health status and the prevalence of caries and periodontal diseases. We investigated the impact of dietary habits on the gingival crevicular fluid (GCF) microbiome and metabolome in PwT1D.

Material and methods: People with T1D were recruited and matched with non-diabetic controls. The oral and periodontal examination was performed and GCF sampled. Genomic DNA was extracted, bacterial 16S rRNA sequenced and concentrations of short-chain fatty acids and trimethylamine derivatives determined. Pro-healthy (pHDI) and non-healthy diet indices were calculated using a validated questionnaire of eating behaviours.

Results: In total, 110 participants were included (mean age 27.1 ±6.0 years, 60.0% male). In 65 PwT1D, the mean duration of diabetes was 15.5 ±8.4 years and mean HbA_{1c}% 6.97 ±0.95% (53 ±2.2 mmol/mmol). 22 cases of mild gingivitis (G) were identified, all in the T1D group. There were no significant differences in the frequencies of pHDI categories between study groups (T1D with G, low 19 [86.4%] and moderate 3 [13.6%]; T1D without G, low 28 [66.7%] and moderate 14 [45.2%]; control, low 30 [68.2%], moderate 14 [31.8%]; $p = 0.213$). Gingival crevicular fluid microbiome composition did not differ between pHDI categories. In PwT1D and G caproic acid was higher in the low vs. moderate pHDI category (3.5 [0.9–4.9] vs. 0.64 [0.49 – NA] µmol/l, $p = 0.04$). In people with T1D without G, isocaproic acid and glycerophosphorylcholine levels were lower in the low vs. moderate pHDI category (0.14 [0.13–0.46] vs. 0.45 [0.18–1.24] µmol/l, $p = 0.032$, and 71.23 [32.83–120.40] vs. 129.8 [70.5–228.1] ng/ml, $p = 0.013$).

Conclusions: This was the first study to report on the impact of diet on GCF in PwT1D. The state of periodontal tissues was worse in people with T1D, overweight and with a worse quality diet. Although the impact of diet itself on the GCF microbiome was not significant, there were alterations in the concentrations of selected GCF metabolites. This suggests an indirect association between the quality of diet and contents of pro-healthy and non-healthy products on the state of the periodontium.

Source of funding: Polish Ministry of Science and Higher Education Grant (NdS/545131/2022/2022)

Maturity onset diabetes of the young: from research to clinical practice. A summary of over 20 years of experience at the Department of Metabolic Diseases, Jagiellonian University *Collegium Medicum* in Kraków

Magdalena Szopa, Jan Skupień, Barbara Zapała, Natalia Nowak, Tomasz Klupa, Maciej Małecki

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Maturity onset diabetes of the young (MODY) is the most common form of monogenic diabetes mellitus (MDM), affecting up to 6% of patients with chronic hyperglycemia or diabetes. It is inherited in an autosomal dominant manner, and currently, 14 subtypes of MODY are distinguished, associated with mutations in 14 different genes. Over 20 years ago, the Department of Metabolic Diseases at Jagiellonian University *Collegium Medicum* began pioneering genetic diagnostics for patients suspected of having MODY. Since then, patients have been selected for genetic testing mainly based on two criteria: early age of diagnosis (≤ 35 years) and a positive, multi-generational family history of diabetes. In 2017, an additional tool – the MODY Probability Calculator – was introduced. Prior to this, genetic testing relied on sequencing a gene selected based on clinical data, such as testing the *GCK* gene for isolated fasting hyperglycemia, or sequencing the *HNF1A* gene when hyperglycemia progressed with symptoms characteristic of mutations in that gene. In 2013, the diagnostic approach was expanded to include next-generation sequencing, covering nearly 100 patients in research projects. After a break, genetic diagnostics were resumed in 2022 as part of services at the University Hospital in Kraków. The aim of this study is to present the characteristics of patients with genetically confirmed MDM, diagnosed in the period 2006–2024. The database, maintained since 2006, now includes 670 probands. The most common form is GCK-MODY (251 patients from 150 families), while HNF1A-MODY was confirmed in 177 patients from 66 families. Pathogenic changes were also identified in other genes linked to MODY, including HNF4A, HNF1B, ABCC8, NEUROD1, and PDX1, and genes associated with lipodystrophy such as LMNA, PPARG, and LIPE. Diagnostic challenges remain for patients with variants of uncertain significance (VUS) and those who clinically fit MDM but lack a genetic change. Increasingly, patients with mutations in multiple genes are being diagnosed, posing an intriguing scientific and clinical challenge. The implementation of MDM genetic diagnostics, as part of comprehensive diagnostics funded by the National Health Fund, has significantly improved the care of patients suspected of having MDM. An accurate diagnosis made early in the disease allows for optimized treatment, improving the quality of life of patients and reducing the risk of diabetes-related complications. It also offers the opportunity for appropriate early diagnosis of family members of patients with MDM. However, it is important for patients with diabetes to be referred for genetic testing in a selective, rather than screening, manner.

SESSION OF ORIGINAL PAPERS 4

Chairs: Agata Chobot, Aleksandra Araszkiewicz, Bogumił Wolnik

Usefulness of the MS-MLPA method in the search for the cause of transient neonatal diabetes mellitus associated with the 6q24 locus (6q24-TNDM)

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Introduction: Neonatal diabetes mellitus (DM) is mostly diagnosed within the first 6 months of life, but according to recommendations it should also be suspected between 6 and 12 months of life. There are two types: permanent (PNDM) and transient (TNDM). Permanent diabetes mellitus is usually caused by mutations in the *KCNJ11* and *ABCC8* genes, whereas TNDM is mostly caused by disorders in the 6q24 chromosome region (6q24-TNDM) in 3 mechanisms: paternal uniparental disomy of 6q24 region, duplication of 6q24 on the paternal allele, and maternal hypomethylation including *PLAGL1*. Transient diabetes mellitus is characterized by intrauterine growth retardation and diabetes usually diagnosed in the first weeks of life, which after several months of insulin therapy undergoes full clinical remission. However, diabetes may recur later and then requires treatment, with sulfonylurea derivatives. The aim of this study was to analyze the molecular basis of neonatal diabetes and to assess the prevalence of 6q24-TNDM.

Material and methods: At the Department of Clinical Genetics of the Medical University of Łódź, we retrospectively analyzed the medical records of 22 patients who were diagnosed with diabetes diagnosed before the age of 1 in 2017–2024. The average age of patients at the time of genetic analysis was 4 years. All patients were examined using targeted next generation sequencing (Illumina) and analyzed for pathogenic variants in genes associated with neonatal diabetes. Four patients were diagnosed with PNDM caused by causative variants in the *KCJN11* gene. Subsequently, MS-MLPA (methylation-specific-multiplex ligation-dependent probe amplification; SALSA MLPA probemix ME033-A1) analysis was performed in 12 patients.

Results: 4/12 (33.3%) patients were diagnosed with 6q24-TNDM: 2 patients had a paternal duplication of the 6q24 region, and another 2 patients had a paternal uniparental disomy of this region. The birth weight of each patient was < 2500 g. Diabetes was diagnosed in all patients within the first weeks of life. Diabetes was diagnosed again at 12 years of age in the oldest patient. Molecular analysis was also performed in the first-degree relatives of the patients. The MS-MLPA technique performed in 9 family members led to the diagnosis of 6q24-TNDM in 1 person.

Conclusions: In patients diagnosed with diabetes < 1 year old, after PNDM has been ruled out, it is reasonable to expand the genetic diagnosis by using the MS-MLPA technique as a reference method for detecting abnormalities at the 6q24 locus. This will make it possible to establish a definitive diagnosis, provide diabetes care and appropriate treatment, and support genetic counseling for the whole family.

Comparison of selected anthropometric and inflammatory indicators depending on the polycystic ovary syndrome phenotype

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Introduction: Polycystic ovary syndrome (PCOS) is commonly diagnosed based on the Rotterdam criteria. Scientists have also observed differences in other PCOS features in the patients studied, which resulted in the division into phenotypes. Anthropometric and inflammatory indicators are simple and useful tools for assessing the risk of cardiometabolic disorders. The aim of the study was to compare selected anthropometric and inflammatory indicators depending on the polycystic ovary syndrome phenotype.

Material and methods: The study was conducted at the Piekary Medical Center in the Department of Endocrinology. The analysis was based on a group of patients hospitalized between March 2013 and December 2020. The medical records of 342 patients with PCOS were analyzed. Ultimately, 114 patients were included in the group studied. Considering the criteria of the PCOS metabolic phenotype, the authors of the study distinguished 114 patients from the group studied – 59 patients with the metabolic phenotype of PCOS, and 55 patients with the non-metabolic phenotype of PCOS. Anthropometric parameters were measured and interpreted, and biochemical parameters and complete blood count were analyzed from medical records. The anthropometric and biochemical parameters were used to calculate "new" anthropometric indicators (BAI, VAI, ABSI, BRI, LAP, RFM and CUN-BAE) and new inflammation indicators: PLR, MPVLR, NLR and SII.

Results: The analysis of the obtained data shows that all values of the "new" anthropometric indicators were statistically significantly higher in the group of patients with the PCOS metabolic phenotype ($p < 0.001$). Statistically significantly higher values of leukocytes, neutrophils ($p < 0.001$), lymphocytes and monocytes ($p < 0.01$) were found in patients with the PCOS metabolic phenotype. A statistically significantly higher platelet count was found in patients with the PCOS metabolic phenotype ($p < 0.01$). The analyses showed that all "new" anthropometric indicators were characterized by a high ability to recognize the PCOS metabolic phenotype, including the highest one – RFM with AUC = 0.99 and a cut-off point for the prediction of the PCOS metabolic phenotype 37.03 and CUN-BAE with AUC 0.97 and a cut-off point for the prediction of the PCOS metabolic phenotype 38.01. The "new" inflammation indicators did not demonstrate usefulness as markers of the PCOS metabolic phenotype, reaching AUC = 0.34–0.59.

Conclusions: "New" anthropometric indicators – BAI, VAI, ABSI, BRI, LAP, RFM and CUN-BAE – may be useful in stratifying polycystic ovary syndrome for metabolic and non-metabolic phenotype.

Relationship of the triglyceride/high-density lipoprotein cholesterol ratio with anthropometric and metabolic parameters in pregnant women with gestational diabetes mellitus

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Introduction: Despite evidence pointing towards an association of the triglyceride/high-density lipoprotein cholesterol (TG/HDL-C) ratio with various metabolic and vascular diseases, there is limited information about the importance of this parameter in pregnant women affected by gestational diabetes mellitus (GDM).

The study aimed to examine the association of TG/HDL-C ratio with anthropometric and metabolic parameters in women with GDM.

Material and methods: The analysis included data from 399 patients, median age 31 (Q25–Q75: 28.0–34.0) years, from the Department of Internal Medicine and Diabetology, Medical University of Łódź and OmniMed Medical Center in Łódź, who were diagnosed with GDM in 2014–2020 (median time of GDM diagnosis was 25 (Q25–Q75: 24.0–27.0) weeks). The inclusion criteria were: diagnosed GDM based on the 2013 World Health Organization criteria and Caucasian origin. The exclusion criteria were: GDM in previous pregnancies, autoimmune diseases, endocrine diseases, chronic and acute inflammatory conditions, infections. The following data were analyzed: age, pre-pregnancy BMI (pBMI), pregnancy weight gain, HbA_{1c}, glycemia in 75 g oral glucose tolerance test (OGTT), lipid profile, fasting insulin, HOMA-IR, HOMA-B, C-reactive protein (CRP), systolic (SBP) and diastolic (DBP) blood pressure. The interview and determination of the above-mentioned parameters were performed before the dietary or pharmacological intervention. The patients were divided into tertiles according to the TG/HDL-C index value as follows: tertile 1 (T1): 0.69–2.31; tertile 2 (T2): 2.32–3.56 and tertile 3 (T3): 3.57–11.61. The Kruskal-Wallis test and Spearman's rank order correlations were used for statistical analysis.

Results: In patients with GDM, there were no significant differences in age, gestational weight gain, glycemia in the 1st and 2nd hour of the 75 g OGTT, HOMA-B, total cholesterol and LDL cholesterol between tertiles ($p > 0.05$). The values of pBMI and TG increased and HDL-C decreased with increasing tertiles ($p < 0.001$). Systolic blood pressure, HbA_{1c}, fasting insulin, HOMA-IR and CRP values were comparable between T2 and T3 ($p > 0.05$), but they were significantly higher compared to T1 ($p < 0.05$). In the case of fasting glycemia in 75 g OGTT and DBP, only in T3 were the values of these parameters significantly higher than in T1 ($p < 0.05$). Positive correlations were noted between the TG/HDL-C ratio and pBMI, fasting glycemia in 75 g OGTT, HbA_{1c}, fasting insulin, HOMA-IR, CRP (for all the mentioned parameters $p < 0.001$), SBP ($p = 0.008$) and DBP ($p = 0.004$).

Conclusions: In women with GDM, an increase in the TG/HDL-C ratio is associated with an increase in pBMI, insulin resistance, and systolic and diastolic blood pressure, as well as the development of inflammation and disorders of carbohydrate metabolism.

Analysis of the glycaemic profile in healthy women by trimester of pregnancy using a continuous glycaemic monitoring system

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Introduction: The continuous glycaemic monitoring system provides a number of unique parameters that were unknown to us before the continuous glucose monitoring (CGM) era. However, the development of glycaemic parameters in healthy pregnant women without diagnosed diabetes requires follow-up of this population. The aim of this study was to assess the daily glycaemic profiles of healthy pregnant women using a glucose monitoring system (CGM, FreeStyle Libre 2, Abbott) and to analyse changes in glycaemic profiles during pregnancy.

Material and methods: A single-centre, prospective study was conducted on 39 healthy pregnant women. The continuous glucose monitoring sensor was applied for 14 days at 11–13 weeks, then at 19–21 weeks and finally at 29–31 weeks of pregnancy. Mean, minimum and maximum glycaemia, glycaemic variability, glycaemic management index, time in range (TIR-63 –140 mg/dl), time below range, time above range (TAR) and weight gain were analysed.

Results: The mean age of the women was 35 ±4.2 years, pre-pregnancy weight was 71.9 ±14.7 kg and body mass index (BMI) was 25.9 ±4.7 kg/m². Mean fasting glycaemia was 88.1 ±7.8 mg/dl in the 1st trimester, 85.7 ±7.8 in the 2nd trimester and 83.6 ±7 in the 3rd trimester of pregnancy. Mean 24-hour glycaemia was 95.3 ±7.1, 93.8 ±7.7 and 92.3 ±7.8 mg/dl; minimum glycaemia was 52.6 ±7.9, 54.5 ±9 and 54.1 ±8 mg/dl; and maximum glycaemia was 165.1 ±19.6, 158.3 ±18 and 156.9 ±18.8 mg/dl (in the 1st, 2nd and 3rd trimesters, respectively). Time in range (63–140 mg/dl) was 96.7 ±2.7, 96.7 ±4.1 and 96.1 ±3.7%. The percentage of time below 70 mg/dl was 4.4 ±5.4, 5.7 ±8.8 and 6.8 ±7.5%, and the time below 63 mg/dl was 1.7 ±2.5, 2.2 ±4 and 2.5 ±3.3% per trimester. The glycaemic management index for each trimester was 5.6 ±0.2% (37.6 ±1.8 mmol/mol), 5.6 ±0.2% (37.2 ±2.1 mmol/mol) and 5.5 ±0.2% (37 ±2.1 mmol/mol). There were no statistically significant differences in these parameters between the first, second and third trimesters (all $p > 0.05$). No differences were found in the indices of glycaemic variation between patients with a BMI below and above 25 kg/m². There was also no correlation between the above indicators and weight gain during pregnancy.

Conclusions: In healthy pregnant women, no significant differences were found between the parameters of glycaemic variability obtained from the glucose monitoring system during consecutive trimesters of pregnancy. Both patients' BMI and gestational weight gain had no effect on the indices of glycaemic variability.

Source of funding: Scientific grant of the Polish Diabetes Association

The potential influence of glycemia in healthy pregnant women on fetal parameters in the third trimester of pregnancy

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Introduction: Continuous glycaemic monitoring (CGM) systems provide many new parameters for glycaemic assessment. At the same time, there is a shortage of sufficient data on glycaemic profiles in healthy pregnant women and the assessment of their relevance to fetal parameters. The aim of this study was to evaluate daily glycaemic profiles in pregnant women using a CGM system (Freestyle Libre 2, Abbott) and to analyse the impact of specific glycaemic parameters in the third trimester of pregnancy on fetal parameters assessed by ultrasound.

Material and methods: A single-centre, prospective study was conducted on 43 healthy pregnant women. The continuous glucose monitoring sensor was applied for 14 days at 11–13 weeks, at 19–21 weeks and then at 29–31 weeks of pregnancy. The correlation of third trimester data was analysed: mean glycaemic values, mean nocturnal glycaemic values, mean fasting glycaemic values, glycaemic management index (GMI), time in target range (TIR – 63–120 mg/dl) in relation to fetal septal thickness, amount of amniotic fluid, fetal abdominal circumference (AC), head circumference (HC) and estimated fetal weight (EFW) in an ultrasound performed in the third trimester.

