Poster Exhibition

5. Diabetes and Obesity

PE 05-01 5. Diabetes and Obesity

Elucidating the Anti-diabetic Properties of Phenolic Compounds in Stingless Bee Honey

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Background: The increase in Type 2 Diabetes Mellitus prevalence has prompted numerous research studies to find an alternative to managing the disease through the oxidant-antioxidant balance, mainly through bioactive compounds in natural products. This study aimed to investigate the antioxidant activity and antidiabetic properties of phenolic-rich extract (PRE) from Stingless bee honey (SBH) as a therapeutic agent to restore the redox balance using both *in-vitro* and *in-vivo* models.

Methods: *In vitro* study, the antidiabetic potential of PRE was determined based on the inhibition against α-amylase and α-glucosidase enzymes. The glucose uptake and cellular antioxidant analyses were performed on 3T3-L1 adipocytes and L6 muscle cells, respectively. *In-vivo* study, the antidiabetic potential was assessed using a high-fat diet-fed and nicotinamide/streptozotocin-induced diabetic rat model. The glucose tolerance and lipid profile of diabetic rats were analyzed. The gene and protein expression involved in insulin signaling and glucose sensing pathways in insulin-sensitive tissues was also investigated. Data were assessed using Tukey's test or two-way ANOVA and Dunnett's multiple comparisons tests.

Results: The results from α-amylase and α-glucosidase inhibitory assays suggested that PRE exhibited significantly ($p<0.05$) higher anti-diabetic activities than SBH. PRE also has good glucose uptake stimulating and reactive oxygen species (ROS) scavenging effects in 3T3-L1 adipocytes and L6 muscle cells. Findings from in vivo study showed that PRE improves lipid profile by lowering total cholesterol and triglycerides levels. PRE regulatory effects on insulin signaling and glucose sensing pathway-related genes were tissue-specific, with liver, skeletal muscle and adipose tissues exhibiting significant transcription for Irs1, Pi3kca, Akt and Glut4 genes. Hepatic translational analyses of PRE reveal an increase in AKT, IRS1, and GLUT4 proteins, indicating an increase in glucose uptake via IRS/AKT activation.

Conclusion: The data suggested that PRE from SBH exhibited a high potential for ameliorating glucose uptake and intracellular oxidative stress, which could moderate diabetes mellitus.

PE 05-02 5. Diabetes and Obesity

Effectiveness of Nutritional Education Intervention on Body Weight Control among Type 2 Diabetes Patients: A Systematic Review-Meta Analysis

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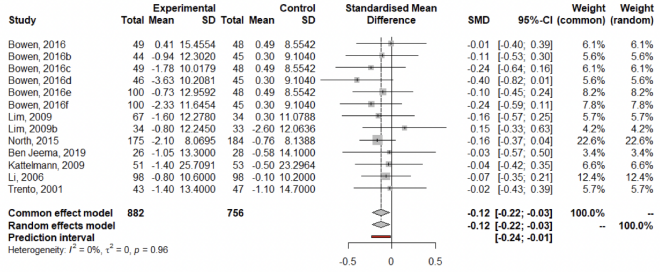
Background: Type 2 diabetes mellitus (T2DM) is a non-communicable disease that increases every year and has complex consequences. Diabetes management plays an important role in addressing the disease. Several studies have determined on the effectiveness of nutrition education on diabetes management. This systematic review and meta-analyses to examine the effectiveness of nutritional education intervention on body weight control in T2DM patient.

Methods: Studies involving individuals with type 2 diabetes aged 18+, evaluating their nutritional education and body weight effects, should be conducted in English are included. We used two databases for conducting this systematic review: PubMed and Scopus and performed Boolean operation. The quality of selected studies was evaluated using Cochrane Risk Bias Tools for Randomized trials, MINORS for experimental studies, and Hoy's table for observational studies.

Results: Thirteen studies were included in the meta-analysis. Patients who received nutritional education had weight reduction of 0.12 kg (n = 882, MD = -0.12; I^2 = 0%, 95% CI -0.22 to -0.03) compared to patients who received usual care. In subgroup analysis, we performed it by length of intervention, delivery method, curriculum. Effect size in the experimental group with duration ≤ 3 months decreased by 0.08 (MD = -0.08; 95% CI -0.22 to 0.07) and with duration >3 months significantly decreased by 0,16 (MD = -0.16; 95% CI -0.30 to -0.03) compared to the control group. Effect size in the experimental group with individual session significantly decreased by 0.15 (MD = -0.15; 95% CI -0.28 to -0.03) and group session decreased by 0.07 (MD = -0.07; 95% CI -0.24 to 0.10) compared to the control group. Effect size in the experimental group with diet only curriculum significantly decreased by 0.14 (MD = -0.14; 95% CI -0.28 to -0.01) and with lifestyle curriculum decreased by 0,10 (MD = -0.10; 95% CI -0.25 to 0.04) compared to the control group.



Conclusion: Nutritional education intervention had positive impact on body weight control of T2DM patient, although showed some small reduction. Furthermore, the nutritional education is regarded to be more beneficial when offered diet-only education with individual approach and long-term duration (more than 3 months). This finding provide support for the role of nutritional education in diabetes management, also stated the importance of establishing appropriate programs that have optimal outcomes for diabetes management needs to be carried out effectively.

PE 05-03 5. Diabetes and Obesity

A case of diabetes remission patient with ketosis prone type 2 diabetes through weight loss, who needed multiple insulin therapy

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Background: The increase in diabetics is a problem with the increase in the obese population. There are many types of diabetes, among them, ketosis prone type 2 diabetes usually needs insulin therapy.

Case: A 28-year-old man without past medical history visited to the emergency room with nausea, vomiting and weight loss. His height was 170cm and body weight was 69kg (body mass index: 23 kg/m^2). Before weight loss, his body weight was 88kg (body mass index: 30 kg/m^2. He showed high glucose (321mg/dL) and high anion gap metabolic acidosis (pH 7.0, HCO3 2.9mmol/L, anion gap 32). His hemoglobin A1c level was 9.7%, fasting c-peptide level 0.39ng/dL, and anti-GAD Ab was negative. He was diagnosed with ketosis prone type 2 diabetes. He was treated with insulin therapy. After his disease stabilization, his insulin dose was reduced. After seven months of active diet management and exercise, he reached a weight loss of 62kg (11%) and stopped insulin. Previously, there were cases where type 2 diabetes remission was reached with more than 15% active weight loss. We report a case of reaching diabetes remission by weight loss and diet control in a ketosis prone type 2 diabetes patient requiring insulin therapy.

Conclusion: Clinicians should recall the importance of active weight management through this case.

PE 05-04 5. Diabetes and Obesity

Cobalt Nanoparticles as Therapeutic Agents: Unraveling Their Antidiabetic Potential and Impact on Oxidative Stress in Fat-Fed and Streptozotocin-Treated Rats

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Objective: The present study investigated the impact of cobalt nanoparticles (CONPs) on serum parameters of renal function, on oxidative stress markers (malondialdehyde [MDA] and 8-isoprostane), serum creatinine and on expression level of insulin receptor, glucose transporter 4 (GLUT4), glucokinase genes and heat-shock proteins (HSPs) in rats.

Methods: Male Wistar rats (n=64, 10 weeks old) were divided into four groups. Group 1 received a standard diet (12% of calories as fat). Group 2 received a standard diet, plus CONPs; received a single daily oral dose of CONPs of 100 mg/kg in suspension. Group 3 received a high-fat diet (40% of calories as fat) for 2 weeks, and was then injected with streptozotocin (STZ) on day 14 (STZ, 40 mg/kg intraperitoneally). Group 4 was treated in the same way as group 3 (HFD/STZ), but was supplemented with CONPs 100mg /kg/body weight/day. Renal damage was assessed by measuring ACR (albumin to creatinine Ratio) and GFR (glomerular filtration rate), serum creatinine , proteinuria, enzymuria, renin-angiotensin system, lipid peroxidation and activities of polyol pathway enzymes.

Results: Experimental diabetic rats group showed hyperglycemia with almost four fold high blood glucose levels. CONPs supplementation lowered kidney concentrations of MDA, 8-isoprostane levels, serum urea-N, and creatinine, and reduced the severity of renal damage in the STZ-treated group (i.e., the diabetes-induced group). The expression of insulin receptor, GLUT-4 , glucokinase genes and HSPs was lower in the STZ group that received CONPs than in the group that did not. Markers of podocyte damage in kidney and GFR were normalized by CONPs treatment. No significant effect of CONPs supplementation was detected in regard to the overall measured parameters in the control group.

Conclusion: It may be concluded that efficacy of CONPs in reducing renal risk factors and impairment without any harmful side effect in experimental diabetes rats.

PE 05-05 5. Diabetes and Obesity

Protective Effect of hesperidin against High Fat Diet induced Obese Diabetic Wistar Rats via reduction of cytokines and Nrf2 Pathway

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Background: Liver steatosis (fatty liver) is frequently found during the conditions such as diabetes and obesity. The current experimental study was scrutinized the protective effect of hesperidin against high fat diet (HFD) induced obese diabetic Wistar rats via alteration of nuclear factor erythroid 2-related factor 2 (Nrf2) pathways.

Methods: Wistar rats were grouped into following groups as follows: normal, HFD, HFD treated with hesperidin (10, 20 and 40 mg/kg) and glibenclamide (2.5 mg/kg), respectively. Rats were received the oral fructose solution (60%), palm oil (25%) for 4 weeks. After experimental induction, serum and hepatic tissue samples were collected to estimation the glycemic status, lipid profiles, antioxidant status, oxidative and stress markers and estimation the hepatic histopathology. Nrf2 transcription and nuclear level were also estimated.

Results: HFD showed rats showed the marked reduction in the hepatic extraction and hepatic steatosis after the hesperidin treatment. The present result showed that hesperidin prevents the occurrence of fatty liver, increasing the glycemic status, reduction oxidative stress and enhancing the antioxidant status. Hesperidin significantly ($P<0.001$) reduced the hepatic parameter includes alanine transaminase, alkaline phosphatase, aspartate transaminase; pro-inflammatory cytokines such as interleukin-6, tumor necrosis factor-α, and monocyte chemoattractant protein-1, respectively. Moreover, hesperidin significantly ($P<0.001$) down-regulated the nuclear Nrf2 activity.

Conclusion: We can conclude that hesperidin reduced the blood glucose level, increased insulin sensitivity and also reduce the inflammation via reduction of cytokines and Nrf2 pathway.

PE 05-06 5. Diabetes and Obesity

Biological Importance And Therapeutic Effectiveness Of Astilbin On Diabetes And Related Secondary Complication 'Diabetic Nephropathy' Through Different Molecular Mechanism

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Background: Herbal medicine comprises the biological application and uses of medicinal plants and their derived products in the traditional system of medicine as well as in modern medicine. Astilbin is a natural flavonoid compound found to be present in the *Smilax aristolochiifolia* and *Smilax glabra*. Astilbin have been well known for their anti-inflammatory activity in medicine. Diabetic nephropathy is one of the major complication of all the diabetes patients and responsible for end-stage renal disorders of human being. Astilbin have been known for their inhibitory potential against carbohydrates-hydrolyzing enzymes which is one of the main factors of hyperglycemic condition in the Human being.

Methods: In order to know the therapeutic effectiveness of astilbin for the treatment of diabetes and related secondary complication, here in the present investigation scientific data of different scientific research were analyzed. However biological effect of astilbin on α-amylase and yeast α-glucosidase has also been performed through scientific data analysis of scientific work in order to know their therapeutic potential against diabetes and related secondary complications. All the other pharmacological data have also been correlated with the medicinal potential in the present work to get better results.

