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ORIGINAL RESEARCH

Evaluation of Red Blood Cell Parameters as a Biomarker for Long-Term Glycemic Control Monitoring Among Type 2 Diabetic Patients in Southwest Ethiopia: A Cross-Sectional Study

Asmamaw M, Sime T, Kene K, Fekadie Baye M, Teshome M, Zawdie B

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4993-5000

Published Date: **30 December 2021**

ORIGINAL RESEARCH

Affective Temperament and Glycemic Control – The Psychological Aspect of Obesity and Diabetes Mellitus

Lesiewska N, Kamińska A, Junik R, Michalewicz M, Myszkowski B, Borkowska A, Bieliński M

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4981-4991

Published Date: **30 December 2021**

ORIGINAL RESEARCH

Association Among Lipid Accumulation Product, Chinese Visceral Obesity Index and Diabetic Retinopathy in Patients with Type 2 Diabetes: A Cross-Sectional Study

Li X, Li HY, Yu ZW, Zhang YT, Tong XW, Gao XY

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4971-4979

Published Date: **29 December 2021**

ORIGINAL RESEARCH

Trajectory Analysis and Predictors of the Percentage of Body Fat Among Chinese Sleeve Gastrectomy Patients

Zhao K, Xu X, Zhu H, Ren Z, Zhang T, Yang N, Zhu S, Xu Q

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4959-4970

Published Date: **29 December 2021**

ORIGINAL RESEARCH

Social Media

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Prevalence of and Factors Associated with Diabetic Retinopathy in Patients with Diabetes Mellitus at Siriraj Hospital – Thailand’s Largest National Tertiary Referral Center

Boonsaen T, Choksakunwong S, Lertwattanak R

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4945-4957

Published Date: **29 December 2021**

ORIGINAL RESEARCH

Role of Diabetes Mellitus in Acute Coronary Syndrome Patients with Heart Failure and Midrange Ejection Fraction Who Have Undergone Percutaneous Coronary Intervention: A 3-Year Case-Series Follow-Up Retrospective Study

Li L, Li G, Chen H, Feng Z, Zhang L, Chen L, Fan L

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4931-4944

Published Date: **29 December 2021**

ORIGINAL RESEARCH

Omental Adipose Removal Decreases High Blood Pressure in Hypertensive Patients Independent of Body Mass Index

Jiang L, Sun W, Zhang M, Wang Y, Tian Y, Li P, Lu Y, Xu T, Qiu M, Yang Y, Jia X, Kong X

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4921-4930

Published Date: **29 December 2021**

ORIGINAL RESEARCH

Risk Predictors of High Uric Acid Levels Among Patients with Type-2 Diabetes

Eljaaly Z, Mujammami M, Nawaz SS, Rafiullah M, Siddiqui K

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4911-4920

Published Date: **24 December 2021**

HYPOTHESIS

A Potential Participant in Type 2 Diabetes Bone Fragility: TIMP-1 at Sites of Osteocyte Lacunar-Canalicular System

Pei Q, Li J, Zhou P, Zhang J, Huang P, Fan J, Zou Z, Li X, Wang B

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4903-4909

Published Date: **23 December 2021**

ORIGINAL RESEARCH

Leptin Concentrations in Non-Obese and Obese Non-Diabetes Nigerian-Africans

Agbogu-Ike OU, Ogoina D, Onyemelukwe GC

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4889-4902

Published Date: **21 December 2021**

ORIGINAL RESEARCH

IL-25 Treatment Improves Metabolic Syndrome in High-Fat Diet and Genetic Models of Obesity

Smith AD, Fan A, Qin B, Desai N, Zhao A, Shea-Donohue T

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4875-4887

Published Date: **21 December 2021**

REVIEW



The Role of Glucagon in Glycemic Variability in Type 1 Diabetes: A Narrative Review

Guo K, Tian Q, Yang L, Zhou Z

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4865-4873

Published Date: **21 December 2021**

ORIGINAL RESEARCH

Family History, Consanguinity and Other Risk Factors Affecting the Prevalence of Prediabetes and Undiagnosed Diabetes Mellitus in Overweight and Obese Yemeni Adults

Al-Sharafi BA, Qais AA, Salem K, Bashaib MO

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4853-4863

Published Date: **20 December 2021**

REVIEW

Regulation of Methylase METTL3 on Fat Deposition

Luo G, Chen J, Ren Z

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4843-4852Published Date: **20 December 2021**

ORIGINAL RESEARCH

Prevalence of Abdominal Obesity in Chinese Middle-Aged and Older Adults with a Normal Body Mass Index and Its Association with Type 2 Diabetes Mellitus: A Nationally Representative Cohort Study from 2011 to 2018

Chen X, Duan M, Hou R, Zheng M, Li H, Singh M, Li C, Liu K, Zhang F, Yang X, Luo Y, He Y, Wu L, Zheng D

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4829-4841Published Date: **20 December 2021**

ORIGINAL RESEARCH

Frequency of Diabetic Ketoacidosis and Its Determinants Among Pediatric Diabetes Mellitus Patients in Northwest Ethiopia

Kidie AA, Lakew AM, Ayele T

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4819-4827Published Date: **19 December 2021**

ORIGINAL RESEARCH

**Association Between Dietary Salt and Plasma Glucose, Insulin and Hemoglobin A1c Levels Among Type 2 Diabetes Patients in Eastern China**

Lin Y, Chattopadhyay K, Yang X, Li JL, Chen YS, Zhou Y, Li L

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4811-4818Published Date: **19 December 2021**

ORIGINAL RESEARCH

Diabetic Complications and Associated Factors: A 5-Year Facility-Based Retrospective Study at a Tertiary Hospital in Rwanda