Results: Four patients who were diagnosed with gestational diabetes on the basis of the oral glucose tolerance test at 24–28 weeks were excluded from the initial study group. The results of the remaining 39 patients were analysed in the study. The mean age of the women was 35 ±4.2 years. AC was statistically significantly correlated with the target TIR of 63–120 mg/dl (p = 0.02; rho –0.38). Further analysis also showed a correlation of AC with the percentage of values above 120 mg/dl (p = 0.008) and above 140 mg/dl (p = 0.026). For GMI, statistical significance was not reached, but the p-values suggested a potential association of GMI with EFW (p = 0.066) and GMI with HC (p = 0.056).

Conclusions: Glycaemic parameters such as TIR and percentage of glycaemic values above target (>140 mg/dl and >120 mg/dl) showed a statistically significant correlation with fetal abdominal circumference in the third trimester of pregnancy. The use of glycaemic monitoring systems in healthy women without diabetes can significantly supplement data on fetal well-being.

Source of funding: Scientific grant of the Polish Diabetes Association

The impact of remote care using the Istel care telemedicine system with a teleconsultation function on the quality of care and its acceptance by patients with gestational diabetes

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Introduction: Gestational diabetes is the most common metabolic disorder complicating pregnancy. The care of pregnant women is a serious challenge for medical professionals, and modern technologies can serve as a new tool for monitoring and educating patients, as well as improving access to highly specialized care for patients regardless of their place of residence. We aimed to evaluate remote care using the Istel Care telemedicine system and its teleconsultation application for metabolic management and therapy acceptance in patients with gestational diabetes.

Material and methods: An observational study was conducted involving 62 women with gestational diabetes, who were identified at one of three diabetes clinics for pregnant women: the Department of Metabolic Diseases and Diabetology, University Hospital in Kraków, the Department of Internal Medicine, Clinical Provincial Hospital of Frederic Chopin No. 1 in Rzeszów, and the Department of Internal Medicine, Diabetology and Nephrology in Zabrze, Faculty of Medical Sciences in Zabrze. The study took place between March 1 and October 6, 2023. Of the 62 patients, 57 participated, and 50 completed the analysis using the Istel Care system and the Istel Health application. The results related to patient care and utilizing the Istel Care telemedicine system were analyzed.

Results: Data from 62 patients with gestational diabetes mellitus and the results of 50 questionnaires were analyzed. The mean age of the patients was 32.23 years (±5.41), and diabetes was diagnosed on average at the 23rd week of pregnancy (23.07 weeks ±7.27). The application was rated highly in several areas: ease of use scored 8.74 out of 10, availability of results 8.98 out of 10, control over results 9.34 out of 10, understanding risk factors 8.98 out of 10, and promoting lifestyle changes 8.74 out of 10. Users of the Istel Care system reported an average of 5–7 entries daily and 1–2 entries daily containing additional information regarding life, treatment, and other relevant topics. However, some comments were made regarding challenges related to telecare, primarily concerning technical barriers (45.7%) and concerns over the unauthorized sharing of data (21.6%). Overall, 76.9% of respondents expressed concerns in this area.

Conclusions: The study indicated positive outcomes and acceptance of remote care using the Istel Care telemedicine system for teleconsultations with patients diagnosed with gestational diabetes.

Post-delivery glycaemic status in women after gestational diabetes depending on the time of diagnosis

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Introduction: The risk of diabetes mellitus (DM) after gestational diabetes mellitus (GDM) is markedly elevated, and its prevalence varies widely in the current literature. We can observe an increasing number of women who are diagnosed with GDM in the first half of pregnancy. Postpartum glycemic status in this context has not yet been fully explored. The aim of the study was to compare post-delivery glycemic status in women with gestational diabetes depending on the time of diagnosis.

Material and methods: A retrospective cohort study was performed in 382 women with previous GDM for whom data concerning postpartum glycemic status were available. In 67 women GDM was diagnosed before the end of the 20th week of pregnancy (group A), and in 315 GDM was diagnosed after the 20th gestational week (group B).

Results: The results of the 75 g oral glucose tolerance test (OGTT) performed 10 to 14 weeks after delivery were analyzed.

The women in group A were significantly younger (31 (31.1–32.6) vs. 35 (34.6–36.1) years (interquartile ranges); $p = 0.012$). The prevalence of GDM in previous pregnancies was comparable. Birth weight of the studied women was comparable, while their pre-pregnancy weight and body mass index (BMI) were both significantly higher in the early GDM group. The percentage of women in each BMI category was comparable. The oral glucose tolerance test fasting plasma glucose (FPG) in the early GDM group was significantly higher, while both its 1-hour OGTT and 2-hour OGTT glucose levels were significantly lower compared to the late GDM group. Abnormal FPG was significantly more prevalent in group A, while abnormal 1h-OGTT and 2h-OGTT were significantly more prevalent in group B. No differences were found in the obstetric history between the groups. Post-delivery FPG in the OGTT was higher in the early GDM group (91.9 (88.3–95.5) vs. 86.7 (85.3–88.2); $p = 0.009$), while 2h-OGTT glucose level was comparable between the groups (103 (92.1–115.5) vs. 108 (102–113, $p > 0.05$). Neither the prevalence of impaired fasting glycemia nor impaired glucose tolerance, diabetes mellitus or abnormal OGTT result differed between groups A and B (4.4 vs. 4.2%, 4.4 vs. 7.6%, 0 vs. 0.32%, and 7.4 vs. 10.8%; all $p > 0.05$, respectively). Early GDM did not correlate with the frequency of any abnormal postpartum OGTT result.

Conclusions: Women diagnosed with early GDM are younger, and have higher pre-pregnancy weight and BMI; however, they have higher fasting glycemia, which requires further observation. Postpartum glycemic status is independent of the time of GDM diagnosis.

POSTER SESSIONS OF ORIGINAL PAPERS

POSTER SESSION OF ORIGINAL PAPERS 1

Chair: Anna Nowak-Szwed

P1
Analysis of relative telomere length in the context of risk assessment of selected chronic complications of type 2 diabetes

Małgorzata Suchecka[1], Krzysztof Sawicki[2], Magdalena Matysiak-Kucharek[2], Daria Gorczyca-Siudak[1], Lucyna Kapka-Skrzypczak[2], Piotr Dziemidok[1]

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Introduction: Type 2 diabetes (T2D) is one of the most prevalent health disorders in the world, and its incidence is predicted to continuously rise for the next few years. The chronic nature of this condition is associated with the development of many complications that can significantly impair patient health and well-being. It is thereby important to continually search for new biomarkers to predict their progression and intensity. This is also important for developing effective, targeted therapies. This study aims to determine whether leukocyte telomere length (LTL) could be a useful marker in predicting the onset of complications in patients suffering from T2D.

Material and methods: The study cohort consisted of 147 Caucasian patients (67 women, and 80 men) aged 39–87 years (median age, 65 years). Leukocyte telomere length was measured using a quantitative polymerase chain reaction method. Key subject's demographics and other clinical characteristics were also included.

Results: A significant association was identified between LTL and some markers of dyslipidemia, including in T2D patients with either diabetic nephropathy or retinopathy. T2D patients suffering from diabetic nephropathy showed significant differences in LDL levels (p = 0.023). In the group of T2D patients with diabetic retinopathy, significant differences were observed for parameters such as duration of diabetes (p = 0.043), HbA_{1c} (p = 0.041), TC (p = 0.003), LDL (p = 0.015), non-HDL (p = 0.004) and triglyceride (p = 0.045).

Conclusions: No significant associations were found between LTL in T2D patients and the prevalence of common T2D complications. Nevertheless, a significant association was identified between LTL and some markers of dyslipidemia, including in T2D patients with either diabetic nephropathy or retinopathy. Therefore, analysis of LTL in T2D patients' leukocytes shows promising potential as a marker in predicting the onset of complications in T2D. This could also help in establishing an effective treatment strategy or even prevent and delay the onset of these severe complications.

P2
Changes in pro-inflammatory and anti-inflammatory cytokine profiles over diabetes duration in type 2 diabetic patients: preliminary studies

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Introduction: Available research indicates that type 2 diabetes (T2D) is often accompanied by chronic low-grade inflammation, with elevated concentrations of pro-inflammatory and decreased concentrations of anti-inflammatory cytokines. However, there is a lack of data on the rates of increase and decline of these cytokines, respectively. It is also unknown to what extent the imbalance between the concentration of pro- and anti-inflammatory cytokines contributes to the development of insulin resistance, β-cell dysfunction, as well as other metabolic disorders leading to the aggravation of the disease and related complications. We aimed to evaluate differences and correlations between levels of pro-inflammatory – IL-6, IL-8, INF and tumor necrosis factor α (TNF-α) – and anti-inflammatory – IL-10, IL-4, IL-5 – cytokines in serum of T2D patients in the first five and 11–15 years from diagnosis.

Material and methods: Blood serum samples collected from the first cohort of diabetic patients were used in the study. All patients provided informed consent. The initial T2D diagnosis was based on the results of fasting plasma glucose and oral glucose tolerance tests. All tests were performed using MAGLUMI X8 (Snibe Diagnostics, Shenzhen, China) high-sensitivity, high-throughput chemiluminescence immunoassay according to the manufacturer's guidelines. Statistical analysis of obtained data was performed using GraphPad Prism (Boston, MA, USA).

Results: Our preliminary data confirm the hypothesis that the levels of pro-inflammatory cytokines increase while the levels of anti-inflammatory cytokines decrease with the disease duration. We also noted significant correlations between cytokine levels within both pro-inflammatory and anti-inflammatory groups; TNF, interferon and IL-6 correlated strongly with each other at both 1–5 and 11–15 years of diabetes, the only exception being IL-8 in the pro-inflammatory group; similarly, among anti-inflammatory cytokines, IL-10 and IL-4 correlated strongly with each other, but less although still significantly with levels of IL-5 at both 1–5 and 11–15 years of the disease. It should be noted, however, that while these changes are noticeable, the observed increase or decrease remained within the respective reference ranges. More research is required to confirm whether the

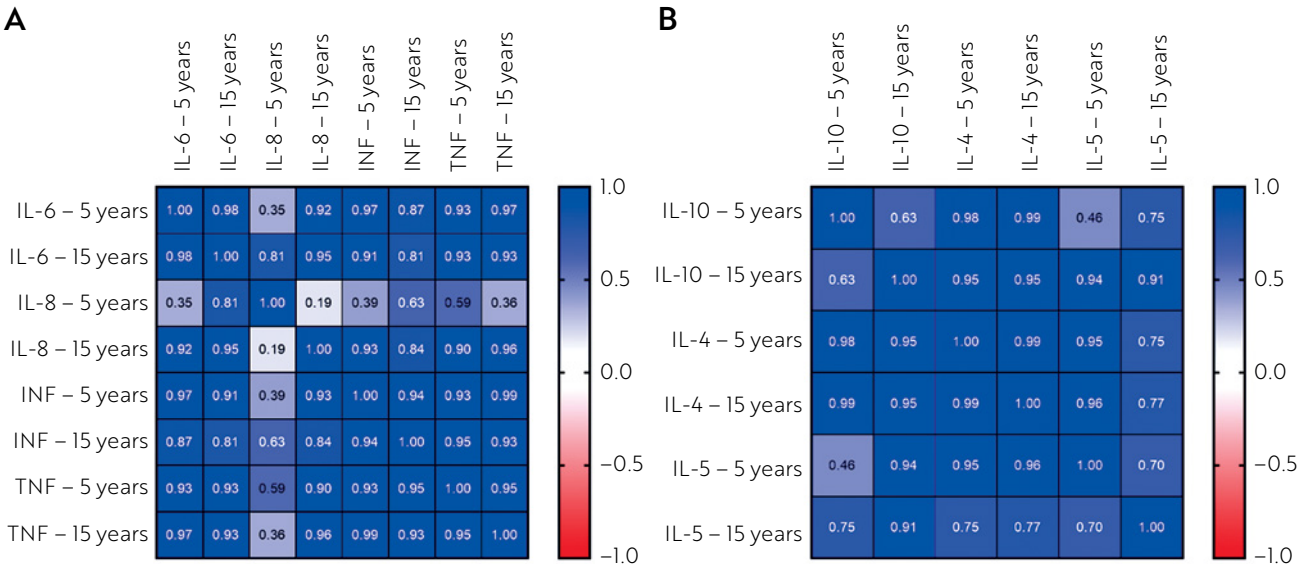

Fig. 1. Correlation matrix. Pearson correlation coefficient measuring linear correlation between pro-inflammatory (**A**) and anti-inflammatory (**B**) cytokines at 1–5 years (labeled as 5 years) and 11–15 years (labeled as 15 years) from diabetes diagnosis

TNF – tumor necrosis factor
Color-coded from +1.0 (indicating the highest possible positive correlation) to –1.0 (indicating the highest possible negative correlation).

observed trend is maintained within larger cohorts of participants.

Conclusions: Our results indicate that both pro-inflammatory and anti-inflammatory cytokine levels change over T2D duration and suggest that targeting cytokine levels and their activity might be used as a supportive therapy in treating T2D and its complications over time.

Source of funding: National Science Center (NCN-2018/30/E/NZ5/00458) – SONATA BIS

P3
Mitochondrial monogenic diabetes: the usefulness of mitochondrial genome sequencing

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Introduction: Mitochondrial diabetes is a rare form of monogenic diabetes caused by mutations in mitochondrial DNA (mtDNA), which are maternally inherited or occur de novo. The most common pathogenic variant is m.3243A > G in the MTTL1 gene encoding tRNALeu. Patients with mtDNA variants often present, in addition to hyperglycemia or diabetes, other clinical abnormalities such as hearing loss, visual impairments, and additional symptoms characteristic for mitochondrial disorders. The objective of this study was to identify pathogenic mtDNA variants in patients referred to the Department of Clinical Genetics at the Medical University of Łódź due to a clinical suspicion of monogenic diabetes, using the next generation sequencing (NGS) method by analyzing a targeted panel containing the mitochondrial genome.

Material and methods: Between 2020 and 2023, 387 patients (207 females and 180 males; median age – 14 years, interquartile range 10–22) with hyperglycemia/diabetes and a clinical suspicion of monogenic diabetes (positive family history, absence of antibodies typical for type 1 diabetes, and absence of obesity) were included in the study group. Sequencing DNA isolated from patients' peripheral blood was performed by NGS on the Illumina platform, focusing on the identification of pathogenic variants in the mitochondrial genome. Bioinformatic analysis was conducted to detect single nucleotide variants, large deletions, and insertions in mtDNA.

Results: In the study group, the m.3243A > G variant typical for the mitochondrial form of monogenic diabetes was identified in 17 patients, and a pathogenic m.8344A > G variant was identified in one patient. No other pathogenic single nucleotide variants, large deletions, or insertions were found in the remaining patients.

Conclusions: The prevalence of mitochondrial diabetes in the analyzed cohort was 4.65% (18/387). These findings highlight the usefulness of genetic testing using high-throughput methods in patients with hyperglycemia/diabetes, enabling the analysis of both nuclear and mitochondrial genes. However, there is a need for further development of diagnostic methods, including consideration of alternative biological materials, such as urine, which may provide more representative results for mitochondrial disorders than DNA extracted from peripheral blood. Such improvements could increase the efficiency of genetic diagnosis in patients with suspected monogenic diabetes and enable comprehensive multidisciplinary care for entire families, including diabetes management and genetic counseling.

P4
How to increase the number of pancreas transplants in Poland? Perspectives of a diabetologist and a transplantologist

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Introduction: The number of diabetes patients in Poland is growing, with many developing organ failure requiring transplantation. Despite this, the number of pancreas transplants remains low.

We analyze national epidemiological and clinical data and present recommendations for diabetologists and transplantologists.

Material and methods: Analysis of Poltransplant data (2015–2024). Interviews with diabetologists and transplantologists. Patient survey on knowledge and attitudes toward pancreas transplantation.

Results: Epidemiology and Clinical Data in Poland:

- diabetic nephropathy affects 20–30% of type 1 diabetes patients, with half reaching end-stage renal disease within 10 years.
- diabetic retinopathy occurs in 80% of patients after 15 years, with 25% developing proliferative retinopathy.

Transplantation statistics:

- Poland: 0.8 pancreas transplants per million inhabitants,
- Czech Republic: 3.4,
- USA: 3.2,
- Finland: 7 per million.

Patient referral process: patients often seek transplant information independently. The main referrals for simultaneous pancreas-kidney (SPK) transplant come from nephrologists and transplant coordinators.