Results: Biological potential of astilbin against pancreatic α-amylase and yeast α-glucosidase have been investigated in the present work through scientific data analysis of different scientific research work in order to know the biological importance of astilbin on diabetes and related secondary complications. Scientific data analysis revealed significant effect of astilbin against α-amylase and yeast α-glucosidase enzymes. Another scientific data analysis revealed the therapeutic effectiveness of astilbin for their inhibitory potential on rat lens and recombinant human aldose reductase, which signified its biological potential to control and prevent osmotic pressure in the hyperglycemia condition. However some research works scientific data also suggest that astilbin inhibit connective tissue growth factor (CTGF) which could be potential tools for the treatment of diabetic nephropathy.

Conclusion: Scientific data analysis of different scientific research work revealed the biological importance of astilbin in medicine for the treatment of diabetes and diabetic nephropathy.

PE 05-07 5. Diabetes and Obesity

Antiglycation Activity of Benincasa hispida and Its Potential in Reducing Serum Advanced Glycation End Products in Patients with Diabesity

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Background: *Benincasa hispida* (*B. hispida*), also known as winter melon is often enjoyed as vegetable in Asian cuisines. Previous literature suggested that *B. hispida* may have an antiglycation effect. Advanced glycation end products (AGEs) have been associated with diabetes-related microvascular and macrovascular complications. The development of potential AGEs inhibitors can be considered in the management of diabetes. Our study aims to investigate the antiglycation activity of *B. hispida* and to evaluate its effect on serum AGEs of patients with diabesity.

Methods: The round fruit pulp of Malaysian-grown *B. hispida* was extracted in distilled water at 60oC for 30 minutes. The antiglycation activity of *B. hispida* aqueous extract was studied in vitro by albumin-glucose assay, albumin-methylglyoxal assay, and post-Amadori screening assay. Powdered drink formulated with *B. hispida* was prepared and a 12-week intervention was conducted involving 50 participants with BMI >23 kg/m^2 and diagnosed with type 2 diabetes from outpatient clinic Hospital Universiti Sains Malaysia. The participants were randomly assigned into intervention or control group. Serum AGEs were determined using human AGEs enzyme-linked immunosorbent assay at baseline, and 12 weeks after the beginning of intervention.

Results: *In vitro* studies revealed that *B. hispida* has a significant inhibitory effect on the formation of AGEs. Besides, *B. hispida* aqueous extract at the concentration of 5 and 10 mg/mL manifested 55.9 and 69.6% inhibition of AGE formation, respectively. The 12-week intervention study showed that participants who received *B. hispida* powdered drink had a greater reduction in mean difference of serum AGEs (Δ -0.11 ng/mL, 95% CI: -0.32, 0.10) than placebo (Δ -0.05 ng/mL, 95% CI: -0.32, 0.22).

Conclusion: *B. hispida* can be exploited as a functional food ingredient beneficial in management of diabetes due to its antiglycation properties and potential to reduce serum AGEs in patients with diabesity.

PE 05-08 5. Diabetes and Obesity

Blood Pressure Variability and End-Stage Kidney Disease Among Individuals with Type 2 Diabetes: a nationwide cohort study

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Background: Longitudinal evidence of the relationship between blood pressure (BP) variability and end-stage kidney disease (ESKD) among individuals with type 2 diabetes is limited. Therefore, we evaluated the association between BP variability and ESKD in Korean adults with type 2 diabetes.

Methods: The study utilized data from the Korean National Health Insurance Service database, comprising health checkups conducted between 2004 and 2015. We enrolled 36,421 adults aged ≥19 years with type 2 diabetes who underwent at least two health checkups and were followed-up until the end of 2017. BP variability measured using the coefficient of variation, standard deviation, and variability independent of the mean. Hazard ratios (HRs) and 95% confidence intervals (CIs) for ESKD determined using multivariate Cox proportional hazards regression analysis.

Results: During a median follow-up of 8.05 years, 290 patients with ESKD were identified. The highest quartile of systolic or diastolic BP variability presented a higher risk of ESKD than did the lowest quartile of systolic or diastolic BP variability. The group with the highest systolic and diastolic BP variability had a 77% higher risk of ESKD than did those in the lowest three quartiles of both systolic and diastolic BP variability. These associations were present in younger individuals without comorbidities.

Conclusion: Among individuals with type 2 diabetes, increased BP variability was associated with an increased risk of ESKD. These associations were similarly observed in younger individuals without comorbidities. Maintaining a consistent BP seems to be important to prevent progress to ESKD in individuals with type 2 diabetes.

PE 05-09 5. Diabetes and Obesity

Impact of Kayakalpa Yoga on Type 2 Diabetes Mellitus Individuals via Mitochondriogenesis

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Background: Approximately one in 11 adults globally has Diabetes Mellitus (DM), with cases projected to rise from 529 million in 2021 to 1.31 billion by 2050, causing 1.5 million deaths annually. Type 2 Diabetes Mellitus (T2DM) results from insulin resistance or insufficient insulin production. Mitochondrial dysfunction contributes to DM by impairing cell function and insulin resistance. Affordable treatment, including insulin, is essential, aiming to halt diabetes and obesity by 2025. Kayakalpa yoga (KY), a complementary therapy, enhances mitochondrial biogenesis and β-cell activity. This study evaluates short-term KY's impact on mitochondrial energetics in T2DM patients.

Methods: Informed consent was obtained from T2DM volunteers practicing KY for a month. Blood samples were collected after assessing BMI and blood pressure. Biochemical analyses for blood glucose, serum creatinine, and lipid profiles (total cholesterol, triglycerides, HDL, LDL, VLDL) were performed using commercial kits. Antioxidant levels were analyzed by measuring GSH and enzymatic antioxidants (SOD, CAT, GPx, GST). Oxidative stress was assessed using the DCFDA method. Mitochondrial membrane potential (MMP) and ATP levels were measured using TMRM staining and ATP lite kits. Gene expression for mitochondrial biogenesis (PGC1α, Nrf2, TFAM), dynamics (hFIS1, DRP1, MFN1/2, OPA1), and insulin-specific markers (GLUT4) was conducted using RT-PCR. Mitochondrial ETC protein levels (COX6A1) were examined using western blotting.

Results: Participants with normal blood pressure, BMI, heart rate, lipid profiles and with DM were selected. KY practitioners showed decreased glucose and cholesterol levels compared to non-practitioners. T2DM patients practicing KY for a month had significant increase in GSH and enzymatic antioxidants, while reducing ROS levels, indicating decreased oxidative stress. Enhanced mitochondrial function was evident from increased MMP, mitochondrial mass and increased mitochondrial energetics gene expression, and elevated mitochondrial ETC proteins (COX6A1) in KY practitioners.

Conclusion: Overall, results suggest that regular KY practice positively impacts controlling T2DM progression by improving mitochondrial function via the PGC1α/Nrf2 pathway.

PE 05-10 5. Diabetes and Obesity

Therapeutic Potential of Palm-Derived Mixed Carotenoids in Managing Type 2 Diabetes

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Background: Obesity-induced type 2 diabetes mellitus (T2DM) exacerbates insulin resistance due to oxidative stress, resulting in metabolic dysregulation. While synthetic drugs like metformin are prescribed to manage T2DM, they often come with uncomfortable side effects, highlighting the need for alternative natural treatments. Palm-derived mixed carotenoids (PDMC) potentiate as a natural source of antioxidants with antidiabetic properties in managing the disease.

Methods: Two concentrations of PDMC extract (8% and 20%) were employed in the study. The antioxidant potential was determined utilizing the DPPH and ABTS assays. The inhibitory activity of PDMC on diabetic enzymes was evaluated through both percentage inhibition and IC_{50} values. The cytotoxicity of PDMC samples on C_2Cl_2 and 3T3-L1 cells were assessed using the MTT assay. In addition, the uptake ability of 2-NBDG glucose analogues was examined in differentiated C_2Cl_2 and 3T3-L1 cells treated with PDMC following palmitic acid induction.

Results: The scavenging ability of 8% and 20% PDMC on DPPH assay demonstrated a dose-dependent increase with 96.4% and 96.2% activity at the highest concentration (1000ug/ml), respectively. In the ABTS assay, the highest activity was 75.62% (400 µg/ml) for 8% PDMC and 83.53% (200 µg/ml) for 20% PDMC. Furthermore, both 8% and 20% PDMC exhibited significant inhibition of α-amylase and glucosidase activity ($p<0.05$) compared to acarbose. The cytotoxicity IC_{50} values for 8% and 20% PDMC on C_2Cl_2 cells were 192 µg/mL and 902 µg/mL, respectively, while on 3T3-L1 cells were 856 µg/ml and 928 µg/ml, respectively. In addition, both concentrations of PDMC (8% and 20%) demonstrated enhanced 2-NBDG uptake with increasing dosage in differentiated C_2Cl_2 and 3T3-L1 cells induced with palmitic acid, highlighting their potential to improve glucose uptake and metabolism.

Conclusion: These findings support further exploration of PDMC as a promising natural intervention for combating T2DM and its associated complications, offering a potentially safer and effective alternative treatment.

PE 05-11 5. Diabetes and Obesity

Effects of Hydrogen Water Intake on Lipid Regulation in Mice.

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Background: Recent studies have shown that hydrogen can improve metabolic disorders. Hydrogen is effective in the treatment of metabolic diseases such as obesity and diabetes. Hydrogen has attracted attention for its potential therapeutic effects due to its antioxidant, anti-inflammatory and anti-apoptotic properties. Its ability to selectively reduce harmful reactive oxygen species and modulate signaling pathways makes it a promising candidate for the treatment of metabolic diseases. This study aims to investigate the mechanisms by which hydrogen water intake affects energy metabolism focusing on its effects on lipid and glucose metabolism.

Methods: Eight-week-old male C57BL/6J mice were divided into two groups: one group received distilled water and the other group received hydrogen water for four weeks. Body composition was measured before and after treatment using computed tomography. Energy regulation factors, including adenosine monophosphate-activated protein kinase (AMPK), carnitine palmitoyltransferase I (CPT1b) in skeletal muscle, and adipose triglyceride lipase (ATGL) in the liver, were determined by Western blot. Blood biochemistry tests were performed to measure alanine aminotransferase (ALT) and non-esterified fatty acid (NEFA). In addition, glucose metabolism was evaluated by a glucose tolerance test.

Results: The group that received hydrogen water for four weeks showed a lower percentage of body fat. In addition, activation levels of AMPK, a master factor of energy metabolism, CPT1b, an enzyme involved in fatty acid uptake, and ATGL, an enzyme that breaks down triglycerides were found to be activated, although NEFA level was reduced in the group received hydrogen water. However, no changes in ALT level and glucose metabolic capacity were observed.

Conclusion: Four weeks of hydrogen water intake resulted in a decrease in body fat percentage, activation of AMPK/CPT1b and AMPK/ATGL signaling pathway. These results suggest that hydrogen water intake increases lipolysis and fatty acid uptake. However, hydrogen water did not affect glucose metabolism.

PE 05-12 5. Diabetes and Obesity

Obesity and Diabetes: Sex and Age Difference Among the Jats of Haryana, India

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Background: The burden of obesity is growing at an alarming rate with WHO (2024) reporting more than a billion people living with obesity which could significantly increase the risk of type 2 diabetic mellitus. The study aims to address the prevalence of obesity and diabetes among the Jat population of Haryana, India according to sex and age.

Methods: A cross-sectional study was conducted among the Jat community of Palwal district, Haryana, involving 1108 adults aged 30 years and above. Data on sex, age, weight, height and fasting blood sugar levels were collected through household surveys and standard measurements. General obesity was assessed using WHO Asia-Pacific BMI criteria and Type 2 Diabetes using the Indian Council of Medical Research (ICMR) guidelines. Statistical analysis included frequency distribution, chi-square tests, linear regression and logistic regression.

Results: Among the Jats, 16% were overweight, and 37.9% were obese. However, only 2.2% had Type 2 diabetes and no significant association was found with overweight/obesity and Type 2 diabetes. Odds ratio analysis show that females had an almost 2-fold risk of being overweight/obese. As for age, overweight increases with age, while obesity decreases with age. Linear regression revealed a significant negative association between BMI and age, where there was a decrease in BMI with increasing age (Table 1).

Conclusion: Our findings have two implications. Firstly, there is an urgent need for obesity intervention among the Jats of Haryana, especially among women. The notable contrast between the high prevalence of obesity and the markedly low prevalence of type 2 diabetes hints at potential genetic and epigenetic factors that might confer protection against diabetes which calls for further studies. Second, prevention and management of overweight and obesity based on age is especially important as overweight increases with age, while obesity decreases with age.

Table1 – Prevalence and Risk of Overweight and Obesity According to Sex and Age.

General Obesity	Overweight n = 175 (16 %)	Obese n = 425 (37.9 %)	Overweight and/or Obese n = 590 (53.9%)	Odds Ratio (CI), p-value
Sex				
Male (Reference)	50 (15.9)	86 (27.3)	136 (43.2)	
Female	125 (16)	329 (42.2)	455 (58.3)	1.837 (1.410 – 2.393), P < 0.001
χ^2 and p-value	20.556, p < 0.001			
Age				
31-40 Years	2 (8.7)	10 (43.5)	12 (52.2)	
41-50 Years	60 (15.7)	169 (44.1)	229 (59.9)	(–) 0.054 {(–) 0.082 – (–) 0.027}, p < 0.05
51-60 Years	61 (16.1)	145 (38.3)	206 (54.4)	
61-70 Years	32 (14.5)	72 (32.7)	104 (47.3)	
71 Years and above	20 (22.2)	19 (21.1)	39 (43.3)	
χ^2 and p-value	22.821, < 0.01			

PE 05-13 5. Diabetes and Obesity

Aerobic Exercise Training and its effects on Energy Expenditure in Obese Individuals: Insights from Physiological Cost Index

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Background: Obese individual tends to expend more energy in particular task as compared to normal Weight individuals. Aerobic exercise has been the subject of investigation to improve energy expenditure. It is difficult to calculate oxygen consumption clinically due to expensive equipment required to measure it. Physiological cost index is one the indirect ways of calculate energy expenditure.

Methods: This was an Interventional study, convenient sampling, sample size of 30 individuals. Inclusion Criteria: Obese adults (WHO Classification), age 18 to 30 years, both genders willing to participate. Exclusion Criteria: Presence of any musculoskeletal, neuromuscular, cardiovascular problems, Obese individuals who are engaged in any other Form of exercise schedule. Presence of any other co-morbidities affecting the PCI like Smoking, Alcohol consumption etc. Outcome measure- Physiological Cost Index (PCI) assessed by 6 MWT and values were put in McGregor's equation: HR walking -HR baseline by walking speed, expressed in beats per meter. A sub maximal 6-minute walk test (6MWT) was performed and the distance walked, walking speed and vitals were recorded pre training and post training. The physiological cost index for everyone was calculated. The individuals then Underwent aerobic exercise training imparted for 3 days for 4 consecutive weeks. The data was statistically analyzed using student paired t test.

Results: Aerobic exercise showed a significant decrease in the physiological cost index after 4 weeks. (p = <0.001).

Conclusion: Aerobic exercise training significantly enhances energy expenditure in obese individuals measured through Physiological Cost Index.

PE 05-14 5. Diabetes and Obesity

Type 2 diabetes remission and the contributing factors after bariatric surgery

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Background: The aim of this study was to ascertain the remission rate of type 2 diabetes mellitus (T2DM) and to investigate the potential contributing factors after bariatric surgery.

Methods: A one-year retrospective analysis was conducted on morbidly obese patients with T2DM who had undergone either Roux-en-Y gastric bypass (RYGB) or laparoscopic sleeve gastrectomy (LSG) from January 2019 to July 2021. Complete remission was defined as an HbA1c <5.7% and a fasting glucose <100 mg/dL in the absence of anti-diabetes medicine.

Results: A total of 70 patients, 47.1% (N = 33) experienced complete remission of T2DM over one year after bariatric surgery. Subjects with complete remission were younger, more obese, and had a shorter duration of T2DM compared to those who never experienced remission. They also exhibited better HbA1c, higher insulin secretion indices, and worse insulin resistance indices before surgery. However, there was not notable difference in remission rate between RYGB and LSG.
In a multivariate model, total muscle mass (OR = 1.24, 95% CI 1.02-1.51, P = 0.028), HbA1c (OR = 0.20, 95% CI 0.06 – 0.69, P = 0.011), and fasting C-peptide (OR 2.35, 95% CI 1.06 – 5.18, P = 0.035) were significantly associated with complete remission of T2DM, whereas obesity indices such as body mass index (BMI), total fat mass, or waist circumference were not. Area under the receiver operating characteristic curve (AUC) of our logistic model which was adjusted for total muscle mass, HbA1c, and fasting C-peptide was superior to pre-operative IMS scores, but it was similar to ABCD score.

Conclusion: The complete remission of T2DM after bariatric surgery is dependent on preoperative muscle mass, HbA1c level, and beta-cell function, regardless of obesity parameters.

PE 05-15 5. Diabetes and Obesity

Factors Influencing Adherence to Refill and Medication in Adults Taking Medication for Diabetes and Metabolic Syndrome: A Preliminary Finding

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Background: Adherence to refill and medication is essential for disease control and treatment in patients taking medication for diabetes. This study aimed to examine factors influencing adherence to refill and medication in adults taking medication for diabetes and metabolic syndrome.

Methods: This study analyzed outcomes data in a longitudinal study conducted on 130 patients taking medication for diabetes and metabolic syndrome from a university-affiliated hospital. Data were collected using structured questionnaires. Medication adherence was measured by the Adherence to refills and medications scale (ARMS) and factors influencing MA were measured by Information-Motivation-Behavioral skills (IMB) model-based questionnaires: medication knowledge, motivation, self-efficacy for medication, and diabetes social support.
The lower ARMS score indicates higher MA. Hierarchical regression analysis was used to analyze factors influencing MA.

Results: Hierarchical multiple regression model accounted for 62.1% of the variance in MA ($p < .001$). Higher MA motivation (β= -.563, $p < .001$), self-efficacy for MA (β= -.314, $p < .05$), and social support (β= -.143, $p < .001$) were statistically significant higher MA (the lower ARMS score indicates higher MA). However, the medication knowledge was not a significant factor influencing MA.

Conclusion: Higher medication motivation, self-efficacy, and social support appear to be the critical factors contributing to MA. The study findings suggest that IMB model should be guided for designing interventions to promote the MA. Intervention strategies based on the IMB model are required to improve MA for Korean patients taking medications. *This work was partly supported by the National Research Foundation of Korea grant funded by the Korea government (MSIT). (No. 2021R1A2C2007858).

PE 05-16 5. Diabetes and Obesity

Identification of cellular targets in diabetic kidney disease by single-cell transcriptome profiling

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Background: Diabetic kidney disease (DKD) is the leading cause of end-stage kidney disease. Kidney is a highly complex organ; thus, the pathogenesis involves the complexity inherent within renal tissues. Advanced single-cell RNA sequencing is expected to offer insights into the cell-specific transcriptional responses in the kidney to DKD and elucidate potential mechanisms of action for two widely used drugs.

Methods: To investigate cellular changes in response to drug treatment in DKD, renoprotective agents, SGLT2 inhibitor (SGLT2i) and Mineralocorticoid Receptor Antagonist (Finerenone), were administered to db/db mice for 14 weeks. Subsequently, a comprehensive analysis encompassed the examination of blood glucose levels, renal function indicators, histopathological alterations. In the isolated kidney tissues, we analyzed single cell RNA sequencing and performed the differential expression gene (DEG) changes between normal, DKD and drug-treated groups.

Results: Single-cell transcriptional profiling analysis identified a total of 12 cell types in kidney tissues. Investigation into alterations in gene expression and essential functions, such as immune response, regulation of energy metabolism, and activation of mitochondria, revealed distinct expression patterns during the mitigation of impaired renal function by SGLT2i and/or Finerenone. Notably, Proximal Tubule (PT) cells, which predominantly engage in metabolic activities, exhibited restored fatty acid metabolism-related functions and regulated cell proliferation upon delayed progression of renal impairment. The validation of biomarkers in an animal model of DKD entailed a thorough analysis of Bulk-RNA sequencing using HK-2 cells.

Conclusion: Overall, our study presents a comprehensive single-cell transcriptomic landscape of DKD. This groundwork can be leveraged for the eventual development of therapeutic intervention, identifying the candidate genes involved in pathophysiologic changes in DKD.

PE 05-17 5. Diabetes and Obesity

Effect on glycemic control of KDPS-hLSM in overweight patients with Type 2 Diabetes

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Background: In Korea, the prevalence of type 2 diabetes mellitus(T2DM) has been rising due to an increase in obesity rates and changes in lifestyle. Overweight and obesity are significant risk factors for the development and progression of T2DM. While lifestyle modification (LSM) is a fundamental treatment approach for diabetes, but there has been a lack of structured LSM program in Korea. Therefore, we aimed to apply KDPS-hLSM(Korea Diabetes Prevention Study-Hospital-based Lifestyle Modification) program to the patients with diabetes and assess its effectiveness. Specifically, we aimed to evaluate the impact of KDPS-hLSM on glycemic control and weight management in overweight/obese Korean patients with T2DM.

Methods: Adults aged 30-75 years with T2DM(HbA1c between 7% and 9%) and a BMI ≥ 23kg/m^2 were enrolled. We implemented the initial 6-month intensive phase of the KDPS-hLSM program, which included four intensive nutrition interventions by a clinical dietitian and seven on-site sessions, along with eight phone calls by a health coordinator to promote 10 healthy habits. Changes in metabolic parameters were compared before and after the 6-month intervention. This research was conducted with financial support from the Korean Society for the Study of Obesity(KSSO).

Results: From July 2021 to November 2022, a total of 20 subjects were screened, with one failing to meet the inclusion criteria. A total of 19 subjects were enrolled (mean age: 57.3 ± 8.3 years; 73.7% women ; 68.4% family history of type 2 DM; mean BMI 27.8 ± 2.4 kg/m^2; and 78.9% with hypertension). Among them, 15 completed the KDPS-hLSM. Subjects showed significant improvements in body parameters and glycemic index. Body weight decreased by 1.4kg (P <0.00), waist circumference fell by 1.2cm (P <0.00), and body fat mass decreased by 1.3kg (P <0.00). HbA1c showed a significant decrease of 0.6%, and CGM metrics indicated a trend of improvement in blood glucose levels.

Conclusion: The KDPS-hLSM program helped improve physical and glycemic-related parameters in overweight/obese patients with Type 2 Diabetes. The results of this study are expected to the development of a standardized lifestyle modification program. Larger and long-term studies are needed to secure additional scientific evidence.