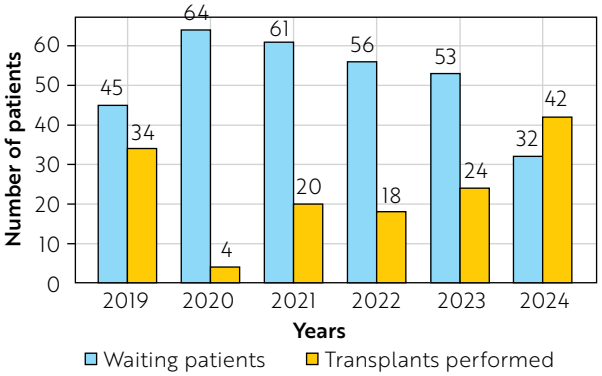

Fig. 1. Pancreas transplantation statistics in Poland (20191–2024)

Characteristics of patients seeking pancreas transplant alone (PTA): significant fear of hypoglycemia. Concerns about diabetes complications. Limited access to diabetes technology. Financial issues and lack of reimbursement.

Conclusions: Actions to improve the situation: promotion of transplant outcomes in media and medical communities. Collaboration between diabetologists and transplantologists to develop treatment algorithms. Sharing patient success stories. Educating patients through webinars and cooperation with organizations.

Systemic differences: Better integration of the transplant system in Scandinavian countries. Greater focus on educating patients and doctors. More streamlined qualification processes in Finland. Increased awareness of diabetes treatment.

Promoting positive transplant outcomes. Increasing the number of pancreas transplants requires closer cooperation between diabetologists and transplantologists, patient education, and the promotion of successful transplant outcomes.

P5
The assessment of quality of life, quality of sleep and diabetes distress in patients with newly diagnosed type 2 diabetes mellitus

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Introduction: Type 2 diabetes mellitus (T2D) is a chronic disease that can be associated with numerous inconveniences, deterioration of quality of life and disturbed sleep. Numerous studies have demonstrated that a long-term disease with complications significantly reduces the quality of life. On the other hand, patients with newly diagnosed T2D without complications may also have a reduced quality of life due to the stress of the diagnosis, lifestyle changes introduced, and regular medical visits. The topic of quality of life is not well understood in patients with newly diagnosed T2D on non-insulin medications. The purpose of this report was to assess quality of life and sleep as well as diabetes distress in individuals with newly diagnosed T2D treated with non-insulin medications.

Material and methods: We included 85 participants, aged 8–65 years, who had received a T2D diagnosis within the past year. Patients were on therapy with non-insulin drugs at the study entry. Validated tools were used for psychological assessment: the Polish version of the QoL-Q diabetes questionnaire, the Diabetes Distress Scale (DDS) and the Athens Insomnia Scale (AIS).

Table 1. Characteristics of the studied population

Parameters	Mean ±SD/median (IQR)
Age (years)	50.2 ±9.4
Diabetes duration (months)	6 (3–12)
HbA_{1c} at enrollment (%)	6.2 (5.7–6.7)
BMI [kg/m^2]	32.9 (27.9–35.8)

BMI – body mass index, IQR – interquartile range, SD – standard deviation

Results: The characteristics of the group are shown in Table 1.

The QoL-Q diabetes questionnaire assessed 23 areas of life. The highest median values were obtained within family/friendship and partner/marriage relationships: 12 (interquartile range–8–15). The lowest median value was obtained within eating as I would like 4 (3–6). In the DDS, the median score was 2.23 (1.47–3.3), indicating moderate diabetes-induced distress. There were 48 participants (56.47%) with a score above 2, corresponding to at least moderate inconvenience caused by diabetes, and 29 (60.42%) of them scoring above 3, indicating severe diabetes-related distress. When analyzing the areas of diabetes-related inconvenience – emotional burden, regimen, interpersonal and physician distress – the medians were 2.6 (1.7–3.9), 1.5 (1.0–3.75), 2.6 (1.8–3.8), and 1.66 (1.0–3.33), respectively.

In the AIS, the median score was 6 (4–10). There were 28 patients (32.94%) with scores of 6–10 (borderline normal), and 20 (23.53%) scoring above >10 points, strongly suggesting insomnia.

Conclusions: Patients had the highest quality of life in the area of both family/friendship and partner/marriage relationships. Patients reported the lowest quality of life within eating as I would like. Patients are already experiencing the distress caused by diabetes at an early stage of the disease.

P6
The role of the ankle-brachial index in preventing diabetic foot disease and cardiovascular complications in people with diabetes

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Introduction: Diabetic foot disease is a significant complication of diabetes. People with type 2 diabetes are considered cardiology patients at the time of diagnosis. The non-invasive ankle-brachial index (ABI) test is considered highly useful. It is the first recommended test after assessing the pulse in the dorsalis pedis and posterior tibial arteries. Chronic hyperglycemia affects the development of vascular endothelial dysfunction. Accompanying lipid changes and limited patient activity due to, for example, neuropathy or obesity, constitute an additional burden. The aim of the study was to determine the role of the ABI in preventing diabetic foot disease and cardiovascular complications in people with diabetes.

Material and methods: The study used the 4ZET questionnaire, which contains a section on the assessment of the risk of vascular complications. The study was conducted in 8 centers in 5 voivodeships on a group of 160 people with diabetes. The average age of the study participants was 67 years, with a majority being women (62%). A medical device called MESI mTABLET was used to examine ABI, obtaining measured values in real time. Blood pressure was also measured on both arms to assess the condition of the arteries.

Results: Among the study participants, 14% obtained results < 0.9, which indicates ischemia. Group 68% obtained results within the norm: 0.9–1.4, with 18% getting a result of 1.3–1.4. Among the examined participants, 8% obtained results > 1.4 on the right side. Among these patients, blood pressure was measured on both arms. Among patients who obtained an ABI result on the right side above the norm, the difference between systolic and diastolic blood pressure was higher on the right side.

Conclusions: An ankle-brachial index test on people with diabetes allows for quick, non-invasive diagnostics of ischemia characteristics, indicating the direction of further diagnostic and educational activities. Taking action will prevent diabetic foot disease and complications from the cardiovascular system.

P7
Analysis of the relationship between adiponectin and adipolin concentrations and the occurrence of diabetic cardiomyopathy in patients with type 2 diabetes

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Introduction: Type 2 diabetes is a significant problem in medicine, and its progressive nature and possible complications require us to thoroughly understand the pathomechanisms involved. Therefore, a better understanding of the relationship between adipocytokines and the pathomechanisms and clinical implications observed in T2D is necessary. Diabetic cardiomyopathy (DCM) is an often overlooked complication in clinical practice. The aim of the study was to assess the concentrations of selected adipocytokines – adiponectin and adipolin – and the frequency of DCM in T2D patients, as well as the relationships between them.

Material and methods: The study included 80 patients with T2D (44 women and 36 men), aged 45–80 years (mean 62.6 ±9.7 years, median 63.5 years) randomly recruited from patients hospitalized in the Department of Endocrinology and Diabetology of the Medical University of Lublin. The average duration of diabetes was 13.1 ±7.4 years, HbA_{1c} 8.8 ±1.7%. All patients in the study group were treated with metformin, and every third patient was treated with insulin therapy. Anthropometric data, medical history, and basic biochemical tests were assessed. Patients underwent echocardiography, which allowed for the assessment of diastolic heart dysfunction, including the determination of the maximum early diastolic flow velocity across the mitral valve, the maximum late diastolic flow velocity across the mitral valve, etc. Concentrations of selected adipocytokines were determined by commercial ELISA kits. Statistical analysis was performed using Statistica software.

Results: The concentration of adiponectin in the study group was 10.3 ±9.6 µg/ml, and the concentration of adipolin was 1.5 ±3.3 ng/ml. Among the studied patients with T2D, only 33 patients had no cardiological diagnosis that could indicate coronary artery atherosclerosis. In this selected group, 27 patients (33.7%) were diagnosed with DCM based on echocardiographic parameters (which constituted 81.8% of patients), including 10 patients without any previously unrecognized chronic complications of diabetes. The relationship between the studied adipocytokines and the occurrence of DCM was then assessed. A significantly lower concentration of adiponectin was observed in patients with this complication ($p < 0.05$). Additionally, during the analysis by gender, a significant relationship between the occurrence of DCM and the concentration of adipolin in men was observed ($p < 0.05$).

Conclusions: In the metabolic environment of T2D, hypoadiponectinemia and elevated adipolin levels are found. DCM is a frequent and asymptomatic complication of diabetes; therefore, the development of unified diagnostic recommendations is needed. Changes in adiponectin and adipolin concentrations may reflect some changes in morphological parameters of the heart, and may also have prognostic value in predicting the occurrence of chronic complications of diabetes, such as DCM.

Source of funding: The statutory activities of the Medical University of Lublin

P8
Prevalence of diabetic cardiovascular autonomic neuropathy in the Silesian voivodeship

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Introduction: Diabetic cardiovascular autonomic neuropathy (CAN) is one of the most common complications of diabetes mellitus (DM) and is associated with increased mortality. It is often underdiagnosed and is a well-recognized risk factor for cardiovascular (CV) events, which constitute the leading cause of death in individuals with DM. Moreover, CV events in this population may occur asymptomatically. Due to the time-consuming nature of CAN diagnostics, it is often overlooked in daily medical practice. Identifying patients affected by this complication may help in detecting individuals at risk of CV events. The prevalence of CAN in the Polish population has not been precisely estimated. The multicenter EURODIAB IDDM Complications Study, published by Kempler *et al.*, conducted on 3,007 patients across 16 European countries, reported CAN prevalence in 37% of the studied population. This study assessed the prevalence of CAN in the population of people with DM in the Silesian region.

Material and methods: The study is part of the Silesia Diabetes-Heart Project (ClinicalTrials.gov NCT05626413). Participants are recruited from hospitalized patients in the Department of Internal Medicine and Diabetology in Zabrze, as well as from individuals responding to recruitment announcements placed in diabetes and primary care clinics across Silesia. Demographic, laboratory (HbA_{1c}, urine albumin-to-creatinine ratio, estimated glomerular filtration rate, and lipid profile), and clinical data were collected. Cardiovascular autonomic neuropathy is diagnosed based on a series of CV autonomic reflex tests (CARTs), the gold standard in CAN testing, using the DiCAN

Table 1. Characteristics of participants

Parameter	General	CAN+	CAN–	*p*-value
Number of patients	730	340 (46.6%)	389 (53.4%)	
Men	341 (46.8%)	154 (45.1%)	187 (54.9%)	0.5
Age	56 (42, 60)	62 (52, 69)	50 (32, 64)	< 0.01
Diabetes duration (years)	10 (5, 18)	11 (5, 20)	10 (4, 17)	0.163
BMI [kg/m^2]	28.5 (24.6, 32.9)	28.9 (25.2, 33.1)	28 (24.2, 32.7)	< 0.01
HbA_{1c} (%)	8.05 (6.8, 9.6)	8.33 (6.8, 10.0)	7.96 (6.7, 9.3)	< 0.01
eGFR [ml/min/1.73 m^2]	87.7 (70.6, 101.7)	81.8 (63.1, 98.7)	91.5 (75.5, 104.8)	< 0.01
UACR [mg/g]	8.5 (5.0, 19.9)	10.1 (6.1, 27.9)	7.9 (4.3, 15.0)	0.461
Total cholesterol [mmol/l]	4.5 (3.8, 4.6)	4.5 (3.6, 5.4)	4.6 (3.9, 5.4)	0.694
LDL [mmol/l]	2.3 (1.7, 3.1)	2.2 (1.5, 3.1)	2.5 (1.8, 3.2)	0.835
HDL [mmol/l]	1.4 (1.1, 1.7)	1.38 (1.1, 1.7)	1.42 (1.1, 1.7)	0.739
TG [mmol/l]	1.3 (0.9, 2.0)	1.4 (1.0, 2.1)	1.3 (0.9, 1.8)	0.015

BMI – body mass index, CAN – cardiovascular autonomic neuropathy, eGFR – estimated glomerular filtration rate, TG – triglyceride, UACR – urine albumin-to-creatinine ratio

(Diabetic Cardiovascular Autonomic Neuropathy) device, following the guidelines outlined in the Toronto Consensus (the CAN Subcommittee of the Toronto Consensus Panel on Diabetic Neuropathy). CAN was staged based on the number of abnormal CARTs results, as follows (1) early eCAN – one abnormal CART; (2) definite CAN – at least two abnormal CARTs; (3) severe CAN – at least two abnormal CARTs accompanied by orthostatic hypotension.

Results: Between the years 2021–2024, 729 individuals with DM (30% with type 1 DM and 70% with type 2 DM) were examined, with their characteristics presented in Table 1. Any CAN was diagnosed in nearly 47% of participants based on the DiCAN assessment (47% early CAN, 53% definite or severe CAN).

Conclusions: This study revealed CAN in almost 47% of participants, indicating an underestimation of its current epidemiology and highlighting the need for further research in this area. Notably, more than 50% of individuals with CAN exhibited a definite or severe form of this complication.

P9
Validation of an AI-based diabetic retinopathy screening system. Performance across two classification thresholds

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Introduction: Diabetic retinopathy (DR) is a major contributor to preventable blindness worldwide. Although screening programs effectively identify early DR, human resource limitation in terms of ophthalmologist consultation may delay diagnosis and treatment. Advances in artificial intelligence (AI) offer potential for ubiquitous DR screening. We compared the accuracy of an AI-based DR detection system to an ophthalmologist reference standard, analyzing two clinically relevant thresholds: (A) no DR/mild/moderate DR vs. severe/proliferative DR and (B) no DR/mild DR vs. moderate/severe/proliferative DR.

Material and methods: Population studied: adult people with DM with a median age of 56 (interquartile range – 40–66), participants of the Silesia Diabetes-Heart Project (NCT05626413). Fundus imaging was conducted among participants using the DRSplus device (Centervue, Padua, Italy), while the AI software RetCAD v2.0.1 (Thirona Retina, Nijmegen, the Netherlands) was used for automated DR grading. The color fundus imaging was assessed by two blinded ophthalmologists as a reference method of retinopathy diagnosis. We calculated sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and area under the receiver operating characteristic curve (AUC). Inter-rater variability between two ophthalmologists was assessed using Cohen's kappa.

Results: A total of 537 participants had fundus images sufficient for at least one eye, resulting in 1,055 total graded eyes. The images of 36 eyes were excluded from the analysis because ophthalmologists deemed them of too low quality to evaluate. 303 (56.4%) participants were classified as having no DR, 125 (23.3%) as mild, 68 (12.7%) as moderate, 36 (6.7%) as severe, and 5 (0.9%) as proliferative DR. For the discrimination of no DR/mild/moderate vs. severe/proliferative DR, the AI model showed

Table 1. No diabetic retinopathy/mild/moderate vs. severe/proliferative diabetic retinopathy

Measure	Estimete	95% CI
Sensitivity	0.692	0.556–0.801
Specificity	0.983	0.972–0.99
PPV	0.726	0.615–0.837
NPV	0.980	0.971–0.989
AUC	0.838	0.781–0.838

AUC – area under the receiver operating characteristic curve, NPV – negative predictive value, PPV – positive predictive value

Table 2. No diabetic retinopathy/mild vs. moderate/severe/proliferative diabetic retinopathy

Measure	Estimete	95% CI
Sensitivity	0.853	0.794–0.901
Specificity	0.972	0.959–0.982
PPV	0.867	0.818–0.917
NPV	0.969	0.957–0.98
AUC	0.913	0.887–0.913

AUC – area under the receiver operating characteristic curve, NPV – negative predictive value, PPV – positive predictive value

a sensitivity of 0.692 (95% CI: 0.566–0.801), specificity of 0.983 (0.972–0.990) and AUC of 0.838 (0.781–0.838). For no DR/mild DR vs. moderate/severe/proliferative DR, sensitivity was 0.853 (95% CI: 0.794–0.901), specificity was 0.972 (0.959–0.982) and the AUC was 0.913 (0.887–0.913). The two expert ophthalmologists showed very high inter-rater reliability, with Cohen's kappa values of 0.924 (no DR/mild/moderate vs. severe/proliferative DR) and 0.917 (no DR/mild DR vs. moderate/severe/proliferative DR).

Conclusions: The AI-based screening tool achieved high specificity and moderate sensitivity, particularly for detecting severe or proliferative DR. The system's performance suggests that it could substantially aid in DR screening where specialist resources are constrained. Further refinements, supported by additional clinical validation, may enhance early detection and reduce preventable vision loss.

POSTER SESSION OF ORIGINAL PAPERS 2

Chair: Elżbieta Wójcik-Sosnowska

P10
Diagnostic difficulties in a patient with suspected monogenic obesity: a case report

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Introduction: Bardet-Biedl syndrome (BBS) is a rare ciliopathy with an autosomal recessive inheritance. Bardet-Biedl syndrome is caused by mutations in more than 20 genes. The syndrome is characterized by early childhood obesity, which is accompanied by progressive hyperglycemia leading to the development of type 2 diabetes mellitus. Other clinical manifestations include polydactyly, retinal dystrophy, endocrine disorders, urinary malformations and neurological disorders. Moreover, isolated clinical manifestations were described in carriers of heterozygous mutations in BBS genes. On the other hand, Fahr's disease is characterized by accumulation of calcium deposits in various areas within the brain, leading to neurodegeneration. The prevalence is estimated to be < 1/1,000,000. The clinical course of the disease is variable, but the onset of symptoms is usually in the 4th decade of life, while calcifications in imaging tests may be visible in the 2nd decade of life. The aim of this study was to discuss diagnostic difficulties in a patient referred with suspected monogenic obesity.