PE 05-18 5. Diabetes and Obesity

Perceptions of healthy lifestyle in Korean adults with early-onset T2D

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Background: In diabetes care, maintaining a healthy lifestyle, including proper diet and exercise, is essential for effective self-care. With the rising incidence of early-onset type 2 diabetes (T2D), there is an increasing need to develop age-specific lifestyle coaching. This study aims to explore the perceptions and current lifestyle regimen practices in Korean adults diagnosed with T2D before the age of 40.

Methods: A qualitative descriptive research method was used. A total of 35 participants (men: n=19, 54.3%) were recruited between June 2023 and February 2024. Each interview, conducted either face-to-face or via video call, lasted 40 to 120 minutes and utilized semi-structured questions. The interview data were analyzed using inductive content analysis methods.

Results: Despite recognizing the importance of diet and exercise, Korean adults with early-onset T2D have shown a low level of adherence to a healthy lifestyle regimen due to an improper understanding of T2D. Many participants reported focusing on calories, a limited menu (e.g., one-food diet), and having irregular eating patterns with unhealthy snacking to control their weight. Regarding exercise, aerobic activities were frequently reported, accompanied by complaints of boredom, muscle weakness, and inadequate motivation. Peer support appears crucial for making behavioral changes while family support exhibited a dual nature, providing both encouragement and restriction. In particular, the perception of family support varied by gender, which impacted adherence to lifestyle regimens.

Conclusion: Developing problem-solving skills in context to overcome various restrictions is essential for encouraging Korean adults with early-onset T2D to adhere to lifestyle regimens. Additionally, self-efficacy and motivation are key to progressing through the stages of change from contemplation to preparation, action, and maintenance. Since peer norms and support are important factors in modifying lifestyle behaviors in this age group, creating a community including eCommunity that shares similar interests may be the first step towards building a healthier community. Digital apps that provide monitoring, feedback (as potential solutions for confronting problems), and motivation may be useful tools for improving adherence to lifestyle regimens. Further research is warranted to determine which behavioral strategies should be incorporated into an age-specific lifestyle coaching and/or the digital apps.

PE 05-19 5. Diabetes and Obesity

Role of PLCβ4 in regulating metabolic functions of AgRP neurons under different diet conditions

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Background: Energy homeostasis involves complex communication between the central nervous system (CNS) and peripheral organs. The agouti-related protein (AgRP)-expressing neurons in the arcuate nucleus of the hypothalamus are key metabolic signals in the CNS. Although phospholipase Cβ4 (PLCβ4) is an intracellular signaling molecule downstream of Gq protein alpha subunit, its exact roles in AgRP neurons remain unclear. This study aims to elucidate the impact of PLCβ4 on the metabolic functions of AgRP neurons.

Methods: Using Cre-lox system, PLCβ4 was ablated in the AgRP neurons in male mice ($AgRP^{PLCβ4\text{-}KO}$). Starting at 5 weeks of age, mice were switched to a high-fat diet (HFD) for 15-17 weeks or remained on a chow diet. Food intake, body weight, and body composition were monitored. Metabolic parameters, including oxygen consumption, carbon dioxide production, substrate utilization, and energy expenditure were assessed. Glucose tolerance test (GTT) and insulin tolerance tests (ITT) were performed. Organ weights were measured post-experiment.

Results: Weekly body weight, food intake and food intake after overnight fasting were unchanged across both diet groups. In the HFD-fed $AgRP^{PLCβ4\text{-}KO}$ mice, overall energy expenditure was unchanged, but the respiratory exchange ratio remained elevated. HFD-fed $AgRP^{PLCβ4\text{-}KO}$ mice showed a significant increase in fat content, particularly in the liver, with increased lipid droplet number and size. The chow group exhibited no genetic differences in metabolic parameters. HFD-fed $AgRP^{PLCβ4\text{-}KO}$ mice had attenuated insulin sensitivity but normal glucose tolerance. We also noted compromised diurnal feeding and locomotion patterns in the HFD-fed $AgRP^{PLCβ4\text{-}KO}$ mice. Patch clamp recordings revealed a suppression in AgRP neuronal activity in HFD-fed $AgRP^{PLCβ4\text{-}KO}$ mice.

Conclusion: Deletion of PLCβ4 in AgRP neurons disrupts lipid and glucose homeostasis under HFD conditions, leading to maladaptive energy fuel adjustments, hepatic lipid accumulation and reduced insulin response. The animals also showed compromised diurnal feeding and locomotion patterns. However, chow-fed knockouts exhibited no significant metabolic differences. Therefore, we suggest that PLCβ4 in AgRP is neccessary for normal metabolic adaptation to HFD conditions, but is dispensable in normal diet conditions.

PE 05-20 5. Diabetes and Obesity

Associations between combined unhealthy lifestyles and risk of new-onset type 2 diabetes in individuals with obesity

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Background: While obesity, characterized by excessive adipose tissue accumulation, significantly increases the risk of developing type 2 diabetes (T2D), this risk is further influenced by additional unhealthy lifestyle. This study aims to investigate the combined impact of multiple unhealthy lifestyle factors—smoking, alcohol consumption, and physical inactivity—on the incidence of T2D in obese individuals.

Methods: Using the Korean National Health Insurance Service-National Sample Cohort database, we analyzed 152,718 individuals with obesity aged ≥20 years who underwent health check-ups between 2009 and 2015. We developed an unhealthy lifestyle score based on the information of each lifestyle factor such as ever-smoking, heavy drinking, and physical inactivity. The associations between lifestyle factors and incident ischemic stroke were examined using multivariable Cox proportional hazards regression models.

Results: Of 152,718 participants (mean age, 46.9 years; 59.2% men), 16,094 (10.5%) developed T2D during 7.3 years of mean follow-up. Obese individuals with smoking history or physical inactivity had increased T2D risk (hazard ratio [HR]: 1.33, 95% confidence interval [CI]: 1.27–1.39 and HR: 1.06, 95% CI: 1.03–1.10, respectively) compared to never smokers or physically active individuals. The T2D risk rose with higher unhealthy lifestyle scores (P for trend <0.001); scores of 2 (HR: 1.30, 95% CI: 1.23–1.37) and 3 (HR: 1.29, 95% CI: 1.18–1.41) had higher risks compared to the score of 0. This association was more pronounced among men and individuals with no impaired fasting glucose.

Conclusion: Smoking and physical inactivity are important risk factors for T2D in individuals with obesity. Two or more unhealthy lifestyles is associated with substantial risk elevation in T2D. Interventions targeting multiple unhealthy lifestyles concurrently may be crucial for preventing T2D in this population.

PE 05-21 5. Diabetes and Obesity

The Relationship Between HbA1c Levels and the Incidence of Diabetic Foot Ulcers in Patients with Type 2 Diabetes Mellitus at RSUD dr. Soedono Madiun

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Background: Diabetes is a chronic disease that has seen a rise in prevalence and is among the top ten leading causes of death globally. Patients with type 2 diabetes mellitus (T2DM) and uncontrolled glucose levels are at increased risk for both microvascular and macrovascular complications. A common complication among T2DM patients is diabetic foot ulcers. The long-term glycemic control indicator for T2DM patients is HbA1c

Methods: *This study employed a case-control design. The research was conducted in the medical records unit of RSUD dr. Soedono Madiun from February to April 2024. The study population included T2DM patients hospitalized at RSUD dr. Soedono Madiun from January 1, 2022, to December 31, 2023. The research sample comprised 56 T2DM patients, with 28 patients having diabetic foot ulcers (case group) and 28 patients without diabetic foot ulcers (control group). Bivariate analysis in this study utilized the Chi-square test and independent sample T-test.*

Results: Among the 28 subjects in the case group, 4 individuals (14.3%) had controlled HbA1c levels, while 24 subjects (85.7%) had uncontrolled HbA1c levels. In the control group, 11 subjects (39.3%) had controlled HbA1c levels, and 17 subjects (60.7%) had uncontrolled HbA1c levels. The Chi-square test analysis indicated a significant association between HbA1c levels and the incidence of diabetic foot ulcers in T2DM patients, with a p-value of 0.035 ($p<0.05$). The independent sample T-test also demonstrated a significant difference in mean HbA1c levels between patients with and without ulcers, with a p-value of 0.001 ($p<0.05$). The mean HbA1c level in the case group was 10.214%, compared to 7.943% in the control group. The odds ratio in this study was 3.88, which means uncontrolled HbA1c has 3.88 times greater risk of diabetic ulcers.

Conclusion: There is a significant association between HbA1c levels and the incidence of diabetic foot ulcers in T2DM patients.

PE 05-22 5. Diabetes and Obesity

Role of cyclooxygenase 2 (COX2) gene in type 2 diabetes mellitus

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Objective: The aim of this investigation was to understand the relationship between COX2 gene expression and variants (-765G>C and -1195A>G) in T2DM cases versus controls, as well as expression analysis on a gender basis.

Methods: After institutional ethical approval and individual written consent, 5 mL blood samples were collected from 472 subjects (221 controls and 251 T2DM cases). All subjects' lipid profiles and anthropometric data were checked, and genotypes were analysed using polymerase chain reaction-restriction length polymorphism. The expression analysis was carried out using real-time polymerase chain reaction with relative quantification and (GAPDH-Internal control), followed by western blot analysis. SPSS (V21), Prism (V), and Roch software's were used for statistical analysis.

Results: Individuals with the COX2 -765G/C 'CC' genotype were 2.43 times more likely to develop T2DM (P=0.017). This is supported by the fact that "C*" has been identified as a significant risk allele for T2DM (P=0.022). Individuals with the COX2-1195A>G 'GG' genotype were significantly less likely to develop T2DM. Furthermore, the impacts of COX2 variants on clinical and biochemical parameters support the importance of genetic factors in T2DM susceptibility. Additionally, the haplotype analysis of both variants demonstrated that 'GG*' conferred notable protection against T2DM (P=0.004). Type 2 diabetes was found to have slightly higher COX2 expression. However, when analyzing expression on a gender basis, a significant difference was observed in T2DM male cases (P=0.03) compared to controls, while no such association was found in T2DM females. T2DM patients with the 'GC+CC' COX2 -765G/C genotype had significantly higher COX2 expression than controls (P<0.05).

Conclusion: We draw the conclusion that GG* haplotype individuals have a low risk of developing diabetes. Understanding of the genetic and molecular elements of T2DM is improved by the study of COX2 gene variants and expression studies as potential future paths for customized diabetic management strategies.

PE 05-23 5. Diabetes and Obesity

Food Supplement for Obesity and Diabetes Mellitus: A herbal (*Orthosiphon stamineus*) Consumption

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Background: The use of herbs as a food supplement is in increasing demand due to evidence of efficacy in treating a variety of disorders. Orthosiphon *stamineus*, commonly known as Java tea or cat's whiskers, offers a promising herbal approach for managing obesity and diabetes mellitus. One of the most common ways to consume Orthosiphon *stamineus* is by brewing it as tea and the extracts is also available in capsule or tablet form. Obesity and diabetes mellitus, particularly type 2 diabetes, are closely linked, with obesity often leading to the development of diabetes. The objective of this study is to explore the effect of food supplement consumption of orthosiphon *stamineus* on obesity and diabetes mellitus.