Case report: A 21-year-old female patient was referred to the Rare Diseases Outpatient Clinic for Children and Adolescents and Diabetogenetics in Łódź with suspected monogenic obesity and impairment of peripheral insulin action. In early childhood, the patient's body weight was increasing rapidly. At 6 years of age, the patient was diagnosed with class III obesity. Currently, her body mass index is 37.7 kg/m^2. The patient had insulin resistance with acanthosis nigricans skin lesions and polycystic ovarian syndrome. In addition, she was diagnosed with hypertension, hyperlipidemia and other components of the metabolic syndrome. The patient was treated with metformin, fenofibrate and liraglutide. The patient's history included learning difficulties. In brain MRI, a lesion in the right thalamus and cerebellar dentate nuclei and symmetric lesions of increased signal in T1 and T2 sequences were described, possibly consistent with changes in Fahr's disease. Molecular tests conducted by the next-generation sequencing (NGS) method with analysis of variants within the family revealed the patient to be a carrier of a heterozygous variant in the *TMEM6* gene, which identified the patient as a carrier of BBS. In addition, a homozygous, pathogenic variant was found in the *MYORG* gene, confirming the diagnosis of Fahr's disease. Analysis of variants within the family revealed both parents to be carriers of a heterozygous variant in the *MYORG* gene.

Conclusions: Obesity and metabolic disorders are caused by the patient's BBS carrier state, which coexists with Fahr's disease. The complexity of the phenotype observed in patients should prompt comprehensive genetic testing by NGS.

P11
Evaluation of the frequency of consumption of selected fruits and vegetables and its association with body mass index in people with type 1 diabetes

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Introduction: Type 1 diabetes mellitus (T1D) is a chronic metabolic disease that requires glycaemic control. A proper diet, including adequate intake of fruits and vegetables, plays a key role in maintaining normal body weight. These products are rich in fiber, vitamins and antioxidants, which can support glycemic control and reduce the risk of complications. Simultaneously, it is important to consciously choose fruits with a lower glycemic index to minimize the negative impact on glycemia. The purpose of this study was to assess how often patients with T1D consume selected fruits and vegetables and to evaluate the relationship between their consumption and body mass index (BMI).

Material and methods: 138 adults with T1D were included in the study, including 68 women and 70 men aged 18–45 years (mean 33 ±8 years), with duration of diabetes 2–37 years (mean 14 ±7 years). The available clinical and anthropometric data were evaluated on the basis of a questionnaire developed for the study, while the frequency of consumption of selected food groups was assessed on the basis of the food frequency questionnaire.

Results: Excessive body weight (overweight and obesity) was found in 60.1% of the subjects, of whom 37% were overweight 16.7% were 1st degree obese, and 6.5% were 2nd degree obese. Normal weight was found in 37.7% of the subjects, and 2.2% were underweight. The mean BMI was 26.7 ±4.9 kg/m^2. The entire group was analyzed for frequency of consumption of selected fruits (i.e., stone fruits, kiwi and citrus fruits, bananas, apples and pears) and selected vegetables (i.e., tomatoes, potatoes, vegetables such as cucumber, cruciferous vegetables, green vegetables). Analysis of consumption frequency showed that subjects who consumed vegetables such as cucumbers more often had significantly higher BMI ($p < 0.05$), and likewise for cruciferous vegetables and green vegetables ($p < 0.05$). In the fruit group, the highest average BMI (29.9 kg/m^2) was observed for those who consumed kiwi and citrus fruits daily, while the lowest average BMI (25.6 kg/m^2) was observed for people who consumed them several times a month. The other groups did not show a statistically significant difference.

Conclusions: Excess body weight is a significant problem among people with type 1 diabetes. The more frequent the consumption of cruciferous vegetables, greens and vegetables such as cucumbers, as well as kiwi and citrus fruits, the higher the BMI in people with type 1 diabetes.

P12
The association between arterial stiffness and visceral fat rating in people with type 1 diabetes and body mass index below 30 kg/m²: a cross-sectional study

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Introduction: Cardiovascular disease (CVD) remains the leading cause of mortality in adults with type 1 diabetes mellitus (T1D), despite advancements in technology and risk reduction methods. Arterial stiffness (AS), measured by pulse wave velocity (PWV), is a robust early predictor of cardiovascular and all-cause mortality in T1D. While obesity (body mass index – BMI > 30 kg/m²) is a known modifiable risk factor, emerging evidence suggests that abdominal obesity may have a stronger association with AS than overall obesity. However, this relationship had never been investigated in the T1D population. We aimed to assess the relationship between visceral fat rating (VFR) and PWV in adults with T1D and BMI below 30 kg/m².

Material and methods: The study included 107 participants with T1D aged 18–50, with a confirmed diagnosis of at least 5 years and positive autoantibodies. Exclusion criteria were BMI > 30 kg/m², current infection, pregnancy, CVD, and hypertension. Demographic, laboratory, and anthropometric data, including BMI, were collected. To estimate abdominal fat, total body fat percentage, and other parameters were assessed using a TANITA device via bioelectrical impedance. Visceral fat rating was estimated based on the TANITA algorithm. Aortic PWV was measured non-invasively using an oscillometric device (Arteriograph 24).

Results: Participants had a mean age of 34.4 ±10.3 years, a BMI of 24.6 ±2.8 kg/m², and a median diabetes duration of 14 [10–21] years; 54.2% were male. Pulse wave velocity was positively associated with VFR (Rs = 0.45, $p < 0.001$), whereas BMI and total body fat percentage were not significantly correlated. Participants with PWV above the median (7.62 m/s) had higher VFR (5.83 ±2.51 vs. 3.77 ±2.16, $p < 0.001$), were older, had higher systolic blood pressure, and had longer diabetes duration. Multiple linear regression showed that VFR was independently associated with PWV (B = 0.22, $p < 0.001$), adjusted for BMI, diabetes duration, systolic blood pressure, and sex.

Conclusions: Visceral fat rating, but not BMI or overall body fat percentage, was independently associated with arterial stiffness in individuals with T1D and BMI below 30 kg/m². Estimating abdominal obesity based on VFR could be useful for cardiovascular risk stratification in this population.

Table 1. Results of multiple linear regression analysis for pulse wave velocity

Parameters	B	SE (B)	95% CI	95% CI	*t*	SE (β stand.)	β stand.	*p*-value
Intercept	4.57	2.15	0.30	8.84	2.12	–	–	0.04
Sex (men)	0.07	0.31	–0.54	0.67	0.21	0.10	0.02	0.83
Diabetes duration (years)	0.04	0.02	0.01	0.08	2.46	0/10	0.23	0.02
BMI [kg/m²]	–0.09	0.06	–0.21	0.03	–1.47	0.12	–0.17	0.14
Visceral fat rating	0.22	0.07	0.07	0.36	2.97	0.12	0.37	< 0.001
SBP [mm Hg]	0.03	0.01	0.00	0.05	2.23	0.10	0.22	0.03
HbA_{1c} (%)	0.03	0.12	–0.19	0.26	0.30	0.09	0.03	0.76

R^2 = 0.251

BMI – body mass index, SBP – systolic blood pressure

P13
Impact of short-term oral semaglutide treatment on glycemic variability in continuous glucose monitoring system readings in patients with prediabetes and obesity: preliminary results

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Introduction: Increased glycemic variability is a recognized independent risk factor for cardiovascular events. However, most publications on this topic focus on patients with diabetes, especially type 1 diabetes. Continuous glucose monitoring systems (CGMs) provide much more precise data on daily glycemic variability than self-monitoring with glucometers. In this interventional study using oral semaglutide, we assess glycemic variability parameters recorded by CGM in patients with prediabetes and obesity and evaluate the impact of this intervention on glycemic stability. To evaluate the effect of oral semaglutide on glycemic variability using continuous CGM data.

Material and methods: The study analyzed CGM records from before and at the end of treatment for the first 100 patients with complete CGM data (more than 7 days of activity) from the GAROS study (Genetics of Acute Response to Oral Semaglutide). Among the participants, 36 had isolated impaired fasting glucose, 14 had both impaired fasting glucose and impaired glucose tolerance (IFG + IGT), 8 had isolated impaired glucose tolerance (iIGT), and 42 were normoglycemic. Patients with obesity (body mass index – BMI ≥ 30 kg/m^2) or BMI > 27 kg/m^2 with coexisting prediabetes were included. A 3-month intervention with gradually increasing doses of oral semaglutide (3–42 mg/day) was implemented. Continuous glucose monitoring sensors were applied at four time points during the study: before treatment, after one month, after three months of treatment, and three months after treatment discontinuation. Parameters (CV, MODD, MAGE, e HbA_{1c}) from CGM records before and after treatment were compared using paired Student *t*-tests and Wilcoxon tests (JASP and R-studio software).

Results: Significant reductions in glycemic variability parameters (CV, MODD, MAGE) were observed following the pharmacological intervention ($p < 0.001$). Most significant CV reductions were found in the iIGT group, from 17.43 (±3.90)% to 13.87 (±4.13)%. Most considerable reductions in MODD, MAGE, and e HbA_{1c} were found in the IFG + IGT group. The mean eHbA_{1c} in the study group decreased from 5.32 (±0.32)% to 4.98 (±0.29)%. The time spent below the target range (< 70 mg/dl) increased from 1.16 to 2.34%, but without a significant increase in the risk of clinically relevant hypoglycemia (< 54 mg/dl; $p = 0.13$).

Conclusions: The use of oral semaglutide in patients with prediabetes and/or obesity is associated with improved glycemic control indicators and reduced daily glycemic variability. Notably, the risk of clinically relevant hypoglycemia did not significantly increase. Continuous glucose monitoring is a good tool for monitoring glycemia in patients with prediabetes or obesity.

Source of funding: Regional Centre for Digital Medicine, grant number 2023/ABM/02/00008. The Excellence Initiative – Research University programme

P14
What if bariatric surgery doesn't work: a case study

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Introduction: Metabolic surgery, regardless of the method used, is currently the most effective method of treating obesity. Surgical treatment of obesity also ensures control over comorbidities, e.g. type 2 diabetes. However, according to reports, approximately 15–35% of patients undergoing bariatric surgery do not achieve the intended effect, defined as losing at least 50% of excess body weight within 2 years after surgery. Do we have other treatment options left for such patients?

Case report: A 50-year-old patient was referred from a surgical outpatient clinic to a diabetes outpatient clinic due to obesity and poorly controlled type 2 diabetes (HbA_{1c} 10.9%). Type 2 diabetes was previously treated with empagliflozin, dulaglutide and metformin, and the patient did not consent to insulin therapy. Despite undergoing bariatric surgery (sleeve gastrectomy – SG) – the patient did not achieve the intended weight loss – Δ15.8 kg (body weight during evaluation for surgery in July 2022 – 112.6 kg; body weight before surgery in April 2023 – 106 kg; body weight one year after surgery in April 2024 – 96.8 kg). Diabetes therapy was modified to include a fixed-ratio combination (FRC) preparation, but satisfactory glycemic control was not achieved – HbA_{1c} 8.1% (04/2024). During subsequent visits to the diabetes clinic, the combination of glargine U-100 and lixisenatide was discontinued, treatment with metformin and empagliflozin was maintained, and semaglutide was added, increasing the dose to 1 mg once a week. The patient was again trained in the principles of proper nutrition and physical activity. During the care, improvement in glycemic control was observed – HbA_{1c} 5.9% (01/2025) – and body weight decreased to 85 kg, including maintaining lean body mass and reducing adipose tissue (45.6–38.7%).

Conclusions: Even though bariatric surgery is the most effective method of treating obesity, not all patients achieve satisfactory and lasting weight loss. In the era of potential treatment with new obesity management medication (OMM) drugs, attempting treatment earlier with the above-mentioned drugs – and rotation of preparations in search of the most effective one – appears to be a justified approach.

P15
Diabetes during steroid therapy is not always type 3 diabetes: a case report

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Introduction: Drug-induced diabetes, which develops as a result of the use of diabetogenic drugs in the etiological classification of diabetes according to the World Health Organization, belongs to type 3 diabetes: *Other specific types of diabetes – diabetes caused by drugs or other chemicals*. The most potent diabetogenic drugs used in many diseases in children are glucocorticoids. In the case of children, the diagnosis of type 1 diabetes should always be taken into account with any diagnosis of drug-induced diabetes.

Case report: A 4-year-old boy, previously healthy, was initially hospitalized at the Department of Paediatrics and Nephrology, due to swelling of the face and limbs and abdominal pain that had been increasing for about a week, where the first stage of nephrotic syndrome was diagnosed. After the initiation of steroid treatment (the first dose of drugs), glycaemia in the range of 300–400 mg/dl and glucosuria were observed. In the previous history, no polyuria, polydipsia, or weight loss were observed. There was a family history of unspecified thyroid disease and type 2 diabetes in her paternal grandmother. Type 1 diabetes was not present in the family history. During the initial diagnosis of hyperglycaemia (without a diabetogenic drug), fasting blood glucose from venous blood was 83 mg/dl, 2 hours after a meal 145 mg/dl, insulin and C-peptide secretion was maintained, and the $Hb1_{Ac}$ value was 5.77%. Based on the results of the tests and the clinical picture, the diagnosis of type 3-drug diabetes was made. Insulin therapy with quick-acting human insulin and a long-acting analogue of human insulin was applied. In the course of further diagnostics, antibodies against elements of the pancreatic islets were determined, obtaining an elevated titre of anti-islet antibodies and a high titre of antibodies against the zinc transporter. The diagnosis was changed to type 1 diabetes.

Conclusions: Each type of diabetes in children requires the determination of antibodies against elements of the pancreatic islets. Medications can reveal previous latent defects in insulin secretion.

P16
Lipoprotein (a) concentration and cardiovascular disease in a group of patients with familial hypercholesterolemia

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Introduction: Lipoprotein(a) is a liver-derived lipoprotein with primarily genetically determined concentrations. High lipoprotein(a) (Lp(a) concentrations are linked to an increased risk of cardiovascular disease (CVD). However, more evidence is needed to assess the association of Lp(a) with CVD in different vascular beds. The aim was to assess the prevalence of increased Lp(a) levels and the association between Lp(a) levels and CVD in hypercholesterolemic patients.

Material and methods: We examined 220 patients (including 110 women) with suspected familial hypercholesterolemia (FH). The mean (standard deviation) age was 49.1 (15.02) years, median low-density lipoprotein cholesterol (LDL-C) was 3.49 (1.75) mmol/l, and median (IR) Lp(a) concentration was 0.15 (0.53) g/l.

Results: Cardiovascular disease was present in 24.5% and coronary artery disease (CAD) in 21.4% of the examined individuals. Patients with CVD and patients with CAD had higher Lp(a) levels than patients without these diseases (p = 0.0403 and p = 0.0063, respectively); however, after adjustment for age and sex, only the difference in Lp(a) concentrations between persons with and without CAD remained significant. 42.3% of patients who underwent carotid ultrasound examination had carotid plaques. We did not observe differences in Lp(a) levels between patients with or without plaques or correlations between Lp(a) and carotid intima-media thickness (IMT).

28.3% of patients had Lp(a) concentrations in the high (> 0.5 g/dl), and 9.9% in the moderate-risk category (0.3–0.5 g/l). We observed an association between Lp(a) risk categories and the presence of CVD (p = 0.003) and CAD (p = 0.0004) but not with the presence of carotid plaques.

Conclusions: We found a high prevalence of increased Lp(a) levels in a group of FH persons and strong associations of Lp(a) risk categories with CAD, which indicates the need for efficient lowering of Lp(a) to decrease cardiovascular risk. The association of Lp(a) levels with CVD and lack of association with carotid IMT might suggest that Lp(a) may play diverse roles in the pathological process of atherosclerosis in different arteries.