Methods: *The scoping review methodology was conducted in this study. Comprehensive searches based on the concepts of health research were conducted in Web of Science (WoS), PubMed, Scopus, and Google Scholar. All full-text, peer-reviewed publications from 2010 to 2024 were gathered using these databases.*

Results: Google Scholar produced a total of 3780 results and the PubMed produced a total of 17 relevant articles. The results from the Scopus and Web of Science (WoS) searches were 33 and 17, respectively. After screening, only 10 articles are relevant for this study. Studies show, obesity, especially excess abdominal fat, is a major risk factor for insulin resistance, leading to type 2 diabetes. *Orthosiphon stamineus* may aid in weight loss by boosting metabolism, promoting fat breakdown, reduce inflammation, high in antioxidants and helping lower blood sugar levels which is often associated with obesity and valuable natural treatment for diabetes mellitus.

Conclusion: *Orthosiphon stamineus* shows promise as a natural aid in managing obesity and diabetes mellitus. Its benefits in regulating blood sugar, enhancing metabolism, and providing antioxidant and anti-inflammatory properties make it a valuable addition to a health regimen.

PE 05-24 5. Diabetes and Obesity

Thigh Muscle Quality and Its Contribution to the Incidence of Type 2 Diabetes Mellitus

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Objective: The role of low-density muscle (LDM) area in predicting diabetes is not well understood. The aim of this study was to investigate the association between LDM area at the midthigh level and the risk of incident diabetes.

Methods: In this prospective study, a total of 2,137 East Asian individuals (age 57.4 ± 16.9 years and body mass index 25.0 ± 3.9 kg/m^2, male 48.3%) with one or more cardiometabolic risk factors but not diabetes was enrolled. A noncontrast cross-sectional scan of the midthigh was obtained, and area ranges 0–30 Hounsfield was defined as LDM. The association between LDM area and incident diabetes was evaluated, and the optimal threshold of LDM to identify incidence of diabetes was determined. The prognostic ability of adding LDM area to traditional metabolic risk factors was also assessed.

Results: During a mean follow-up of 7.4 years, 201 males (19.5%) and 156 females (14.1%) developed diabetes. Participants who progressed to diabetes had higher baseline values for HbA1c (6.1 ± 0.3 vs. 5.7 ± 0.4%) and larger LDM areas (48.8 ± 14.2 vs 38.1 ± 13.2 cm^2). The threshold for defining a large LDM area was 44.7 cm^2 for males and 38.3 cm^2 for females. A large LDM area was identified as a significant predicting factor for incident diabetes (HR 2.54, 95% CI 1.86–3.46 for males; HR 3.11, 95% CI 2.22–4.37 for females). Adding LDM area to traditional risk factors improved the predictive ability for diabetes progression, with area under the receive operating characteristic curve values of 0.838 for males and 0.908 for females.

Conclusion: This is the first study suggesting that a large LDM area is a significant predictor of incident diabetes. Interventions targeting LDM reduction, such as physical exercise programs, should be highlighted to prevent diabetes progression and improve cardiometabolic health outcomes.

PE 05-25 5. Diabetes and Obesity

Primary Cilia in the Hypothalamic AgRP Neurons Mediate Metabolic Effects of Butyrate

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Background: The microbiota-derived short-chain fatty acid (SCFA) butyrate is known to act beyond the gut to influence host metabolism, including its central nervous system regulation of appetite and energy homeostasis. However, mechanistic insights into central butyrate metabolic actions are undetermined.

Hypothalamic primary cilia have recently been demonstrated to play a critical role in the regulation of whole body energy homeostasis. In the current study, we examined whether the SCFA butyrate directly modulates hypothalamic primary cilia function to promote its metabolic actions.

Methods: To determine whether central butyrate administration is sufficient to promote systemic metabolic effects, butyrate was delivered directly into the third ventricle via intracerebroventricular cannula. To investigated whether hypothalamic primary cilia is required for butyrate's metabolic actions, we stereotaxically injected Cre recombinant virus into the hypothalamus of Ift88F/F mice or employed primary cilia-specific neuronal knockout mouse models targeting three different neurons, then examined in response to butyrate treatment.

Results: Here, we showed that butyrate directly modulates primary cilia of the agouti-related peptide (AgRP) neurons in the hypothalamus arcuate nuclei to promote its anorexigenic and metabolic effects on glucose homeostasis. Butyrate treatments, either via peripheral or central administration, markedly increased histone acetylation and ciliogenesis in the hypothalamus, suppressing food intake to benefit whole-body metabolism. Disruption of primary cilia in the entire hypothalamus or specifically in the AgRP neurons, but not in the pro-opiomelanocortin (POMC) or ventromedial hypothalamus (VMH) neurons, abolished butyrate metabolic effects

Conclusion: These findings reveal that the SCFA butyrate directly targets primary cilia in the hypothalamic neurons, particularly those of the AgRP neuronal population, to exert its anorexigenic action and glucose homeostasis.

PE 05-26 5. Diabetes and Obesity

Effect of Sodium-glucose cotransporter 2 inhibitors on cardiovascular risk in overweight and obese participants: A meta-analysis of randomized controlled trials

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Objective: Sodium-Glucose Cotransporter 2 (SGLT2) inhibitors are primarily used to treatment of type 2 diabetes; however, they have also been reported to promote weight loss. We performed a meta-analysis to consolidate evidence from randomized clinical trials that to assessed the effects of SGLT2 inhibitors on cardiovascular risk in overweight and obese participants.

Methods: We searched MEDLINE, EMBASE, Web of Sscience, and the Cochrane Library for data from randomized controlled trials involving SGLT2 inhibitors that reported cardiovascular outcomes in overweight and obese individuals. Random effects models and inverse variance weighting were used to calculate relative risks (RR) with 95% confidence intervals (CI).

Results: We extracted and analyzed the data from seven studies, including 17,810 participants treated with SGLT2 inhibitors and 14,876 participants treated with a placebo. The risk of cardiovascular events, including cardiovascular death, myocardial infarction, ischemic stroke, and hospitalization for heart failure, significantly decreased in participants treated with SGLT2 inhibitors (RR = 0.722; 95% CI, 0.639–0.821).

Conclusion: Significant improvements in cardiovascular outcomes are be expected when SGLT2 inhibitors are used to treatments for diabetes, chronic kidney disease, or heart failure in overweight and obese individuals

PE 05-27 5. Diabetes and Obesity

Empagliflozin, an SGLT2 inhibitor, prevented palmitate-induced lipotoxicity through enhanced fatty acid oxidation and reduced stress signals

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Aim/Hypothesis: Sodium-glucose cotransporter 2 (SGLT2) plays a crucial role in glucose absorption. Empagliflozin, an SGLT2 inhibitor, targets renal pathophysiological defects in type 2 diabetes. While significantly lowering blood glucose, SGLT2 inhibitors have also emerged as potential cardioprotective agents, especially beneficial in early heart disease stages. However, their direct effects on cardiomyocytes remain unexplored. This study investigated the molecular mechanisms of empagliflozin (EMPA) in mitigating palmitate (PA)-induced cardiomyopathy in H9c2 cells.

Methods: H9C2 cells were treated with palmitate, with and without the SGLT2 inhibitor. Subsequently, insulin resistance, 2-NBDG uptake, and immunoblotting with insulin signaling pathway antibodies were measured. Beta-oxidation and cardiac metabolism were analyzed using q-RT-PCR and oxygen consumption rate (OCR). Additionally, cardiomyocyte apoptosis was assessed through DNA fragmentation assays and immunoblotting for cleaved caspase 3.

Results: EMPA significantly reduced PA-induced impairment in insulin sensitivity, glucose uptake, cellular apoptosis, inflammation, and ER stress. EMPA also increased AMP levels, activated the AMPK pathway, and elevated carnitine palmitoyl transferase 1 (CPT1) gene expression. These effects collectively enhanced fatty acid oxidation and decreased stress signals.

Conclusion: This study reveals a new mechanism of EMPA's protective effects against PA-induced cardiomyocyte injury, offering fresh therapeutic insights into its role as a cardioprotective agent.

PE 05-28 5. Diabetes and Obesity

LMK-235, an HDAC inhibitor, prevented diabetic skeletal muscle atrophy

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Aim/Hypothesis: Histone deacetylase (HDAC) has been identified as a significant pathogenic factor in the development of muscle atrophy. Recent studies indicate that some HDAC inhibitors can effectively mitigate muscle atrophy, insulin resistance, and diabetes. However, the effects of LMK-235 on diabetic skeletal muscle atrophy have not been sufficiently explored. This research investigates the preventative properties of LMK-235 and its underlying molecular mechanisms in diabetic muscle atrophy, using db/db mice as the experimental model

Methods: To assess the impact of LMK-235 on diabetic muscle atrophy, db/db mice were randomly divided into three groups: a control group, a db/db group, and a db/db plus LMK-235 group. The mice received LMK-235 (10 mg/kg/i.p) for 4 weeks. The body weight of the mice was monitored. After euthanasia, muscle tissue was excised, dissected, and weighed. Hematoxylin and eosin stain was used for each section of muscle tissue. The cross-sectional area of these stained sections was analyzed using ImageJ software. To explore the molecular mechanisms of LMK-235, several muscle atrophy-related factors were examined using RT-PCR.

Results: LMK-235 administration in db/db mice effectively mitigated muscle weight loss and insulin resistance. MRI examination of hindlimb muscle mass and fat accumulation revealed that LMK-235 not only reduced fat accumulation but also ameliorated muscle loss. The Tibialis anterior muscle and gastrocnemius muscle showed significant atrophy in db/db mice. LMK-235 treatment prevented weight loss in these muscles and significantly restored muscle fiber size. Notably, LMK-235 significantly reduced the expression of atrophy-related genes such as MURF1 and Atrogin-1 in the Tibialis anterior muscle.

Conclusion: This study examined the impact of LMK-235 on diabetic muscle atrophy in db/db mice. LMK-235 demonstrated a mitigating effect on muscle atrophy by reducing the expression of atrophy-related genes. These findings suggest that LMK-235 could provide a basis for developing therapeutic drugs targeting muscular or metabolic diseases associated with atrophy.

PE 05-29 5. Diabetes and Obesity

The Relationship Between Intellectual Developmental Disability and Depression in Type 2 Diabetes Patients : A Focus on Obesity.

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Background: Obesity is known to be an important risk factor for complications in type 2 diabetics. And, Intellectual Developmental Disabilities (IDD) is also known to increase the risk of depression. This study aims to investigate whether obesity significantly interacts with the risk of depression in type 2 diabetic patients with IDD.

Methods: Data were analyzed from the Korea's National Health Insurance Service dataset. A total of 1,819,869 type 2 diabetics aged 20 years and older who underwent health examinations in 2015-2016 were followed up until December 31, 2022 (median follow-up period of 5.81 years) for the outcome. IDD was defined as cases classified with the disability type code for intellectual disability, and obesity was defined as a body mass index of 25 or higher. The relationship between IDD, obesity, and the outcome was analyzed using Cox regression models, yielding hazard ratios (HR) and 95% confidence intervals (CIs).

Results: Analysis of the basic characteristics was done. The average age of the group with IDD was 52.0 years, and the average age of the group without IDD was 54.8 years, which was younger on average. Compared to individuals without IDD, patients with IDD were more likely to be Female, Low income, but less likely to be Current smoker, Drinker, Regular exercise, Hypertension, Dyslipidemia. The risk of depression was compared according to the presence of IDD and obesity. For non-obese individuals, the HR for depression in those with IDD compared to those without was 1.81 (95% CI: 1.63-2.01). In obese individuals, the HR for depression in those with IDD compared to those without was 1.66 (95% CI: 1.50-1.84).

Conclusion: In type 2 diabetics, the risk of depression increased with the presence of IDD, but there was no significant difference in the risk of depression when considering obesity status. Therefore, for type 2 diabetics with IDD, management and support for developmental disabilities may be crucial.