Source of funding: UJ CM N41/DBS/000982

POSTER SESSION OF ORIGINAL PAPERS 3

Chair: Edyta Cichocka

P17

Comparison of the impact of regular human insulin and insulin glulisine on postprandial glycemic changes depending on meal carbohydrate content, in patients with type 2 diabetes

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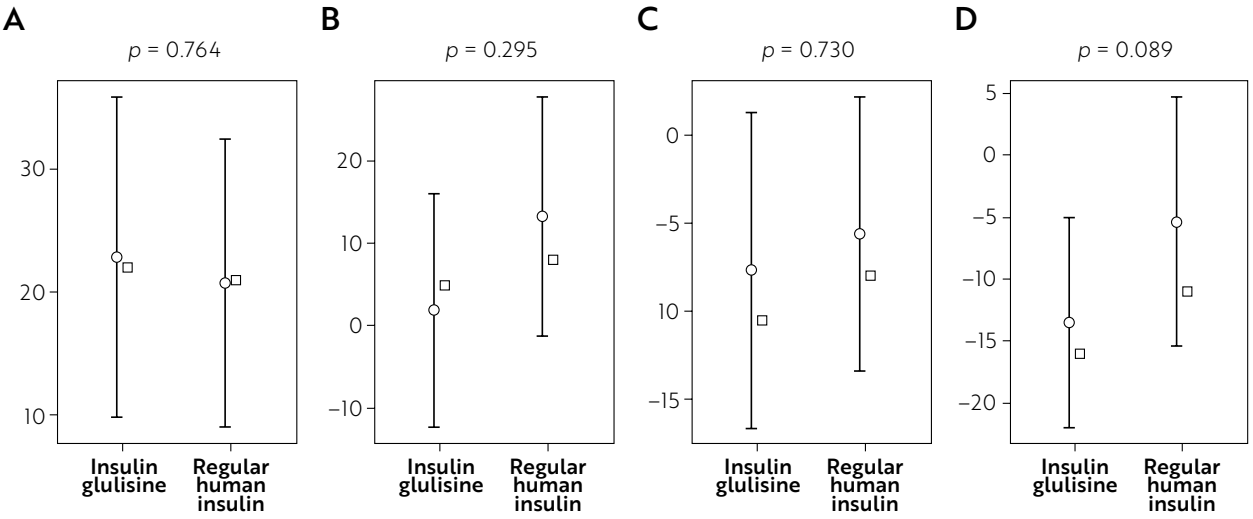
Introduction: Scientific data suggest that postprandial glycemia (PPG) is an equally important element of metabolic control in type 2 diabetes mellitus (T2D) as fasting plasma glucose and HbA_{1c}. Postprandial hyperglycemia is a proven, independent risk factor for the development of chronic complications of diabetes. One of the pharmacological methods to properly control PPG is the pre-meal, subcutaneous administration of regular human insulin (RHI) or a fast-acting insulin analog (FAI). Despite many years of experience in the use of these preparations in clinical practice, data on the differences in their effectiveness in controlling postprandial glycemia are incomplete. The aim of the study was to assess whether there are differences in the range of glucose changes after low-carbohydrate and high-carbohydrate meals in patients with T2D using RHI vs. FAI.

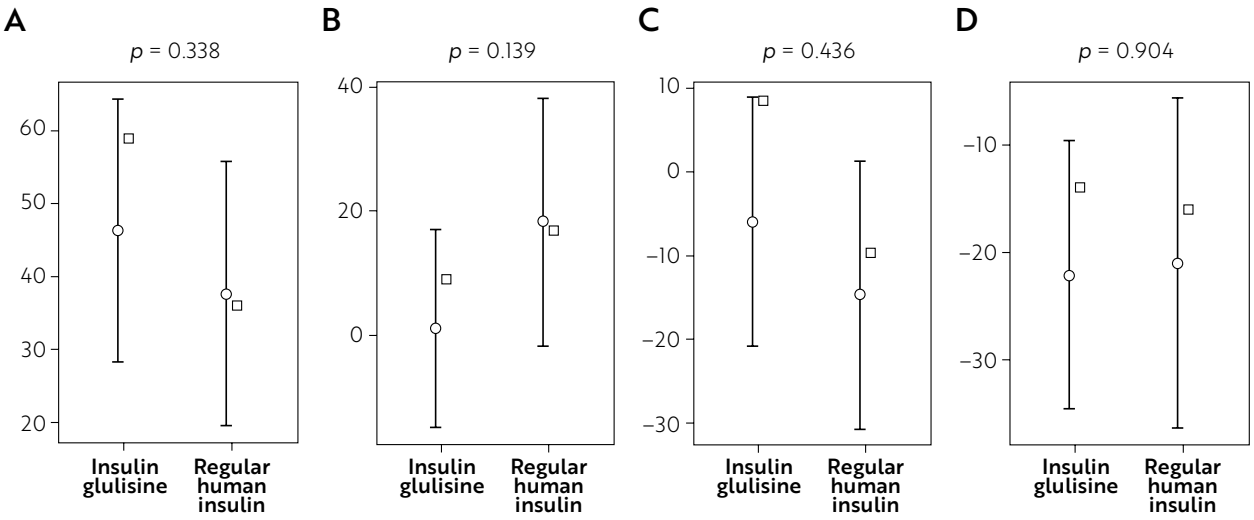
Material and methods: The study included 30 patients with T2D treated with Neutral Protamine Hagedorn (NPH) insulin, of both sexes, aged 55–75 years. In a random order, for four days, patients were given RHI or insulin glulisine, at a dose of 0.1 U/kg body weight, 15 minutes before a standardized morning meal with a high (65.4 g) or low (32.5 g) carbohydrate content. Serum glucose concentrations were assessed before insulin administration and every 30 minutes after a meal, for the next 5 hours. The change in glucose concentration at each time point was assessed by calculating the difference between the glucose concentration at a time point and the glucose concentration before insulin administration. To assess the dispersion of glucose concentration changes, their standard deviations and interquartile ranges were calculated.

Results: Changes in glucose concentrations after use of RHI and insulin glulisine did not differ statistically significantly at any time point, both after a low-carbohydrate and high-carbohydrate



A – 30 minutes after meal consumption; B – 60 minutes after meal consumption;
C – 120 minutes after meal consumption; D – 180 minutes after meal consumption

Fig. 1. Comparison of glucose level changes (X-axis [mg/dl]) after a low-carbohydrate meal depending on the insulin used



A – 30 minutes after meal consumption; B – 60 minutes after meal consumption;
C – 120 minutes after meal consumption; D – 180 minutes after meal consumption

Fig. 2. Comparison of glucose level changes (X-axis [mg/dl]) after a high-carbohydrate meal depending on the insulin

meal (Figs. 1, 2). Measures of dispersion were lower after a low-carbohydrate meal, regardless of the type of insulin administered.

Conclusions: The study did not show any significant differences between RHI and insulin glulisine in terms of changes in serum glucose concentrations after meals, regardless of the amount of carbohydrates contained in them. In patients with type 2 diabetes, the composition of a meal may be of greater importance for obtaining more stable postprandial glycemic values.

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P18
Carbohydrate metabolism disorders in the course of primary adrenal insufficiency

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Introduction Patients suffering from primary adrenal insufficiency (PAI) require lifelong steroid replacement, which is often difficult to adjust. Glucocorticoid deficiency is life-threatening, while prolonged steroid excess may be harmful by promoting metabolic alterations, including hyperglycemia/diabetes. The study aimed to evaluate the frequency of carbohydrate disorders in patients with PAI and identify their etiology, considering the plausible role of exogenous glucocorticoids.

Material and methods: This was a retrospective data analysis of 240 patients suffering from PAI (171 females, 69 males). 194 (80.8%) patients displayed autoimmune comorbidities, while only 46 (19.2%) had isolated PAI. Their mean age was 48.3 ±14.8 years and their disease/treatment duration was 10.7 ±11.2 years. All patients were on hydrocortisone (HC): mean daily dose 23.1 ±7.1 mg, adjusted for body mass 0.34 ±0.11 mg/day/kg, and cumulative HC dose 94.2 ±98.1 g.

Results: Hyperglycemia was found in 57 (23.8%) individuals, including 19 with prediabetes, 15 with type 2 diabetes (T2D), and 23 with type 1 diabetes (T1D). Patients with T1D (9 males, 14 females), aged 49.9 ±14.4 years were treated with insulin analogs, and their mean HbA_{1c} was 7.7 ±1.5%. Primary adrenal insufficiency was the first disease diagnosed in 13 patients, T1D was first in 8, and both simultaneously in 2 subjects. Furthermore, 21(91.3%) PAI + T1D patients displayed additional autoimmune conditions.

The T2D cohort (3 males, 12 females), with no T1D-specific autoantibodies, was treated with diet only (3), metformin (7), sulphonylurea derivatives (4), and insulin (4). Their mean HbA_{1c} was 7.3 ±1.2%. Excess waist circumference was found in 13 (86.7%), and mean body mass index (BMI) was significantly elevated compared with PAI patients with no carbohydrate disorders (30.4 ±6.7 kg/m^2 vs. 24.5 ±4.8 kg/m^2; p = 0.0002). Mean daily HC doses in T2D and non-diabetic PAI subjects were similar (p = 0.254), as were cumulative HC doses (p = 0.134). Finally, individuals with prediabetes (5 males, 14 females) presented a mean BMI of 26.3 ±4.3 kg/m^2 (p = 0.067 vs. patients with normal glycemia), and a mean HOMA-IR value of 3.8 ±1.9. Again, their mean daily and total HC doses were similar to the remainder of the PAI cohort (p = 0.633 and p = 0.445, respectively). 21(61.8%) of the combined prediabetes/T2D group were diagnosed with metabolic syndrome compared to 29 (15.8%) without carbohydrate disorders (p < 0.0001).

Conclusions: Patients conventionally treated for PAI are at increased risk for diabetes, due to susceptibility to autoimmune conditions, but also through an increased risk of developing metabolic syndrome, prediabetes, and type 2 diabetes. Regular assessment in this regard is required during follow-up in PAI.

P19
Glycemic status of adult patients with phenylketonuria: preliminary data from a pilot study

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Introduction: Phenylketonuria (PKU) is a rare inborn error of metabolism caused by mutations in the PAH gene, resulting in decreased metabolism of phenylalanine (Phe). Little is known about the impact of a sugar-rich low-Phe diet supplemented with Phe-free amino acid mixtures recommended in PKU on carbohydrate metabolism. We aimed to assess the HbA_{1c} level and glycemic profiles using continuous glucose monitoring (CGM) in adult patients with PKU.

Material and methods: Adult patients with PKU were matched with non-PKU controls based on age, sex, and body mass index. Glycemic status was assessed using HbA_{1c}% and CGM metrics (Dexcom One+, Dexcom Inc; Freestyle Libre 2, Abbot).

Results: So far, we have included 13 patients with PKU and 13 non-PKU controls. The mean age of the participants was 30.2 ±6.9 years; 11 (42.3%) were male. The mean sensor use time was 11.4 ±2.9 days. The mean HbA_{1c}% did not differ between patients with PKU and non-PKU controls (4.9 ±0.2% vs. 5.2 ±0.5%; $p = 0.155$). There were no cases of diabetes or HbA_{1c} level between 5.7 and 6.4%, suggesting prediabetes, in either study group. The analysis of CGM data revealed no differences in mean glucose (101.4 ±8.0 mg/dl vs. 104.9 ±7.5 mg/dl; $p = 0.132$), time-in-range 70–180 mg/dl (3.9–10.0 mmol/l; 97.8 ±1.7% vs. 98.4 ±1.5%; $p = 0.203$), glucose management indicator (5.7 ±0.2 vs. 5.8 ±0.2; $p = 0.133$), or coefficient of variation (16.6 ±3.5% vs. 16.3 ±2.9; $p = 0.287$) between the study groups. Personal glycemic state (PGS) and glucose variability percentage (GVP) were higher in patients with PKU than in non-PKU controls (10.4 ±2.0 vs. 8.5 1.9, $p = 0.024$, and 5.1 ±5.5 vs. 1.4 ±0.1, $p = 0.015$, respectively).

Conclusions: This was the first study to assess glycemic profiles using HbA_{1c}% and CGM in an adult PKU cohort. The HbA_{1c} level and basic CGM metrics did not differ between PKU individuals and healthy controls. Additional analyses suggested a worse PGS and higher glycemic variability in patients with PKU.

P20
Application of the clinical frailty scale in therapeutic decision-making for patients aged 60+ with diabetes: a preliminary report

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Member of the Main Board, Polish Society of Gerontology

Introduction: In view of the aging population, a significant group of patients in internal medicine departments and outpatient clinics are aged 60+. Age is associated with multimorbidity and the resulting multi-drug use. In patients aged 60+ with multimorbidity with diabetes, an additional problem is the frequently occurring but unfortunately rarely diagnosed frailty syndrome. The aim of the study was to assess the usefulness of the clinical frailty scale (CFS) in therapeutic decision-making for patients with multimorbidity, including type 2 diabetes. The diagnosis of frailty syndrome resulted in the inclusion of dietary and physiotherapy treatment as well as a thorough consideration of the previous hypoglycemic treatment.

Material and methods: The study included 50 consecutive patients of the department aged 60+ in whom one of the diagnosed diseases was diabetes. The Clinical Frailty Scale was used to diagnose frailty syndrome.

Results: In 60% of patients, frailty syndrome of varying degrees of severity was diagnosed, which resulted in the inclusion of dietary and physiotherapy treatment. Due to the diagnosis of severe and very severe frailty syndrome in some patients, the previous hypoglycemic treatment was modified.

Conclusions: The introduction of CFS to the recommendations of the Polish Diabetes Association regarding hypoglycemic therapy in the group of patients 60+ seems to be a very interesting option.

P21
Diabetes mellitus in a patient with neurofibromatosis type 1

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Introduction: We present a case report supplemented by a review of the literature. Neurofibromatosis type 1 (von Recklinghausen's disease, NF1) is a rare genetic disease resulting from mutations in the NF1 gene, which encodes neurofibromin. It is characterised by skin lesions (café-au-lait spots, neurofibromas), bone lesions and an increased risk of cancers such as sarcomas, gastrointestinal stromal tumors (GISTs), optic nerve gliomas and leukaemia. Patients with NF1 also frequently present with endocrinopathies, including pheochromocytoma, adrenal tumours, neuroendocrine tumours and hyperparathyroidism.

Case report: The patient, a 45-year-old man with neurofibromatosis 1, was found to have a heterozygous NM_001042492.3:c.4179delT (p.Ser1394AlafsTer12) alteration in the NF1 gene by genetic testing, showing typical skin manifestations of the disease. A family history of NF1 was also diagnosed in his father, who had undergone bilateral pheochromocytoma excision. At the age of 35, the patient was diagnosed with diabetes mellitus. He was admitted to the Diabetology Department with hyperglycaemia (> 400 mg/dl), polydipsia and mild dehydration, without diabetic ketoacidosis. Initially, insulin therapy was introduced, and then metformin treatment. Autoimmune aetiology of diabetes and pancreatic lesions on imaging studies were excluded. A diagnosis of type 2 diabetes was made. In the following years, good glycaemic control was achieved with metformin (at a dose of 3,000 mg/day), which was confirmed by HbA_{1c} values (5.8–6.1%). After 4 years, symptoms of polyneuropathy appeared in the lower limbs. Electromyographic examination showed symmetrical axonal damage to sensory fibres. The neurological diagnosis was extended due to NF1, occupational exposure and diabetes. The aetiology of the polyneuropathy was not established. Treatment with duloxetine and α-lipoic acid was implemented, with a reduction in symptoms.

Conclusions: Diabetes in the course of NF1 is rare, and there are descriptions of type 1 diabetes with an autoimmune aetiology. Type 2 diabetes in this patient group is extremely rare, with studies showing lower mean fasting blood glucose compared to controls in one publication. It may also be secondary to endocrinopathies such as pheochromocytomas or pancreatic tumours, including – very characteristic of NF 1 patients – the rare somatostatinoma neuroendocrine tumour.

P22
Impact of 1-year use of the FreeStyle Libre 2 system on glycemic outcomes in patients with type 1 diabetes

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Introduction: Regular glycaemic control is crucial for proper diabetes management, and preventing the development of complications. Broad access to the flash glucose monitoring (FGM) system enhanced blood glucose monitoring, which is essential in all patients treated with intensive insulin therapy. The aim of the study was to evaluate glycaemic control in patients with type 1 diabetes (T1D) after one year of use of the FGM system to assess whether parameters of sensor use affect the benefit from continuous glucose monitoring.

Material and methods: Patients with T1D were included in the study. Study subjects used the FreeStyle Libre 2 sensor continuously for a period of 12 months. All participants remained under the care of the Diabetology Department. The effectiveness of using the FreeStyle Libre 2 system was assessed using ambulatory glucose profile (AGP) reports at four time points (1 month – p0), 3 months (p1), 6 months (p2), and 12 months (p3).

Results: The study included 233 patients with T1D. Mean age was 43 ±11 years and mean diabetes duration was 19 ±10 years. 135 patients (58%) were treated with MDI, while the rest used insulin pumps (98 (42%)). Mean sensor glucose did not differ between p1 and all the remaining points. Similarly, there were no differences in glycaemic management index (GMI), CV, time in range (TIR), time above range (TAR) and time below range. The number of hypoglycemia episodes, from the 14-day time period analyzed in the AGP report, was higher after 6 and 12 months as compared to 1 month (9.6 ±15.7 (p0) vs. 23.9 ±34.0 (p2), $p < 0.00001$; vs. 29.1 ±38.8 (p3), $p = 0.0001$), while the total time spent in hypoglycemia was comparable. Sensor activity time was high and comparable between all the points. The frequency of sensor scans at the successive time points was increasing and was significantly higher as compared to p0: 13.8 ±10.7 (p0) vs. 16.8 ±22.0 (p1), $p = 0.03$; vs. 18.6 ±2.6 (p2), $p = 0.0014$; vs. 26.5 ±31.1 (p3), $p < 0.0001$. No correlations were found between sensor activity time and the analyzed glycemic outcomes. The frequency of sensor scans correlated with TAR > 180 ($r = -0.184$, $p = 0.0049$), TAR > 250 ($r = -0.139$, $p < 0.05$), TIR70-180 ($r = 0.22$, $p = 0.0007$), GMI ($r = -0.203$, $p = 0.0023$), mean glucose ($r = -0.191$, $p = 0.0049$).

Conclusions: Despite long-term use of the FGM system and the increasing number of sensor scans, the only improvement in metabolic control concerned hypoglycemia. Hypoglycemic episodes were more frequent but shorter over time, suggesting that safety rather than efficacy is more important. Some benefits regarding glucose outcomes were noted with increasing frequency of sensor scans. Development of efficient training methods is needed to use the full potential of FGMs.

P23
Adherence to dietary recommendations in adults with type 1 diabetes mellitus

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Introduction: Proper nutrition is a key component of diabetes therapy, but there is no universal dietary model for all patients. It is recommended to follow the principles of a healthy diet, portion control, carbohydrate intake, limiting simple sugars, and meal regularity. Adherence to dietary recommendations is challenging for many patients, and its effectiveness depends on various factors, the identification of which may improve treatment outcomes. This study aimed to assess adherence to dietary recommendations in adults with type 1 diabetes (T1D) and identify factors influencing adherence.

Material and methods: The study included 394 adults with T1D (mean age: 35.34 years; standard deviation – SD = 11.36). The diabetes dietary guidelines adherence index (DDGA Index) was used to evaluate dietary adherence based on the frequency of consumption of 29 food groups (14 recommended, 15 not recommended) and meal regularity. The diabetes dietary guidelines adherence index ranged from 0 to 30 points, where 0 indicated total non-compliance and 30 complete adherence. Results were converted to a sten scale, distinguishing low (sten 1–4), medium (sten 5–6), and high (sten 7–10) adherence levels. Sociodemographic and disease-related data were also collected. Statistical analysis was performed using STATISTICA 13.3, with $p < 0.05$ considered significant.

Results: Most subjects were women (65.0%), tertiary educated (57.3%) and residents of large cities (45.9%). The mean DDGA index score was 18.68 points (SD = 3.97, min–max 9–29 points). Low adherence was achieved by 28.9%, medium adherence by 37.8% and high adherence by 33.3% of respondents. Respondents were more likely to avoid unrecommended products than to eat recommended products often enough (80.4% vs. 44.1%). Analysis of the relationship between selected demographic and disease-related factors and adherence to dietary recommendations showed that those with higher education ($p < 0.001$), fewer hyperglycemic episodes per week ($p = 0.028$), knowledge of the average amount of carbohydrates consumed per day ($p = 0.001$) and knowledge of the calorie content of their diet ($p < 0.001$) fared better. Older patients also had better compliance ($p < 0.001$), as did those who used fewer units of insulin per kilogram of body weight ($p = 0.036$).

Conclusions: More effective diabetes management is associated with increased effectiveness of behavioural therapy, including better adherence to dietary recommendations. The results of the study suggest that the degree of adherence to recommendations depends on a number of factors, so it is important to individualise diet plans and develop strategies with the patient to facilitate implementation.

POSTER SESSION OF ORIGINAL PAPERS 4

Chair: Jerzy Hohendorff

P24
Comparison of vitamin D levels in patients newly diagnosed with type 1 diabetes vs. children without autoimmune disorders

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Introduction: In the pediatric population, vitamin D deficiency is frequently observed in patients with autoimmune disorders, including type 1 diabetes (T1D). The aim of this study was to assess the serum levels of 25(OH)D (25-hydroxyvitamin D) in a group of patients with newly diagnosed T1D and compare them with children without autoimmune diseases.

Material and methods: Patients with newly diagnosed T1D hospitalized at the Department of Pediatric Diabetology and Pediatrics between January 2020 and December 2021 (n = 361) were compared with a group of children hospitalized during the same period due to non-autoimmune-related conditions at the Department of Pediatric Nephrology (n = 153) at the Upper Silesian Children's Health Center in Katowice, Poland. The groups were age-matched. Serum 25(OH)D levels were assessed, taking into account participants' anthropometric measurements and the season of hospitalization. Statistical analysis was performed using Statistica software (StatSoft, Tulsa, OK, USA). A significance level of $p < 0.05$ was adopted.

Results: The mean serum 25(OH)D concentration was significantly lower in the T1D group (25.06 ng/ml, standard deviation – SD ±10.55 ng/ml) compared to the nephrology group (28.42 ng/ml, SD ±18.03 ng/ml, $p < 0.01$). Vitamin D deficiency was observed in 35.5% (n = 128) of T1D patients, compared to 23.5% (n = 36) in the nephrology group, $p < 0.05$.

Conclusions: Patients with newly diagnosed T1D have significantly lower vitamin D levels compared to children without autoimmune diseases. There is an increasing body of evidence suggesting that vitamin D supplementation may improve the treatment of autoimmune diseases. Therefore, measuring 25(OH)D levels should be a routine procedure in the pediatric patient population.

P25
Satisfaction with life in young adults with type 1 diabetes mellitus

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Introduction: The intensive rules of type 1 diabetes mellitus (T1DM) therapy and self-monitoring can have a significant impact on the satisfaction and quality of life of young people. Self-management is crucial for the effective control of T1DM, being the basis for maintaining a healthy lifestyle and preventing future complications. The purpose of this paper is to assess the level of satisfaction with life in young adults with T1DM and present the impact of various sociodemographic factors, methods of treatment and additional diseases on satisfaction with life in young adults with T1DM.

Material and methods: The study was conducted on the basis of an original survey and a psychological questionnaire The satisfaction with life scale (SWLS) among young people with T1DM who were sick for over a year.

Results: 120/222 women with T1DM were from the 18-35 age group who were sick for more than 10 years and were treated by use of a personal insulin pump. An average raw score for the respondents' answers to the statements included in the SWLS psychological questionnaire was 19.9 ±6.2, and the median of stens for the respondents' answers to the statements included in the SWLS psychological questionnaire was 5 (4÷2.2). The survey revealed a negative relationship between satisfaction with life and a glycosylated haemoglobin level and a weak positive relationship between the respondents' satisfaction with life and their age. The T1DM patients with a higher glycosylated haemoglobin level reported lower satisfaction with life. It was observed that young people with T1DM who do not keep a "traditional" paper self-monitoring diary, use the continuous glucose monitoring system, do not suffer of other chronic diseases, like hypothyroidism and hyperthyroidism and celiac disease had more satisfied with their life.

Conclusions: Most respondents report average satisfaction with life. Satisfaction with life is influenced by additional diseases: hypothyroidism and hyperthyroidism, as well as celiac disease. Lower satisfaction with life is connected with uncontrolled T1DM. The use of modern monitoring and treatment technologies T1DM increases the level of satisfaction with life in young adults with T1DM.

P26
Coexistence of autoimmune diseases of the gastrointestinal tract in a child with type 1 diabetes: a case report

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Introduction: The coexistence of another autoimmune disease can be found in up to 20–30% of patients with type 1 diabetes. The most common diseases associated with diabetes in children include autoimmune thyroid diseases and celiac disease. A less common disease that can coexist with type 1 diabetes is autoimmune hepatitis.

Case report: A nearly 7-year-old girl was admitted to the clinic due to newly diagnosed diabetes. On admission, in addition to signs of dehydration and moderately developed subcutaneous tissue, bloody bruises were found on the upper limbs, and a distended abdomen. Laboratory tests from abnormalities revealed metabolic acidosis, hyperglycemia, glucosuria with ketonuria, as well as low inflammatory parameters, increased transaminase activity, trilinear pancytopenia and coagulation disorders. An indicative abdominal ultrasound revealed an enlarged spleen and a moderately enlarged liver. Microbiological diagnostics, including molecular tests, did not show signs of active infection. A bone marrow biopsy ruled out the possibility of a proliferative process. In the course of further diagnostics, highly positive antibody titers against tissue transglutaminase, deamidated gliadin and against endomysium were found; therefore, celiac disease was diagnosed. During hospitalization, increased transaminase levels, elevated bilirubin levels, hypoalbuminemia, hyperglobulinemia, and high IgG levels were maintained. In studies of the coagulation system, decreased fibrinogen concentration, increased D-dimer concentration, prothrombin and kaolin-cephalin time were maintained. In the panel of anti-tissue antibodies, positive titers of antibodies against hepatic cytoplasmic antigen type 1 (anti-LC-1) and antibodies against smooth muscle were recorded. Differential diagnosis excluded infections with hepatitis A, B, C, α-1 antitrypsin deficiency and Wilson's disease. Abdominal ultrasound with Doppler and elastography ruled out thrombosis in the portal system, and a nodularly changed liver with increased cohesion with features of portal hypertension was visible. Gastroscopic examination did not reveal varicose veins of the esophagus, typical features of celiac disease were found, and magnetic resonance imaging of the bile ducts confirmed small nodular cirrhosis with moderate changes in the bile ducts. Liver biopsy was not performed due to permanent coagulation disorders. Due to the overall clinical picture and the results of additional tests, a multi-organ autoimmune disease (type 1 diabetes, celiac disease, pancytopenia, autoimmune hepatitis with cirrhosis) was diagnosed. The treatment included intensive insulin therapy, vitamin K supplementation, and initially an infusion of immunoglobulins in an immunosuppressive dose – without effect, followed by steroid therapy.

Conclusions: Although the incidence of most autoimmune diseases increases with the duration of diabetes and the age of the patient, the possibility of coexistence of other autoimmune diseases should be taken into account in all patients with type 1 diabetes, regardless of the duration of the disease and age.

P27
Experience of type 1 diabetes diagnosis from the patients' perspective: qualitative and quantitative data analysis

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Introduction: The diagnosis of a somatic disease, such as type 1 diabetes, can be a significant stressor, leading to stress-related symptoms with the potential for traumatization. Such an experience may alter patients' self-perception and their outlook on the future. The aim of the study was to perform a narrative analysis of individuals with type 1 diabetes, assessing their disease perception, coping strategies, and adaptive responses within the study group.

Material and methods: In the pilot phase of the study, data from 20 patients diagnosed with type 1 diabetes (T1D) no more than two weeks prior to their participation were analyzed. The study employed a self-designed questionnaire along with the following tools: the Disease-Related Appraisals Scale, the Coping Inventory for Stressful Situations (mini-COPE), and the Reactions to Impairment and Disability Inventory. The qualitative component included an analysis of individual interviews in which patients described their key thoughts and feelings in response to the diagnosis, the impact it had on their self-beliefs and self-esteem, and their perceptions of their future and life plans. Transcripts were analyzed thematically.

Results: The diagnosis of T1D was associated with high stress levels. Patients employed a variety of coping strategies, including both active and emotion-focused approaches. The experience of diagnosis brought significant uncertainty about the future and the ability to achieve personal life goals. Patients also expressed ambivalence regarding their self-esteem. Some interviews highlighted that patients perceive the diagnosis as a challenge and a source of hope for the future.

Conclusions: Type 1 diabetes can be a highly challenging experience, requiring adaptive coping strategies. Some patients adopt maladaptive coping methods and perceive their condition negatively. This underscores the need for ongoing psychological monitoring and interprofessional collaboration among doctors, psychologists, and psychiatrists to enhance care quality. It is recommended to introduce psychological screening as a standard part of T1D care in Poland, alongside continued research in this area.

P28
Assessment of the introduction of the new version of the FreeStyle LibreLink application for glycaemic control in patients with type 1 diabetes using the Libre 2 system: real-world data

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Introduction: FreeStyle Libre 2 is a widely used continuous glycemic monitoring system (CGM). It is classified as flash technology, which initially required scanning to check glycaemia. Since November 2023, the application FreeStyle LibreLink has been updated to real-time CGM (rtCGM). There are only a few reports regarding the impact of the new version of the Libre system on patients' glycaemia control. The purpose of our study was to assess the introduction of the new version of the FreeStyle LibreLink application for glycaemic control in patients with type 1 diabetes (T1D) using the Libre 2 system.

Material and methods: The analysis was based on the 90-day AGP reports from a tertiary diabetes department based on the LibreView application and the AGP reports of a tertiary diabetes department. The retrospective analysis included 119 patients, aged 18–75 years, all after the remission period of T1D. A comparison was made between Q3 2023 and Q1 2024, including in terms of sensor activity time, time in range (TIR), time above range (TAR), time below range (TBR), glucose variability (CV), and glycemic management index (GMI). Patients during this period were under routine outpatient medical care. Statistical analysis was performed using IBM SPSS software. The Shapiro-Wilk test was used to evaluate normality. Due to the non-normal distribution, the Wilcoxon test for pairs of observations was used, and the results are presented as median and interquartile range.

Table 1. Baseline characteristics of the study population (*N* = 119: 71 women, 48 men)

Parameters	Mean ±SD/median (IQR)
Age (years)	39 (27–50)
Duration of diabetes	14 (7–26)
Treatment model (multiple insulin injections/personal insulin pump)	97/22

IQR – interquartile range, SD – standard deviation

Results: Baseline characteristics are shown in Table 1.

Sensor activity time was 95 (76–99)% vs. 98 (89–100)% $p = 0.001$, respectively. Glycemic parameters before and after the system update were, respectively: TIR 59 (39–72)% vs. 62 (48–74)% $p = 0.008$, TAR 38 (24–58)% vs. 35 (23–49)% $p = 0.017$, TBR 2 (1–5)% vs. 2 (1–5)% $p = 0.682$, glucose variability 37.7 (34.2–41.4)% vs. 36.6 (32.4–41.7)% $p = 0.058$, GMI 7.3 (6.8–8.1)% vs. 7.2 (6.8–7.8)% $p = 0.03$.

Conclusions: After upgrading the FreeStyle LibreLink system, a significant increase in sensor activity time was observed, as well as improvements in the glycemic parameters available in the AGP – TIR, TAR and GMI. The relationship between the extension of the system use time after switching to rtCGM technology and the improvement of glycemic parameters may be causal.

P29
Retrospective analysis of the course of pregnancy and childbirth and neonatal health of mothers with type 1 diabetes mellitus treated with continuous subcutaneous insulin infusion in Opole province in the period 2014–2024

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Type 1 diabetes mellitus (T1D) is a risk factor for pregnancy and delivery complications, as well as fetal disorders, so achieving normoglycaemia during pregnancy is recommended as a condition for its normal course and birth of healthy children.

This study conducted a retrospective analysis of the course of pregnancy and delivery and health status of newborns of mothers with T1D treated with continuous subcutaneous insulin infusion, giving birth in 2014–2024 in Opole province.

Evaluation included 61 pregnancies in 43 women with mean age 29.50 ±4.54 years. The majority had one (44%) or two (42%) pregnancies, five women had three, and one had four. Mean duration of diabetes before conception was 12.18 ±6.79 years. Patients were characterised by normal body weight before pregnancy – mean body mass index 24.47 ±3.82 kg/m^2. Three patients had pre-pregnancy retinopathy, 1 was proliferative, and 1 patient had pre-pregnancy myocardial infarction. The largest group in the White classification was group C (42.62%), 40.98% were classified in group B, 13.11% in class D and 1.63% in class H and R. There was history of miscarriage in 5 women (11.6%), preterm delivery in one. 78.7% of pregnancies were planned (A); the mean HbA_{1c} level before pregnancy in this group was 6.40 ±0.86%, which was significantly lower than in women without planned pregnancy (B), 9.13 ±1.67% (p = 0.0036). After confirmation of pregnancy, group A patients reported to diabetologists nonsignificantly earlier than group B patients: 8.46 ±2.94 vs. 9.69 ±3.50 weeks' gestation (wg). Pregnancy HbA_{1c} was still significantly lower in A than B: 1st trimester 6.39 ±0.89 vs. 7.55 ±1.20% (p = 0.0072); 2nd 5.96 ±0.55 vs. 6.60 ±0.75% (p = 0.028); 3rd 6.09 ±0,43 vs. 6.49 ±0,63% (p = 0.059).

Mean birth weights of newborns of mothers A and B differed insignificantly: 3749 ±480 vs. 3486 ±501 g. Birth weight above 4000 g was found in 20.8% of newborns in A and 7.7% in B. Hypoglycaemia appeared in 8.3% of babies. In 8 cases (13.11%) failure occurred, most (75%) in group A. These were: miscarriage of one fetus in twin pregnancy at 26 wg, 1 intrauterine death of fetus without congenital anomalies (37 wg), 4 cases of congenital anomalies (hydronephrosis and three heart defects – one lethal), a case of congenital pneumonia requiring intensive care treatment, and a case of impending fetal asphyxia. In all cases of pregnancy failure, there was suboptimal preconception and pregnancy glycaemic control (HbA_{1c} 6.0–9.1%). In patients with T1D planning pregnancies, significantly better glycaemic control was observed. Women not planning pregnancies failed to achieve recommended control. To reduce complications of pregnancy and delivery, improvement of glycemic control before and during pregnancy is necessary.

P30
Type 1 diabetes, SARS-CoV-2 and vitamin D_3

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Introduction: The aim of the study was to assess the relationship between vitamin D_3 concentration and the titer of anti-SARS-CoV-2 IgG antibodies (Ab) in children with type 1 diabetes (T1D).