PE 05-30 5. Diabetes and Obesity

Management of obesity in patients with Type 2 diabetes

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Background: Diabetes and its related factors, such as diabetes medications and alterations in glucose metabolism, contribute to an increased risk of obesity. Commonly recommended glucose-lowering medications may lead to weight gain. Owing to the awareness of these complications and the significant relationship between obesity and diabetes, there is a need for a shift in the advance of managing obesity in patients with T2DM to improve clinical outcomes.

Methods: 185 patients who were overweight and obese and were followed up in a diabetes clinic in a county referral hospital were sampled. The patient's treatment was evaluated and randomly assigned to an intervention or control group and followed up for one year.

Results: Baseline results- At the beginning 134 of the participants were overweight and 31 were obese. The majority of patients with overweight and obese were on Insulin and sulphonylurea drugs compared to their counterparts who were on glucagon-like peptide-1 agonists, sodium-glucose cotransporter-2 inhibitors, Dipeptidyl-peptidase 4 inhibitors, and metformin. The patient's condition was individually evaluated and treatment was adjusted to regimens that would promote weight loss and improve cardiac health. Other non-pharmacological interventions such as physical activity and dietary practice were also included and the participants were followed closely. At mid-intervention, 48% of the patients had lost weight and had achieved optimal glycemic control compared to before intervention. At the end of the intervention, 86% of the participants had achieved significant weight loss and achieved optimal diabetes control.

Conclusion: Common glucose-lowering treatments, according to current diabetes guidelines, impact on weight. Medications such as metformin, glucagon-like peptide-1 agonists, sodium-glucose cotransporter 2 inhibitors, and Dipeptidyl-peptidase 4 inhibitors, help in weight loss and improve overall cardiovascular health. Obesity should also be considered when choosing medical therapy for T2DM.

PE 05-31 5. Diabetes and Obesity

High Glucose Aggravates the Detrimental Effects of Pancreatic Stellate Cells on Beta-Cell Function

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Background: Type 2 diabetes mellitus (T2DM) is a clinical syndrome characterized by elevated blood glucose caused by a combination of insulin resistance and progressive failure of insulin secretion by the β-cells in pancreatic islets of Langerhans. The cellular mechanisms underlying -cell failure in T2DM are not well understood, but several recent studies suggest that pancreatic stellate cells (PSCs) might play an important role in this process. We here assess the effects of PSCs on β-cell function and apoptosis in vivo and in vitro.

Methods: PSCs were transplanted into Wistar and Goto-Kakizaki (GK) rats. Sixteen weeks after transplantation, β-cell function, apoptosis, and islet fibrosis were assessed. In vitro the effects of PSCs conditioned medium (PSCs-CM) and/or high concentration of glucose on INS-1 cell function was assessed by measuring insulin secretion, INS-1 cell survival, apoptosis, and endoplasmic reticulum stress (ER stress) associated CHOP expression.

Results: PSCs transplantation exacerbated the impaired β-cell function in GK rats, but had no significant effects in Wistar rats. *In vitro*, PSCs-CM caused impaired INS-1 cell viability and insulin secretion and increased apoptosis, which were more pronounced in the presence of high glucose.

Conclusion: Our study demonstrates that PSCs induce β-cell failure in vitro and in vivo. In this model, PSCs
do not initiate the onset of T2DM but act to amplify the consequences of the hyperglycemic, inflammatory environment, enhancing the development of *β*-cell fibrosis and their ultimate functional failure.

PE 05-32 5. Diabetes and Obesity

Effect of proprioceptive neuromuscular facilitation on blood Glucose level and quality of life among Type 2 Diabetes Mellitus

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Background: Diabetes mellitus (DM) is a challenging problem for health care providers worldwide. Physical activity is the cornerstone for managing type 2 diabetes mellitus (T2DM). Exercise has a role in metabolic health and has a has a positive impact on insulin responsiveness. Proprioceptive Neuromuscular Facilitation (PNF) is a concept of treatment for motor learning and motor control, and it works by stimulating muscles and joint proprioceptors.

Methods: Four hundred five patients were randomly allocated into three groups as per inclusion and exclusion criteria. All recruited patients were assessed for their blood glucose level and quality of life scale. Patients in Control (Group-A) and Experimental groups (Group B & C) underwent for 12 weeks of protocol having brisk walking (30 minutes per day, 150minutes per week and 5days per week) with diet chart as per the recommendations of National Institute of Nutrition. Patients in experimental group B were given PNF strengthening using elastic resistance band in diagonal patterns (D1Flexion, D2Flexion, D1 extension and D2 extension) for upper limbs and lower limbs. 10 repetitions each was given for three times per week, resistance of elastic resistance band was selected based on 10 repetition maximum (RM) and 10 RM was rechecked after 4 weeks. Patients in experimental group C were given PNF stretching using Hold-Relax method in diagonal patterns (D1Flexion, D2Flexion, D1 extension and D2 extension) for upper limbs and lower limbs. 10 repetitions each was given for three times per week.

Results: Blood glucose levels improved significantly in all groups over the course of 12 weeks. Between group analysis revealed significant improvement in PNF Strengthening Group (Group B) compared to Control (Group A) and PNF Stretching Group (Group C) ($p< 0.05$). Role limitation due to physical health, physical endurance, general health, and emotional and mental health improved in all groups significantly over the period of 12 weeks. Between group analysis revealed significant improvement in PNF strengthening ($p< 0.05$). Treatment satisfaction, symptom botherlessness, financial worries, and diet satisfaction were not improved in all groups over the period of 12 weeks. Between group analysis revealed non-significant improvement in all three groups ($p> 0.05$).

Conclusion: Both proprioceptive neuromuscular facilitation strengthening and stretching were found to be effective, whereas PNF strengthening had been more effective than PNF stretching in controlling blood glucose levels and improving quality of life among people with type 2 diabetes mellitus.

PE 05-33 5. Diabetes and Obesity

Correlations between obesity and overweight in middle-aged workers and the risk of cardiovascular disease based on metabolic risk variables.

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Background: Cardiovascular disease (CVD) and obesity are not well understood, especially in the case of people with known risk factors for the condition. Data from the study were examined in subsequent analyses. Particularly among people with hypertension, hyper-low-density lipoprotein (LDL)-cholesterolemia, or diabetes, we investigated the relationship between the degree of obesity and risk of CVD and its subtypes.

Methods: The current analysis made use of pooled data from 4486 adults (3638 men and 948 women) that were recruited between 2012 and 2018. To estimate the hazard ratios (HRs) and 95% confidence intervals (CIs) for the relationships between the risk of CVD and its subtypes, such as stroke and coronary heart disease (CHD), and the degree of obesity measured using body mass index (BMI), we utilized the multivariable Cox proportional hazard model.

Results: There were 98 CVDs over a median of 6 years (40 CHDs and 59 strokes). The risks of CVD, CHD, and total stroke were positively and substantially linked with a BMI of > 27.5 as opposed to 21.0–22.9 kg/m^2. 15.9%, 5.8%, and 8.7% of the correlations between obesity and CVD were mediated by hypertension, 5.8% by hyper-LDL cholesterol, and 28.3% by their combined effects. BMI > 25.0 (overweight/obesity) compared to BMI < 25 kg/m^2 was linked to an increased risk of CVD in people with and without hypertension, but only in those who had hyper-LDL cholesterol and no diabetes, according to the stratified analyses based on the presence of risk factors.

Conclusion: Overweight/obesity was associated with the risk of CVD and its subtypes. About 30% of the risk was explained by hypertension, hyper-LDL-cholesterolemia, and diabetes, of which hypertension accounted for approximately the half of the explained risk. However, overweight/obesity increased the risk of CVD even in those without hypertension. These findings highlight the importance of controlling and preventing overweight/ obesity regardless of chronic disease status.

PE 05-34 5. Diabetes and Obesity

How far we should care about education, wealth, and macroeconomic variables to prevent diabetes prevalence among pregnant women?

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Background: Gestational diabetes mellitus (GDM) is considered a globally common pregnancy complication with complex disease mechanisms, which leads to an increased risk of developing type 2 diabetes in both mother and child. In contrast, several risk factors may contribute to its onset. This study aimed to summarize, analyze, and evaluate various risk factors associated with GDM among low-income countries.

Methods: Gestational diabetes mellitus (GDM) is considered a globally common pregnancy complication with complex disease mechanisms, which leads to an increased risk of developing type 2 diabetes in both mother and child. In contrast, several risk factors may contribute to its onset. This study aimed to summarize, analyze, and evaluate various risk factors associated with GDM among low-income countries.

Results: Data were analyzed by robust random effect estimation with STATA MP.14. Yhe prevalence of GDM is estimated at an overall 16%, in the first pregnancy is 3.4%, and in the second pregnancy is 4.6%. The highest prevalence of GDM is in Malaysia (19%), followed by Indonesia (10.6%), Thailand (9.7%), Philippines (7.1%), and Vietnam (6.1%). The prevalence of GDM among pregnant women increased with increase in adult female illiterate rate, labor force participation and female share of employment. Meanwhile, increasing in health expenditure, GDP per capita, and HDI will decrease the prevalence of GDM among pregnant women.

Conclusion: The high prevalence of GDM among pregnant women indicates diabetes to be a major public health problem in ASEAN countries. The government needs to pay attention to socioeconomic factors to reduce cases of diabetes in pregnant women by increasing health expenditure, GDP per capita, and HDI. In addition, providing supporting access for working mothers and strategies to reduce the number of illiteracies among women will give positive changes regarding pregnant women's health issues in ASEAN-5.

Keywords: Diabetes, Pregnant women, Wealth on health, Education attainment, Socioeconomic status

PE 05-35 5. Diabetes and Obesity

Association between Metabolic Syndrome and Diabetes Mellitus

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Background: Patients with diabetes mellitus experience an increase in micro and macro vascular problems as a result of lifestyle modifications that cause metabolic syndrome. The study's primary goals were to determine whether metabolic syndrome was present and assess the gender-related differences in each of the syndrome's components using criteria from the National Cholesterol Education Programme Adult Treatment Panel III (NCEP ATP III) and the International Diabetic Federation (IDF).

Methods: A cross-sectional study including 550 individuals with type II diabetes was carried out. Every study participant between the ages of 30 and 80 was enrolled. The study excluded subjects who had type I diabetes and women who were pregnant.

Results: Using the IDF and NCEP ATP III criteria, the prevalence of metabolic syndrome in the diabetic community was determined to be 42.28% and 28.85%, respectively. According to the IDF and NCEP ATP III criteria, it was noted that the prevalence was higher in females than in males and was deemed to be statistically significant ($p < 0.001$). Blood pressure was raised by central obesity, and female patients' lowered levels of high-density lipoprotein were noticeably higher. In this study population, central obesity was the most common risk factor, followed by hypertension. Based on a comparative examination of the IDF and NCEP ATP III criteria, diabetes patients with metabolic syndrome were found to have considerably higher levels of all metabolic risk components when compared to those without the condition.

Conclusion: According to the study's findings, metabolic syndrome was incredibly common in the diabetic community, particularly in female participants

PE 05-36 5. Diabetes and Obesity

An Application of machine learning algorithms to research data in order to predict uncontrolled diabetes mellitus related obesity.