Material and methods: Between June 1, 2021 and January 1, 2025, a cross-sectional study was conducted among children with T1D. The control group consisted of children without carbohydrate metabolism disorders and autoimmune diseases. Anti-SARS-CoV-2 IgG antibodies titer, 25(OH) vitamin D_3 concentration and HbA_{1c} were determined. Vitamin D_3 deficiency was diagnosed if < 30 ng/ml, and anti-SARS-CoV-2 IgG seropositivity if the titer was ≥ 7.1 BAU/ml.

Results: The study group included 278 children (133 boys), aged 12.4 ±4.2 years, 226 people with diabetes (with 58 newly diagnosed T1D, nT1D), in whom a total of 374 tests were performed (in 80 children the test was performed ≥ twice at an interval of ≥ 12 months). The median $25(OH)D_3$ concentration was 29.9 [interquartile range – IQR = 16.9] ng/ml and did not differ depending on gender, T1D or co-occurrence of other diseases ($p > 0.05$). Although not significant, $25(OH)D_3$ was lower in T1D than in controls: 26.7 [IQR = 15.4] ng/ml vs. 29.4 [IQR 16.0] ng/ml, $p = 0.0586$. Vitamin D_3 deficiency was diagnosed in 215 cases (57.8%). $25(OH)D_3$ was lower in nT1D (Me = 22.8 [IQR = 8.9] ng/ml), compared to children with T1D for > 1 year (oT1D) (Me = 27.9 [IQR = 17.1] ng/ml) and the controls (Me = 30.6 [IQR = 16.1] ng/ml), $p = 0.0012$. Anti-SARS-CoV-2 seropositivity reached 95.7%, median titer was 298.0 [IQR = 535.4] BAU/ml, which did not differ depending on gender, vitamin D_3 supplementation status and other diseases ($p > 0.05$). In T1D, the Ab titer was higher than in the controls (Me = 329.7 [IQR = 638.7] BAU/ml vs. Me = 178.0 [IQR = 398.6] BAU/ml), $p \leq 0.0001$. In nT1D (Me = 348.2 [IQR = 635.9] BAU/ml) it was lower than in oT1D (Me = 348.2 [IQR = 635.9] BAU/ml), $p < 0.0001$, but comparable to controls. There was a correlation between Ab titer and age ($R = 0.3715$, $p<0.0001$) and between HbA_{1c} and $25(OH)D_3$ ($R = -0.3693$, $p < 0, 0001$). Children seronegative for SARS-CoV-2 ($n = 16$, 4.3%) were significantly younger (8.7 ±5.6 years vs. 12.6 ±4.0 years), $p = 0.0047$; concentrations of $25(OH)D_3$ and HbA_{1c} were comparable to those of anti-SARS-CoV-2 IgG positive children ($p > 0.05$).

Conclusions: In children with type 1 diabetes, the titer of anti-SARS-CoV-2 IgG antibodies did not depend on the concentration of vitamin D_3. However, in the group of children with the lowest $25(OH)D_3$ concentration, the titer of IgG anti-SARS-CoV-2 antibodies was also lowest. Lower titers of these antibodies in younger children indicate a weaker immune response in this group. Vitamin D_3 deficiency occurring in the majority of respondents indicates the need for its systematic supplementation.

P31
Comparison of selected psychological parameters of parents of children with type 1 diabetes and parents of children with allergic diseases

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Introduction: Both allergic diseases and type 1 diabetes (T1D) pose significant challenges to children and their parents. When a diagnosis is made, many psychological aspects of their current everyday functioning change. The aim of the study was to assess and compare selected psychological parameters of parents of children with allergic diseases and parents of children with T1D and the impact that the child's disease has on the parents' lives.

Material: and methods: The study used questionnaires: Beck's Depression Inventory, the State-Trait Anxiety Inventory (STAI X-1 and X-2), the Hospital Anxiety And Depression Scale (HADS) , and the Orientation to Life Questionnaire (SOC-29). A group of 30 parents of children with allergic diseases (asthma – 5, allergic rhinitis – 8, atopic dermatitis – 5, bee sting allergy – 1, other allergic diseases – 15) and a group of 30 parents of children with T1D were asked to complete psychological questionnaires. The collected data were analyzed using the Mann-Whitney *U* test (Statistica 13.0; StatSoft Inc.), assuming a level of statistical significance of $p < 0.05$.

Results: Parents of children with T1D scored higher than parents of children with allergic diseases in:

- Beck's questionnaire (1107.5 vs. 722.5, $p < 0.01$), which suggests a higher risk of depressive symptoms in parents of children with T1D, the STAI X-1 (1108.5 vs. 721.5, $p < 0.01$) and STAI X-2 test (1118.5 vs. 711.5, $p < 0.01$), indicating that parents of children with T1D exhibit higher levels of anxiety both as a state and as a trait than parents of children with allergic diseases,
- the anxiety (HADS-A: 1065.0 vs. 765.0, $p = 0.03$) and the depression questionnaire (HADS-D: 1071.5 vs. 758.5, $p = 0.02$), which indicates a greater intensity of emotional disorders among caregivers of children with T1D.

Parents of children with allergic diseases achieved higher results in the SOC-29 questionnaire (1079.0 vs. 751.0, $p = 0.01$), which measures the sense of coherence at the level of three components: comprehensibility, manageability, and meaningfulness in life. According to these data, parents of children with allergic diseases more often perceive the meaning and value of life and are confident that they can cope with the difficulties they encounter.

Conclusions: The collected data showed significant differences between the results obtained by parents of children with T1D compared to those of parents of children with allergic diseases. Despite the chronicity of children's conditions in both groups, the study showed that parents of children with T1D are significantly more likely to experience emotional disorders.

P32
Evaluation of complete blood count parameters in children with type 1 diabetes

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Introduction: Blood count is a basic, easily accessible and inexpensive test that provides important information about general well-being and potential health problems. It is one of the most frequently used tests to screen people with type 1 diabetes (T1D), but it is not included in the recommendations for diabetes care. The aim of our study was to assess peripheral blood count parameters in children with T1D and compare them with the values of children without T1D.

Material and methods: The study included 266 children with T1D [mean age 13.0 (10.0–16.0) years, 53.38% girls] without concomitant chronic diseases. The control group consisted of 90 patients without T1D [mean age 11.0 (7.0–13.5) years, 52.22% girls], in whom acute or chronic disease with a potential impact on blood count parameters was excluded. The study also excluded children who were diagnosed with acute inflammation or infection at the time of testing. Based on medical documentation, peripheral blood count results were obtained. Statistical analysis was performed in Statistica v.13.3.

Results: The mean values of morphology parameters in both groups were within the norm. Statistically significant differences were found between the groups for red blood cell parameters. Patients with T1D had a significantly higher number and mean volume of erythrocytes, as well as higher hemoglobin and hematocrit concentrations.

In the context of white blood cell parameters, children with T1D had a significantly lower WBC count and percentage of lymphocytes compared to children without diabetes. At the same time, children with T1D were characterized by a significantly lower number of platelets and thrombocrit compared to the control group.

Conclusions: The complete blood count in the examined children with T1D did not show any significant deviations from normal values. However, differences were observed in the parameter values compared to children without T1D. An extended analysis of these discrepancies should take into account biochemical nutritional parameters, among others.

Table 1. Red blood cell parameters

Parameters	DM+ (*n* = 266)	Control (*n* = 90)	*t*/*Z*	*p*-value
RBC	4.95 ±0.45	4.72 ±0.36	4.81	< 0.001
Hb	13.95 ±1.34	13.16 ±1.08	5.57	< 0.001
Htc (%)	40.88 ±3.54	38.03 ±3.26	6.66	< 0.001
MCV [fl]	82.75 ±4.30	81.10 ±5.28	2.68	< 0.001

MCV – mean corpuscular volume, Htc – hematocrit RBC – red blood cell count, Hb – hemoglobin

Table 2. White blood cell parameters

Parameters	DM+ (*n* = 266)	Control (*n* = 90)	*t*/*Z*	*p*-value
White blood cells	6.41 (5.40–7.82)	6.92(5.63–9.02)	2.41	< 0.05
Lymphocytes	2.30 (1.87–2.90)	2.63 (2.01–3.66)	3.55	< 0.01
(%)	36.41 ±11.95	39.80 ±11.08	2.35	< 0.05
PLT	28.05 (249.00–326.00)	301.5 (261.5–357.00)	2.02	< 0.05
PCT	0.295 ±0.054	0.309 ±0.062	1.97	< 0.05

PCT – plateletcrit, PLT – platelets

POSTER SESSION OF ORIGINAL PAPERS 5

Chair: Elektra Szymańska-Garbacz

P33
The impact of anemia on glycated hemoglobin levels

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Introduction: Glycated hemoglobin is the basic test for evaluating glycemic status and diagnosing diabetes and prediabetes. Chronic hyperglycemia is frequently associated with anemia of various etiologies. The presence of anemia can influence HbA_{1c} levels, thereby leading to misinterpretation. The study aim was to examine relationships between HbA_{1c} and hemoglobin levels/erythrocyte parameters.

Material and methods: The study utilized the laboratory database, which contained the results of 756 individuals (443 women and 313 men). The analysis of complete blood count (CBC) and HbA_{1c} levels, determined simultaneously, was performed. For statistical processing, Pearson's r and χ^2 tests were used.

Results: A positive correlation of HbA_{1c} with hemoglobin levels was identified ($r = 0.10$, $p = 0.015$). It was confirmed in two distinct groups: firstly, in 266 women and 165 men with $HbA_{1c} < 5.7\%$ ($r = 0.34$, $p < 0.001$ and $r = 0.27$, $p = 0.009$, respectively); secondly, in 84 women with $HbA_{1c} \geq 6.5\%$ ($r = 0.22$, $p = 0.042$). Anemia was detected in 132 (17.5%) individuals. Of these, hypochromic anemia was observed in cases of $HbA_{1c} < 5.7\%$ ($n = 80$) in 24 (30.0%), 5.7–6.4% ($n = 21$) in 14 (66.7%), and ≥ 6.5% ($n = 31$) in 18 (58.1%) individuals ($\chi^2 = 13.2$, df = 2, $p = 0.001$). In all 100 women with anemia, negative correlations were identified between HbA_{1c} and hemoglobin levels ($r = -0.24$, $p = 0.016$), mean corpuscular volume (MCV) ($r = -0.34$, $p = 0.001$), and mean corpuscular hemoglobin (MCH) ($r = -0.31$, $p = 0.002$). Positive correlations of HbA_{1c} with neutrophil count ($r = 0.08$, $p = 0.036$) and erythrocyte sedimentation rate (ESR) ($r = 0.15$, $p < 0.001$) were identified. A negative correlation of hemoglobin levels with ESR ($r = -0.42$, $p < 0.01$) was observed in individuals with anemia. Consequently, both anemia and chronic hyperglycemia are partially associated with systemic inflammation. It is important to note that glucose and iron metabolism, hematopoiesis, and proinflammatory reactions are closely linked through common signaling pathways such as NF-κB, mTOR, JAK-STAT, and HIF-1α. Many genes related to glucose metabolism and hematopoiesis are located nearby, in particular 1p34.2-p34.3 (*SLC2A1*, *MPL*, *CSF3R*), 11p15.4-p15.5 (*HBB*, *HBD*, *INS*, *IGF2*, *KCNQ1*), and 19p13.2 (*INSR*, *EPOR*). It contributes to mutual influences on their expression levels through direct interactions and common regulatory and epigenetic mechanisms.

Conclusions: Hemoglobin and HbA_{1c} levels correlate differently depending on gender, glycemic status, and anemia presence. Both patients with anemia and normal glucose metabolism and women with anemia and diabetes may have falsely decreased HbA_{1c} levels. In patients with hypochromic anemia, particularly among women, HbA_{1c} may be falsely elevated. This occurrence is more prominent in cases of more severe anemia. Consequently, reliance on HbA_{1c} for the assessment of glycaemic status, diagnosis of diabetes and prediabetes is recommended following normalization of hemoglobin levels in such cases.

P34
Molecular mechanisms of the impact of gestational diabetes on the development of congenital heart defects in fetuses

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Introduction: Gestational diabetes mellitus (GDM) defines glucose intolerance that develops during pregnancy and leads to elevated maternal blood glucose levels. Hyperglycemia can significantly affect fetal development, especially during key periods of cardiac morphogenesis. The aim of this study was to identify the molecular mechanisms determining the effect of GDM on the development of congenital heart defects (CHDs) in fetuses. The paper describes the role of hyperglycemia, oxidative stress and disturbances of selected signaling pathways in the process of cardiac morphogenesis.

Material and methods: The study analyzed 80 scientific publications from around the world on the topic presented.

Results: Uncontrolled GDM in the first trimester is associated with a higher incidence of complex heart defects, including unbalanced complete atrioventricular septal defect with a common arterial trunk. Elevated glucose levels can cause oxidative stress and inflammation, which are detrimental to the development of the fetal heart. Hyperglycemia in pregnant mice increases oxidative stress and apoptosis in embryonic tissues, causing structural defects in fetal hearts. Oxidative stress disrupts cell signaling pathways necessary for heart development, including the Notch signaling pathway, which plays a key role in heart cell differentiation and morphogenesis. A link between GDM and reduced expression of critical cardiac transcription factors, such as NKX2-5, essential for cardiac development, has also been suggested. This downregulation of NKX2-5 expression can lead to fetal cardiac dysplasia, which is a prerequisite for CHDs. In addition, hyperglycemia can cause abnormal expression of MST1 and YAP1 in fetal heart tissues, promoting apoptosis pathways that impair cardiac structure. The fetal environment itself also plays an important role in the development of CHDs. Hyperglycemia in a pregnant woman can lead to changes in blood flow patterns and pressure in the developing fetal heart, resulting in structural abnormalities of the heart. Elevated insulin levels in the fetal circulation as a consequence of hyperglycemia in a pregnant woman may also contribute to cardiac remodeling and defects.

Conclusions: The mechanisms determining the effect of GDM on the occurrence of fetal CHDs include both maternal hyperglycemia and changes in the fetal environment. The interplay of these factors during critical periods of cardiac development highlights the importance of early detection and effective treatment of GDM to lower the risk of developing CHDs and improve neonatal outcomes.

P35
The role of single nucleotide polymorphisms in the pathogenesis of gestational diabetes

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Introduction: Gestational diabetes mellitus (GDM) is a complex metabolic disorder characterized by glucose intolerance that first appears in pregnancy. Among the factors conducive to the development of GDM, both genetic changes and environmental influences are distinguished. The aim of the study was to identify and evaluate the importance of selected single nucleotide polymorphisms (SNPs) in the occurrence and development of GDM.

Material and methods: The study reviewed 95 scientific publications on this issue from around the world.

Results: One of the best-studied SNPs in GDM is rs7903146 located in the *TCF7L2* gene. An association of rs7903146 with an increased risk of type 2 diabetes and GDM in many populations has been identified. The presence of the T allele in rs7903146 correlated with impaired insulin secretion and increased insulin resistance, which are key factors in the development of GDM. In the case of the rs10229583 polymorphism, located near the *PAX4* gene, participation in the regulation of insulin secretion was confirmed, as well as an important relationship with GDM, identified in various studies. Also, changes in rs2975760 and rs3792267 located in the *CAPN10* gene have been associated with an increased risk of GDM, particularly in Asian populations. These polymorphisms may regulate the expression of the CAPN10 protein, for which a possible effect on insulin sensitivity (IS) and secretion has been reported. On the other hand, in the case of the polymorphisms rs266729 and rs17300539 from the area of the *ADIPOQ* gene, an association with altered levels of adiponectin, which regulates IS, was detected. Lower levels of adiponectin are often seen in people with insulin resistance, so rs266729 and rs17300539 may act as genetic markers of susceptibility to GDM. In addition, the rs1143623 polymorphism in the *IL1B* gene was associated with increased postprandial lipemia and insulin resistance. These changes therefore suggest the potential involvement of inflammatory pathways in the development of GDM.

Conclusions: The genetic background of GDM is complex and includes many SNPs involved in different biological pathways. Understanding the function of these genetic factors can help develop personalized strategies for the prevention and treatment of GDM, and – ultimately – improve health outcomes for mothers and their newborns.

P36
Association between cortisol/dehydroepiandrosterone sulfate ratio and carbohydrate metabolism disorders in patients with non-functioning adrenal adenomas

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Introduction: Current publications suggest that cortisol/DHEA-S ratio is associated with cognitive functioning disorders, age-related neurodegenerative illnesses, sarcopenia and carbohydrate metabolic disorders. It is well known that secreting adrenal tumors increase the risk of carbohydrate metabolism disorders. However, recent reports suggest that also patients with non-functioning adrenal adenomas (NFA) have a higher cardiometabolic risk. To the best of the authors' knowledge, no data on the association between cortisol/DHEA-S ratio and carbohydrate metabolism disorders in patients with NFA have been published so far. The aim of the study was to evaluate the prevalence of carbohydrate metabolism disorders and its relationship with cortisol/DHEA-S ratio in a group of patients with NFA.

Material and methods: The study included 150 patients with non-functioning adrenal incidentalomas hospitalized in the Endocrinology Department of the City Hospital in Piekary in 2016–2019. Adrenal panel and carbohydrate metabolism parameters were taken from the patients' medical record. Anthropometric measurements were collected in the morning hours. Cortisol and DHEA-S concentrations were used to calculate cortisol/DHEA-S ratio; fasting glucose and insulin concentrations were used to calculate HOMA-IR; body mass and weight were used to calculate body mass index (BMI); and, finally, height and waist and hip circumference were used to calculate waist-to-hip ratio (WHR) and waist-to-height ratio (WHtR). In order to evaluate the relationship between quantitative variables, the Spearman test was performed. The significance level was $p < 0.05$.

Results. Most of the respondents in the studied group of 150 patients with NFA were women (72.67%), the median age was 64, the median cortisol/DHEA-S ratio was 0.11, and the mean BMI was 29.6. The most common carbohydrate metabolism disorders were insulin resistance (IR) (diagnosed in 64% of patients) and impaired glucose tolerance (46%). There were statistically significant associations between cortisol concentration (8:00 am) and fasting insulin ($p = 0.006$), cortisol concentration (at midnight) and glucose concentration ($p < 0.001$), cortisol concentration (at midnight) and HbA_{1c}% ($p = 0.04$), cortisol/DHEA-S ratio and fasting insulin ($p = 0.03$), cortisol/DHEA-S ratio and BMI ($p = 0.046$), and cortisol/DHEA-S ratio and age ($p < 0.001$). The results of simple analyses were verified using multivariable analysis in a linear regression model. The value of the cortisol/DHEA-S coefficient included in the model: cortisol/DHEA-S index = age + insulin + BMI showed a statistically significant dependence on the age variable ($p < 0.001$). Regression coefficient: 0.005.

Conclusions. Cortisol/DHEA-S ratio depends on age. Associations were found between cortisol at 8:00 and insulin and between midnight cortisol and HbA_{1c}% in the studied group of patients with non-functioning adrenal incidentalomas.

P37
The effect of reimbursement policy on the use of DPP-4 inhibitors in diabetes type 2 management in Poland

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Gliptins represent a valuable therapeutic option for managing diabetes type 2, particularly in patients who are intolerant of metformin, at risk of hypoglycemia, or require an additional agent to achieve optimal glycemic control. In Poland, these medications were introduced to the pharmaceutical market in the late 2000s. Despite their well-established role in diabetes management, there is a lack of data on their utilization and the impact of reimbursement policy on their use in clinical practice.

This study aimed to assess the clinical utilization of gliptins in Poland in 2019–2024. The analysis utilized data collected by PEX (RECEPTOmetr), a company specializing in pharmaceutical market research. Information on the number of gliptin packages sold was obtained from 6,000 pharmacies between August 2019 and July 2024 and subsequently extrapolated to the national level. The study examined the monthly sales volume and, using prescription data, analyzed the prescribing physicians' specialties, co-payment options, and patient age distribution. Until 2022, the monthly sales of gliptin packages remained stable, averaging 50,000. However, between 2022 and 2024, sales increased nearly 5-fold (Fig. 1).

This trend correlated with changes in reimbursement policy: sitagliptin was included in the reimbursement scheme with a 30% co-payment in 2022, followed by its inclusion in the free medication program for patients aged 65 and older in 2023 (Fig. 2).

By 2024, nearly 44% of all gliptin prescriptions were issued free of charge, in the 65+ population. Before 2022, linagliptin was the most commonly used agent; however, following the introduction of reimbursement, sitagliptin became the predominant choice. Gliptins were more frequently prescribed as monotherapy than as fixed-dose combinations with metformin, with sales of single-agent formulations exceeding those of combination

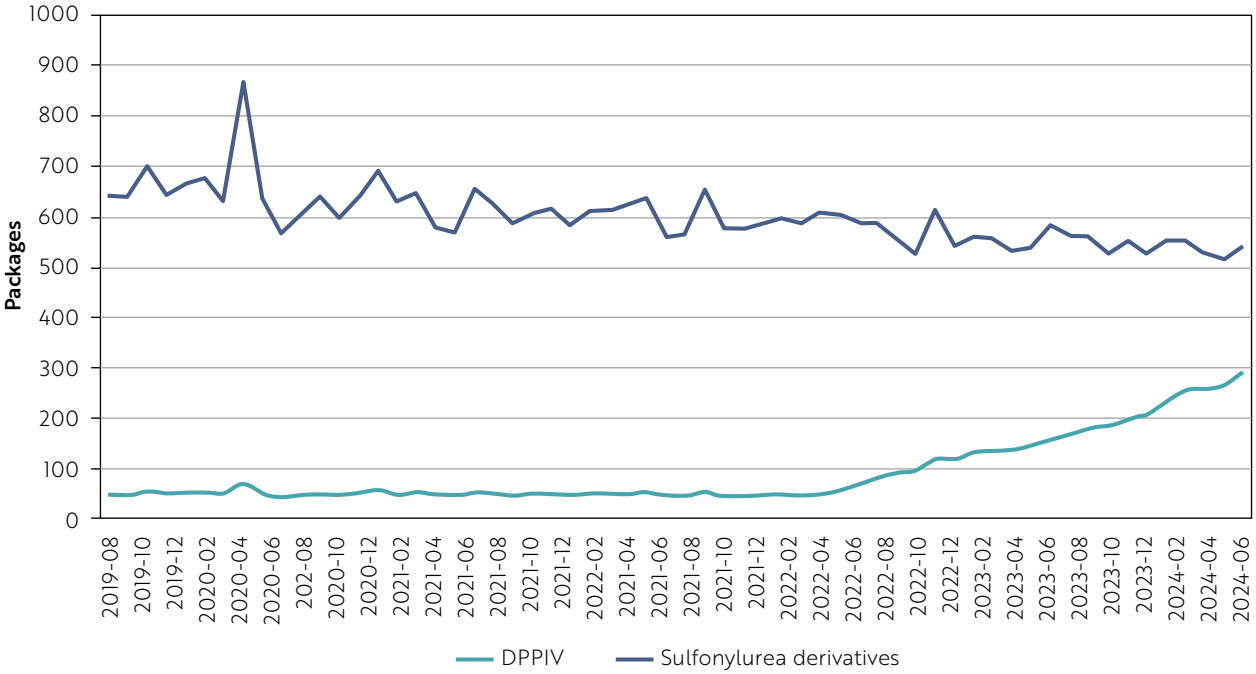

Fig. 1. Sales volume of gliptins and sulfonylurea derivatives

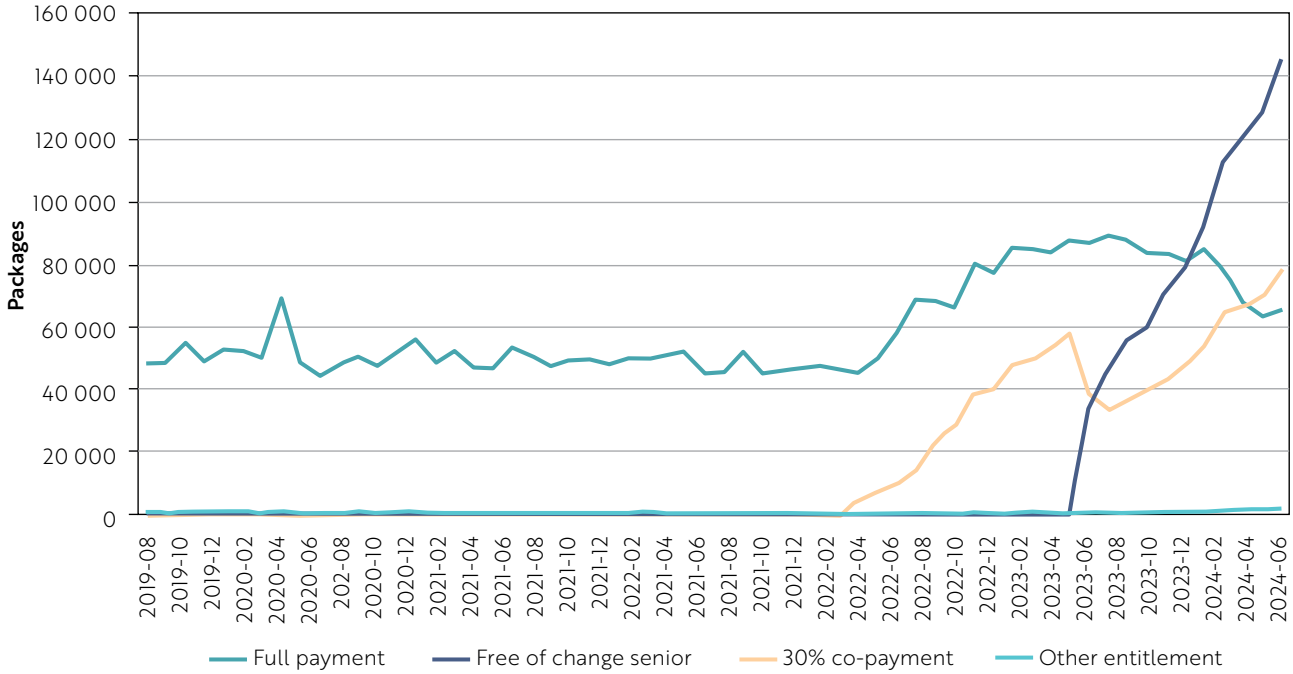

Fig. 2. Gliptins sold by payment category

therapies by more than twofold. In the initiation of gliptin therapy, the number of prescriptions issued by general practitioners was comparable to that of diabetologists. However, in therapy continuation, general practitioners prescribed averagely 142% more gliptin packages than diabetologists. The reimbursement policy had a significant impact on the increased sales of gliptins in Poland between 2022 and 2024, particularly among patients aged 65 and older, and influenced prescribing preferences for specific formulations. General practitioners play a crucial role in both the initiation and continuation of gliptin therapy. The rise in gliptin use correlated with a decline in sulfonylurea sales, suggesting a gradual shift from this drug class to newer and safer therapeutic options.

P38
Preformulation studies of selected topical insulin hydrogel formulations for skin application

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Introduction: Insulin-containing hydrogels are promising wound care formulations due to their biocompatibility, biodegradability, and ability to provide a moist environment that promotes healing. Preclinical and clinical studies conducted in a diabetic wound model confirm that dermatological insulin formulations can influence accelerated wound healing and increased cell proliferation. The authors of these studies note that insulin increases collagen synthesis, reduces inflammation and oxidative stress, and promotes re-epithelialization and angiogenesis. Despite advances in knowledge in the development of an epidermal formulation of insulin, challenges remain in optimizing the technology for the preparation of hydrogels containing the hormone. The aim of this study was to develop a hydrogel carrier for insulin, in terms of making a prescription drug. At present, there is no dermatological insulin drug on the market for skin application.

Material and methods: Hydrogels were prepared according to the recommendations of Polish Pharmacopoeia XII. Substrates based on Poloxamer 407 (30% m/v) (F1) and Poloxamer 407 with chitosan (30%, 2% m/v) (F2), which contained insulin (Insulatard Penfill) at a dose of 1 mg/g, were tested. An *in vitro* insulin release study was performed in a paddle apparatus (Erweka DT600, Husenstamm, Germany) in Enhancer Cell extraction chambers (Erweka, Husenstamm, Germany). A synthetic dialysis membrane (Strat-M; Merck Millipore), which mimics the structure of human skin, was used. The rheological properties of the hydrogels were tested using an RM 200 Touch rotational rheometer (Lamy Rheology Instruments, Champagne au Mont d'Or, France).

Results: The formulations developed were characterized by a prolonged insulin release profile. The pharmaceutical availability of the hormone from the hydrogels was 23% (F1) and 21% (F2). Insulin release occurred in a prolonged manner, consistent with first-order kinetics. API release profiles were similar (f1 = 7.16, f2 = 89.22). Rheological analysis showed that the obtained formulations are non-Newtonian shear-thinning fluids with thixotropic properties.

Conclusions: Dermatological insulin hydrogels that can potentially be prepared under pharmacy formulation conditions have been developed.

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P39
Gestational diabetes diagnosed before and after 20th gestational week: similarities and differences in anthropometric, clinical, and metabolic features

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Introduction: Gestational diabetes mellitus (GDM) is associated with a higher risk of adverse pregnancy outcomes. Nowadays, an increasing prevalence of GDM that is diagnosed in the first half of pregnancy is observed. However, the causes of this trend have not yet been elucidated. The aim of the study was to compare the anthropometric, clinical and metabolic characteristics in women with GDM depending on the time of diagnosis.

Material and methods: A retrospective cohort study was performed in 551 pregnant women with GDM. Gestational diabetes mellitus was diagnosed before the end of the 20th week of pregnancy in 212 women (group A – early GDM), and after the 20th gestational week in 339 women (group B – late GDM). The anthropometric, clinical and metabolic characteristics of the subjects were analyzed.

Results: The women in group A were significantly younger, with much less frequent positive family history of diabetes mellitus, and a significantly lower rate of previous or current smoking. The prevalence of GDM in previous pregnancies was comparable. The proportion of primipara was comparable, and there was also a similar rate of abortion or preterm delivery in the obstetric history. Macrosomia in previous pregnancies was more frequent in group A (13% vs. 6%; $p = 0.0058$), with a lower rate of cesarean section (8% vs. 15%; $p = 0.0215$). Birth weight of the studied women was significantly higher in group A (3500 (3200–3780) vs. 3430 (3100–3700) kg (interquartile ranges – IQR); $p < 0.05$). No difference was found for height, while both pre-pregnancy weight and body mass index were significantly higher in group A (69 (62–85) vs. 65 (58–74) kg (IQR); $p = 0.0052$, and 25.3 (22.6–30.3) vs. 24.1 (21.3–27.4) kg/m^2 (IQR); $p < 0.01$, respectively). The percentage of normal weight and obese subjects was lower in group A, with a higher percentage of overweight women. Fasting plasma glucose (FPG) in the 75 g oral glucose tolerance test (OGTT) performed during pregnancy in group A was significantly higher (93 (86–99) vs. 86 (80–95) mg/dl (IQR); $p < 0.00001$), while both 1h-OGTT and 2h-OGTT glucose levels were lower (170 (143–191) vs. 182 (162–196) mg/dl (IQR); $p = 0.0001$, and 142 (118–162) vs. 158 (145–171) mg/dl (IQR); $p < 0.00001$, respectively). Abnormal FPG was more prevalent in group A (54 vs. 33%; $p < 0.00001$), while abnormal 1h-OGTT and 2h-OGTT glucose levels were more prevalent in group B (44 vs. 35%; $p < 0.05$, and 44 vs. 23%; $p < 0.00001$, respectively). No difference was found in the number of abnormalities in OGTT between the groups.

Conclusions: Variation in body mass parameters and glucose levels in OGTT may indicate different dominant mechanisms leading to hyperglycaemia diagnosed in pregnancy.

P40
Leukocyte telomere length in patients with type 2 diabetes

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Introduction: Type 2 diabetes (T2D) accounts for approximately 90% of all diagnosed cases of diabetes. Although T2D is a progressive disease, its progression varies widely among patients and depends on their individual characteristics. T2D is an age-related disease influenced by both genetic and environmental factors. Telomere shortening has been linked to T2D. The aim of this study was to find any correlation between leukocyte telomere length (LTL) and patients' biochemical blood parameters that may be useful in prediction of the onset of disease.

Material and methods: The study cohort consisted of 147 Caucasian patients (67 women, and 80 men) aged 39–87 years (median age, 65 years). Leukocyte telomere length was measured using a quantitative polymerase chain reaction method. Key demographics and other clinical characteristics of subjects were also included.

Results: No significant associations were found between demographic, clinical and biochemical characteristics of the T2D patients and LTL using Pearson correlation and Spearman's rank correlation. Most of the measured parameters were not normally distributed (i.e., non-parametric), which may in part explain the lack of statistically significant differences between tertiles, for parameters such as duration of diabetes, and the levels of HbA_{1c}, C-reactive protein (CRP) and triglyceride (TG). Another reason for the lack of statistical significance may be the relatively small cohort, which has insufficient statistical power to discern any underlying relationships present. Nevertheless, some trends were found upon comparing the parameters from the 1st tertile vs. the 3rd tertile, i.e., the shortest LTL vs. the longest LTL. Patients from the 3rd tertile had shorter duration of diabetes compared with the 1st tertile (median, 15 vs. 17 (years)), older age at diagnosis (mean, 51 vs. 48 (years)), smaller waist circumference (mean, 114.63 vs. 116.96 cm), lower levels of HbA_{1c} (median, 7.80 vs. 8.30 %) and CRP (median, 3.60 vs. 4.23 mg/l), along with higher level of vitamin D_3 (mean, 22.79 vs. 19.57 ng/ml) and lower levels of both low-density lipoprotein (LDL) cholesterol (mean, 68.59 vs. 79.67 mg/dl) and TG (median, 131.00 vs. 146.00 mg/dl). These results demonstrate that patients with long LTL had objectively more physiologically favorable parameters compared to those with short LTL.

Conclusions: This therefore demonstrates the promising potential of LTL analysis. Further multicenter studies on LTL and diabetes are needed, but on a much larger group of patients. Further studies should be completed on changes in telomere length over time, as well as their changes in target tissues.