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Background: Uncontrolled diabetes mellitus (UDM) is defined clinically as having a hemoglobin A1c (HbA1c) level above 7.0% or sporadic blood glucose readings higher than 180 (mg/dL). Uncontrolled diabetes mellitus presents with a wide range of symptoms, but the presence of micro- and macrovascular issues makes it easy to diagnose. Healthcare providers can use a prediction model that incorporates multiple patient characteristics to detect UDM patients early on, allowing for prompt intervention and therapy. Therefore, the goal of this research is to use different ML algorithms to investigate different patient traits and biomarkers in UDM prediction.

Methods: Patients older than eighteen years who had diabetes were included in this study. Among the data's component pieces are biospecimens, electronic health records (EHRs), digital health technologies, physical measurements, and health surveys. The data utilized in this study were processed using R version 4.0.2 (the R Project for Statistical Computing). Extreme gradient boost, random forest, logistic regression, and weighted ensemble models were the methods applied. Individuals who have a history of uncontrolled diabetes were considered cases under the International Classification of Diseases code. Basic demographic, biomarker, and hematological index data are among the features included in the model.

Results: The random forest model performed well in predicting uncontrolled diabetes compared to the weighted ensemble model (accuracy: 0.78, 95% CI: 0.77-0.79), the logistic regression (accuracy: 0.62, 95% CI: 0.61-0.63), and the extreme gradient boost (accuracy: 0.76, 95% CI: 0.77-0.77). The receiver characteristics curve's area under the random forest model has a minimum value of 0.5 and a maximum value of 0.76. Significant markers of uncontrolled diabetes included height, aspartate aminotransferase, potassium levels, body weight, and heart rate. When it came to predicting uncontrolled diabetes, the random forest model did remarkably well. Significant markers of uncontrolled diabetes included physical measurements and serum electrolytes.

Conclusion: In conclusion, this study evaluated how well machine learning algorithms predict UDM. The results demonstrated that, in comparison to other machine learning methods, random forest (RF)-based models were more effective at predicting UDM. Additionally, the study found that physical assessments, blood indices, and serum potassium concentrations were crucial indicators of UDM. By factoring in these clinical traits, machine learning approaches may be utilised to predict uncontrolled diabetes.

PE 05-37 5. Diabetes and Obesity

The Role of Galectin-3 to Predict Mild Cognitive Impairment in Type 2 Diabetes

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Background: Type 2 diabetes mellitus (T2DM) is closely linked to mild cognitive impairment (MCI), which often progresses to dementia. Early detection and intervention during the MCI stage are crucial yet challenged by the absence of specific symptoms and effective screening methods.This study aimed to investigate the role of galectin-3 (coded by LGALS3 gene), as a biomarker for MCI in T2DM patients and to develop and validate a predictive nomogram integrating galectin-3 with clinical risk factors for MCI prediction.

Methods: A total of 329 hospitalized T2DM patients were recruited and randomly allocated into a training cohort (n=231) and a validation cohort (n=98) using 7:3 ratio. Demographic data and neuropsychological assessments were recorded for all participants. Plasma levels of galectin-3 were measured using ELISA assay. We employed Spearman's correlation and multivariable linear regression to analyze the relationship between galectin-3 levels and cognitive performance. Furthermore, univariate and multivariate logistic regression analyses were conducted to identify independent risk factors for MCI in T2DM patients. Based on these analyses, a predictive nomogram incorporating galectin-3 and clinical predictors was developed. The model's performance was evaluated in terms of discrimination, calibration, and clinical utility.

Results: Galectin-3 was identified as an independent risk factor for MCI, with significant correlations to cognitive decline in T2DM patients. The developed nomogram, incorporating Gal-3, age, and education levels, demonstrated excellent predictive performance with an AUC of 0.813 in the training cohort and 0.775 in the validation cohort. The model outperformed the baseline galectin-3 model and showed a higher net benefit in clinical decision-making.

Conclusion: Our findings emphasize the utility of Gal-3 as a viable biomarker for early detection of MCI in T2DM patients. The validated nomogram offers a practical tool for clinical decision-making, facilitating early interventions to potentially delay the progression of cognitive impairment.

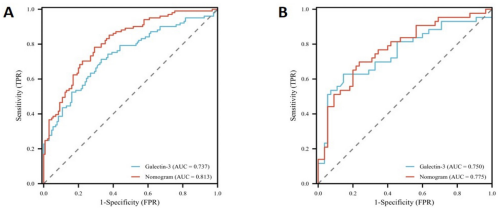

Figure 1 ROC Curves of the Galectin-3 and Nomogram Models for the Training (A) and Validation (B) Cohorts.

PE 05-38 5. Diabetes and Obesity

SGLT2 Inhibitors And Nonalcoholic Fatty Liver Disease (NAFLD): Meta-Analysis of Randomized Trials Evaluating Hepatic Steatosis And Fibrosis

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Background: Nonalcoholic fatty liver disease (NAFLD) is increasingly recognized as a prevalent hepatic disorder, affecting approximately 12.2% of individuals in the Philippines and between 10% to 30% of the U.S. population. Its development is closely associated with metabolic conditions (e.g. obesity, T2DM and hypertension). Sodium-Glucose Cotransporter 2 (SGLT2) inhibitors, a class of glucose-lowering medications, have shown cardiovascular benefits beyond glycemic control, raising interest in their potential impact on NAFLD. Thus, this meta-analysis aims to evaluate the efficacy of SGLT2 inhibitors in improving hepatic steatosis and fibrosis in NAFLD patients utilizing imaging biomarkers.

Methods: A comprehensive electronic database search was conducted to identify studies published from inception through December 2024, with no language restrictions applied. Randomized controlled trials (RCTs) that assessed the effects of SGLT2 inhibitors on NAFLD were included. Primary outcomes included the Controlled Attenuation Parameter (CAP) and Liver Stiffness Measurement (LSM). Data were extracted, and study quality was evaluated using the Newcastle-Ottawa Quality Assessment tool. Statistical analysis was conducted using RevMan 5.4, with results presented as weighted mean differences (WMD) and 95% confidence intervals (CI).

Results: A total of ten studies were included, comprising 616 patients. The analysis revealed that SGLT2 inhibitors significantly reduced CAP, with a mean difference of −11.35 dB/m (95% CI: −18.54 to −4.16, p = 0.002) and decreased LSM, with a mean difference of −0.82 kPa (95% CI: −1.35 to −0.30, p = 0.002).

Conclusion: SGLT2 inhibitors effectively reduce hepatic steatosis and may positively influence liver fibrosis in patients with NAFLD. However, further research with comprehensive methodologies and longer follow-up is needed to validate these findings and optimize clinical application.

PE 05-39 5. Diabetes and Obesity

Association between type II diabetes mellitus and Organic Cation Transporter 1 (OCT1) gene polymorphism in patients from North Indian population.

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Background: Diabetes mellitus has become a most important health problem worldwide in recent times.

Aims and objective: To investigate the possible association of organic cation transporter- 1(OCT1) gene polymorphism (A-G) in type II Diabetes mellitus.

Methods: 100 diagnosed T2DM patients were recruited for the study and the genotypes for OCT-1 gene polymorphism using polymerase chain reaction (PCR) followed by restriction fragment length polymorphism (RFLP) were done.

Results: We did not find any significant association between GG homozygous alleles ($p<0.079$) and AG heterozygous alleles ($p=0.209$) in type 2 diabetes mellitus patients compared to the control. It this case-control study, the frequency of the G allele of OCT-1 was found significant in alcoholic type 2 diabetes mellitus patients ($p=0.026$*).

Conclusion: OCT-1 gene G allelic polymorphism is associated with type 2 diabetes mellitus patients in the north Indian population.

PE 05-40 5. Diabetes and Obesity

Biological Effect Of Hernandezine In Medicine For The Treatment Of Type 2 Diabetes Through Its Molecular Mechanism On Different Cells And Tissues Of Diabetic Mice

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Background: Plants-derived bioactive compounds are useful to the human being for the preparation of food material and drugs in the modern age. Nature is the source of all the raw materials that we need. Traditional and complementary medicine is a substantial health resource for preventing and managing the health conditions of aging populations. Hernandezine isolated from Thalictrum *simplex* has inhibited protein kinase C signaling in human peripheral blood T cells and repression of lipopolysaccharide (LPS) induced tumor necrosis factor-α (TNF-α) generation in human macrophage cells.

Methods: Biological effect of hernandezine in different cells and tissues, including primary hepatocytes, skeletal myotubes cell lines, as well as tissues from diabetic (db/db) mice has been investigated through scientific data analysis of different scientific research works. Further, biological potential of hernandezine for their effectiveness on the body weight and blood glucose in type 2 diabetes mullitus (T2DM) has been investigated through scientific data analysis of different scientific research works. Other pharmacological potential of hernandezine has also been investigated in the present work through scientific data analysis in order to know its biological potential on T2DM.

Results: Scientific data analysis of the present work revealed that long-term oral hernandezine treatment potently reduced body weight and blood glucose in T2DM mouse models by increasing glucose disposal and reducing lipogenesis. However, hernandezine also activates AMPK by suppressing its dephosphorylation. Further, hernandezine effectively alleviated hyperglycemia signified its impact on risk of causing cardiac hypertrophy, and might be used as a potential therapeutic agents for the treatment of T2DM.

Conclusion: Present work scientific data signified the therapeutic effectiveness of hernandezine in medicine for the treatment of T2DM.

PE 05-41 5. Diabetes and Obesity

The Global Impact of Obesity on Health Spending: A Comparative Study of Japan and South Korea (2015-2021)

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Background: Obesity poses a burgeoning global public health challenge, carrying substantial health and economic consequences. There is a lack of research addressing the potential medical cost savings achievable through the alleviation of abnormal weight. The goal of this study is to provide estimations of the impact of obesity and overweight on healthcare expenditures.

Methods: Using data obtained from OECD.Stat, Japan and South Korea were selected to see how Obesity affects Helath spending. This study employed data from 2015-2021 and then analyzed using Regression Data analysis.

Results: From the results of data regression, it is known that variables of Obesity have a significantly positive influence on health spending. These economic costs amount to an average of 1.8% of the gross domestic product (GDP) across the two countries. Our results indicate significant economic impacts of obesity that transcend national borders and economic variations.

Conclusion: These impacts are projected to escalate if prevailing trends persist. These findings underscore the urgency for advocacy efforts to enhance awareness regarding the societal implications of obesity. Additionally, they emphasize the necessity for policy interventions to tackle the underlying systemic factors contributing to obesity.

PE 05-42 5. Diabetes and Obesity

Quality of Life Diabetes Patients in Indonesia using Indonesia Family Life Survey

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Background: Diabetes disease is one of the most common diseases in Indonesia. The 2023 International Diabetes Foundation shows that Indonesia is in the fifth position in the world with the highest number of people suffering from diabetes. This study analyzes the quality of life of patients with diabetes disease in Indonesia.

Methods: The study uses IFLS-5 (Indonesia Family Life Survey-5) data. Descriptive tabulations are used in this study. The number of respondents was 583 respondents with diabetes disease. The analysis carried out was the quality of life of diabetes patients in terms of Physical Functioning, Activities of Daily Living (ADL) and Instrumental Activities of Daily Living.

Results: The results show that from a physical functioning perspective, out of 583 respondents, 20.75% had difficulty carrying a heavy load (like a pail of water) for 20 meters, 6. 17% had difficulty sweeping the house floor yard, 217 patients or 37.22% had difficulty walk for 5 kilometers, 13.38% had difficulty drawing a pail of water from a while, 35 patients or 6 % had difficulty bowing, squats, knees and 21 people with diabetes had difficulty standing up from sitting on the floor without help. If seen from the Activities of Daily Living (ADL), 3.6% find it difficult to dress without help, 3.09% patients find it difficult to eat, 31 patients have to control urination or defecation. When viewed from the quality of life based on Instrumental Activities of Daily Living, 12.18% have difficult to prepare hot meals, and 6.17 % patients had difficulty taking medicine.

Conclusion: So it can be seen that the quality of life for diabetes sufferers in Indonesia is quite good as can be seen from the negative impact. It can be seen that what really influences quality is the physical function of diabetes sufferers, such as difficulty walking for 5 kilometers.

PE 05-43 5. Diabetes and Obesity

The Influence of Socio-Economic Factors, Mental Health, and Sleep Disorders on Diabetes Sufferers In Indonesia

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Background: Indonesian diabetes is one of the most common diseases in Indonesia. This research analyzes the influence of socio-economic factors, mental health and sleep disorders on diabetes sufferers in Indonesia.

Methods: The method used is logit model analysis with IFLS (Indonesia Family Life Survey) 5 data. The dependent variable is a binary variable in the form of 1 being a diabetes sufferer, 0 not being a sufferer. The independent variables are age, gender, educational status and income as a socio-economic indicator, stress as an indicator of mental health, and difficulty sleeping, an indicator of sleep disorders. The number of respondents was 188 respondents.

Results: The results show that age and income significantly positively influence a person's chances of developing diabetes, while gender and marital status are not significant. If seen from mental health, it is not significantly positive. And if we look at sleep disturbances, there is a significant positive chance of suffering from diabetes

Conclusion: So it can be concluded, diabetes sufferers must maintain their health from an early age, not have a lot of income because they can spend on non-nutritious food, and maintain quality sleep to reduce the risk of suffering from diabetes.

PE 05-44 5. Diabetes and Obesity

Anti-obesity effect of revesterol against Streptozotocin/High Fat induced Obese in Diabetic rats via alteration of NF-κB pathway

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Background: besity is the fast-growing disease worldwide due to consumption of high fat diet and changes the life style. Inflammatory reaction plays an important role in the expansion of obesity. Revesterol (flavonoid) already proofed their anti-inflammatory effect against chronic inflammatory model. In this protocol, we try to comfort the anti-obesity effect of revesterol against the Streptozotocin (STZ)/High Fat diet (HFD) induced Obese in Diabetic rats via alteration of NF-κB pathway.

Methods: STZ was used for induction of diabetes and rats were received the HFD throughout the protocol. The rats were received the oral administration of revesterol (5, 10 and 15 mg/kg). food intake, water intake, blood glucose level and body weight were estimated at different time intervals. At end of the protocol, the biochemical parameters were estimated.

Results: Revesterol treatment significantly ($P<0.001$) reduced the body weight, food intake and water intake as compared to STZ/HFD induced obese rats. Revesterol significantly ($P<0.001$) reduced the level of blood glucose level, non-essential fatty acid and increased the level of plasma insulin, adiponectin as compared to STZ/HFD induced obese rats. Revesterol significantly ($P<0.001$) down-regulated the level of total cholesterol (TC), low density lipoprotein (LDL), triglyceride (TG), very low-density lipoprotein (VLDL) and up-regulated the level of high density lipoprotein (HDL). Revesterol significantly ($P<0.001$) suppressed the level of MDA and boosted the level of SOD, GPx, GSH, CAT; reduced the level of hepatic parameters viz., AST, ALT and ALP; decreased the level of cytokines such as TNF-α, IL-1β, IL-6 and inflammatory parameters includes COX-2, PGE2 and NF-κB, respectively.

Conclusion: On the basis of result, we can say that revesterol is a potent phtyo-constituent to reduces the obesity via suppression of NF-κB pathway.

Keywords: Obesity, Inflammation, Antioxidant, NF-κB pathway

PE 05-45 5. Diabetes and Obesity

Genetic elements of obesity paradox in atherosclerosis identified in an intercross between two hyperlipidemic mouse strains

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Background: Obesity paradox, referring to the protective role of overweight and obesity in atherosclerosis or other diseases, has been observed in humans and mice, yet studies to address the underlying genetic basis are scarce. The discordance of sex differences in body weight and atherosclerosis makes mice an appealing model for investigating the paradoxical relationship between the two traits.

Methods: T154 female and 145 male F2 mice were generated from BALB/cJ and LP/J apolipoprotein E-deficient mice and challenged with a Western diet for 12 weeks. Atherosclerotic lesion size in aortic root, body weight, plasma lipid and glucose levels of F2 mice were measured and genotypes determined with miniMUGA SNP arrays.

Results: Quantitative trait locus (QTL) analysis of all F2 mice with sex as a covariate revealed 4 significant QTLs on chromosomes (Chr) 3, 6, 13 and 15 for atherosclerosis. Chr15 atherosclerosis QTL overlapped with a significant QTL for body weight near 35 Mb. After adjusting for variation in body weight, Chr15 atherosclerosis QTL downgraded from significant to suggestive linkage. Body weight was inversely correlated with atherosclerotic lesion sizes in male and all F2 mice. Using public data collected from two backcross populations, we demonstrated strong correlations between body weight and fat mass in mice ($r \geq 0.77$; $p \leq 7.0E-62$).

Conclusion: The colocalization of QTLs with opposing effects on body fat and atherosclerosis underlies the paradoxical relationship between the two traits.

PE 05-46 5. Diabetes and Obesity

Association between Fatty Liver and Colonic Polyp

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Background: Metabolic syndrome components such as obesity and hyperlipidemia are considered the most common etiological factors for colon polyps as well contributing to the pathogenesis of fatty liver disease. We aimed to assess the relationship between fatty liver and colon polyps.

Objectives: To determine the possible association between ultrasound fatty liver stage and colonic polyps.

Methods: This retrospective cohort observational study conducted at the Intermed Hospital in Ulaanbaatar, Mongolia, included subjects who underwent screening colonoscopy over a 3 months period. Data were extracted from the patient charts and included demographics, anthropometric measurements, vital signs, underlying diseases, medical therapy, laboratory data, and results of the abdomen ultrasound. The colonoscopy report extracted polyp were also evaluated.

Results: A total of 105 patients were enrolled in study; 52.3% of patients were males. Their mean age was 48.48 11.56 years. Fatty liver stages that are determined by abdominal ultrasonography: Mild fatty liver accounts for 25.7%, moderate fatty liver 26.7%, severe fatty liver 4.8%. Polyps are determined by colonoscopy. 42.8% of patients were evaluated polyps. Fatty liver stages were determined colon polyps. 9(20%) polyps were in mild fatty liver stage, 17 (37.7%) polyps were in moderate fatty liver stage, 2(4%)polyps were in severe fatty liver stage. Colon polyps and fatty liver abdominal ultrasonography is a statistically significant difference (OR-2.52, $P < 0.01$ 95%CI 1.36-1.98. The multivariate analysis, after adjusting for, age, BMI, glucose, HBA1c, triglycerides, HDL, LDL, total cholesterol, showed that the presence of was associated with increased risk for colon polyps ($P < 0.01$). Colon polyps were more common in overweight men ($P < 0.01$).

Conclusion: Colon polyps and fatty liver abdominal ultrasonography is a statistically significant difference. Fatty liver is specifically associated with an increased risk of colorectal adenomatous and hyperplastic polyps in men.

Key words: Fatty liver, colon polyp, metabolic dysfunction associated fatty liver disease

PE 05-47 5. Diabetes and Obesity

Phytochemical and Pharmacological Evidence for the Use of Soursop Leaves (Annona muricata L) Extract in Traditional Medicine from Diabetes in Indonesia

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Background: In Indonesia, diabetes is ranked as the third most deadly disease. Diabetes mellitus (DM) is a clinical syndrome of metabolic disorders. Diabetes mellitus (DM) is a chronic disease whose prevalence increases every year. Hyperglycemia is the cause of many complications. Soursop leaves (Annona muricata L) are believed to have many health benefits, one of which is lowering blood sugar levels. The purpose of this study was to study the phytochemical content and pharmacological evidence of the use of soursop leaf extract in the traditional treatment of diabetes.

Methods: An electronic database was utilized in this study for the purpose of review. The information gathered from the publications published in 2019 through 2023 serves as proof from Indonesia.

Results: Based on research obtained soursop leaf content that is beneficial for blood sugar are flavonoids and tannins. Flavonoids are substances that have the effect of lowering blood sugar levels. Some mechanisms include inhibiting glucose absorption in the intestine, triggering insulin release, and improving blood sugar tolerance. Tannin activates the activation of Mitogen Activated Protein Kinase (MAPK) and Phosphoinositide (PI3K) so that more glucose will be taken into cells and levels in the blood decrease. Some previous studies that conducted research related to the effects of soursop leaf extract on blood sugar levels showed the results of a single administration of soursop leaf extract in rats was shown to reduce blood glucose levels by 75% at a dose of 100 mg / kg compared to the initial value. Meanwhile, the long-term administration of Annona muricata leaf extract, which is 28 days, proved to be able to provide many benefits for diabetic rats. It was stated that the administration of 180 milligrams (mg) of Annona muricata leaf extract and 5 mg of glibenclamide caused a promising decrease in blood sugar.

Conclusion: Based on this study, it proves that the phytochemical content and pharmacology of the use of soursop leaf extract in the traditional treatment of diabetes show good results and can be used as an alternative in medicine to stabilize blood sugar in diabetic patients.

PE 05-48 5. Diabetes and Obesity

ASSOCIATED FACTORS OF TYPE 2 DIABETES MELLITUS IN INDONESIAN ADOLESCENTS

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Background: The type 2 diabetes is a common condition that causes the level of sugar (glucose) in the blood to become too high, chronic health condition that can lead to other serious health issues such as heart disease, stroke, blindness, and kidney failure. According to data from the Institute for Health Metrics and Evaluation, diabetes was Indonesia's 3rd highest cause of death in 2019, namely around 57.42 deaths per 100,000 population. Data from the International Diabetes Federation (IDF) found that the number of diabetics in 2021 in Indonesia has increased rapidly in the last ten years. This number is expected to reach 28.57 million in 2045 or 47% greater than 19.47 million in 2021. Diabetes suffered by adolescents is likely caused by lifestyle and health problems. Factors such as genetics can increase a teenager's risk of developing diabetes, but many unhealthy lifestyles are the main problem that causes young people to develop diabetes eventually. This study aims to determine associated factors of type 2 diabetes mellitus in Indonesian adolescents.

Methods: The method used was studying secondary data from published journals and evaluated by searching in PubMed, EMBASE, and the Cochrane Library database. Of the several journals collected, 20 articles were selected. The search for articles included the following criteria; the articles must be published in the last 10 years (from 2014-2024) and the sampled was adolescent in Indonesia.

Results: Based on the dependent variable, it was found that 18 factors were related to type 2 diabetes mellitus in adolescent in Indonesia. Those factors were physical activity, history of hypertension, high triglycerides, history of dyslipidemia, exercise habits, body mass index (BMI), education level, low economic income, consumption of fast food, consumption of instant drinks, smoking habits, heredity, age, obesity, insulin resistance, blood sugar levels, consumption of fruits-vegetables and unhealthy lifestyle. Need to increase health promotion about the factors that cause the incidence of type 2 diabetes mellitus and its prevention in adolescents.

Conclusion: It is recommended to increase health promotion about the factors that cause the incidence of type 2 diabetes mellitus and its prevention in adolescents. Furthermore, type 2 diabetes mellitus in adolescents should be prevented as early as possible.

Keyword: Diabetes, type 2 diabetes mellitus, adolescence, Indonesia