Iradukunda A, Kembabazi S, Ssewante N, Kazibwe A, Kabakambira JD

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4801-4810Published Date: **18 December 2021**

ORIGINAL RESEARCH

The Predictive Ability of Hepatic Steatosis Index for Gestational Diabetes Mellitus and Large for Gestational Age Infant Compared with Other Noninvasive Indices Among Chinese Pregnancies: A Preliminary Double-center Cohort Study

Song S, Duo Y, Zhang Y, Qiao X, Xu J, Zhang J, Peng Z, Chen Y, Nie X, Sun Q, Yang X, Wang A, Sun W, Fu Y, Dong Y, Lu Z, Yuan T, Zhao W

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4791-4800Published Date: **16 December 2021**

ORIGINAL RESEARCH

Association Between Metabolic Syndrome and Peripheral Arterial Disease in Elderly Patients with Type 2 Diabetes

Gao L, Zhao W, Liu Q, Qin M

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4783-4789Published Date: **14 December 2021**

ORIGINAL RESEARCH

Exosomes from β -Cells Promote Differentiation of Induced Pluripotent Stem Cells into Insulin-Producing Cells Through microRNA-Dependent Mechanisms

Guo Q, Lu Y, Huang Y, Guo Y, Zhu S, Zhang Q, Zhu D, Wang Z, Luo J

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:4767-4782Published Date: **11 December 2021**

ORIGINAL RESEARCH

Correlation Between Hemoglobin Glycosylation Index and Nerve Conduction Velocity in Patients with Type 2 Diabetes Mellitus

Li Z, Gao Y, Jia Y, Chen S

Published Date: **8 July 2021**

REVIEW 

Assessment and Management of Diabetic Patients During the COVID-19 Pandemic

Verma AK, Beg MMA, Bhatt D, Dev K, Alsahli MA, Rahmani AH, Goyal Y

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3131-3146

Published Date: **8 July 2021**

ORIGINAL RESEARCH

Poor Glycemic Control and the Contributing Factors Among Type 2 Diabetes Mellitus Patients Attending Outpatient Diabetes Clinic at Mbarara Regional Referral Hospital, Uganda

Patrick NB, Yadesa TM, Muhindo R, Lutoti S

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3123-3130

Published Date: **8 July 2021**

ORIGINAL RESEARCH

Contribution of Different Phenotypes of Obesity to Metabolic Abnormalities from a Cross-Sectional Study in the Northwest China

Lu X, Wang Q, Liang H, Xu L, Sha L, Wu Y, Ma L, Yang P, Lei H

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3111-3121

Published Date: **7 July 2021**

CORRIGENDUM

Pre-Existing Diabetes Limits Survival Rate After Immune Checkpoint Inhibitor Treatment for Advanced Lung Cancer: A Retrospective Study in Japan [Corrigendum]

Hisanaga K, Uchino H, Kakisu N, Miyagi M, Yoshikawa F, Sato G, Isobe K, Kishi K, Homma S, Hirose T

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3109-3110

Published Date: **6 July 2021**

ORIGINAL RESEARCH 

Connecting Peripheral to Central Neuropathy: Examination of Nerve Conduction Combined with Olfactory Tests in Patients with Type 2 Diabetes

Ni W, Zhang Z, Zhang B, Zhang W, Cheng H, Miao Y, Chen W, Liu J, Zhu D, Bi Y

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3097-3107

Published Date: **6 July 2021**

ORIGINAL RESEARCH

Liver Stiffness Measurement by Using Transient Elastography in Bangladeshi Patients with Type 2 Diabetes Mellitus and Ultrasonography-Diagnosed Nonalcoholic Fatty Liver Disease

Alam MS, Kamrul-Hasan ABM, Kalam ST, Rahman SMM, Hoque MI, Islam MB, Paul AK

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3089-3096

Published Date: **6 July 2021**


ORIGINAL RESEARCH

Complement C7 is Specifically Expressed in Mesangial Cells and is a Potential Diagnostic Biomarker for Diabetic Nephropathy and is Regulated by miR-494-3p and miR-574-5p

Guo H, Yan Z, Hu Y, Huang X, Pan C

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3077-3088

Published Date: **5 July 2021**

REVIEW  (This is a well written narrative review for gestational diabetes.) 

An Update on Screening Strategies for Gestational Diabetes Mellitus: A Narrative Review

Minschart C, Beunen K, Benhalima K

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3047-3076

Published Date: **5 July 2021**

ORIGINAL RESEARCH 

Cardiovascular Risk Prediction, Glycemic Control, and Determinants in Diabetic and Hypertensive Patients in Massawa Hospital, Eritrea: Cross-Sectional Study on 600 Subjects

Tesfai B, Kibreab F, Dawit A, Mekonen Z, Ghebrezghi S, Kefele S

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3035-3046Published Date: **5 July 2021**

ORIGINAL RESEARCH

External Validation of the Prognostic Prediction Model for 4-Year Risk of Metabolic Syndrome in Adults: A Retrospective Cohort Study

Zhang H, Chen D, Shao J, Zou P, Cui N, Tang L, Wang X, Wang D, Ye Z

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3027-3034Published Date: **1 July 2021**

ORIGINAL RESEARCH

Associations of GWAS-Supported Non-MHC Genes with Autoimmune Thyroiditis in Patients with Type 1 Diabetes

Liang J, Liang G, Liu Z, Cai H

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3017-3026Published Date: **1 July 2021**REVIEW 

Oral Health Messiares: Diabetes Mellitus Relevance

Ahmad R, Haque M

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:3001-3015Published Date: **1 July 2021**REVIEW 

Lipophagy: A New Perspective of Natural Products in Type 2 Diabetes Mellitus Treatment

Huang M, Yang X, Wang Z, Long J, Wang A, Zhang Y, Yan D

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2985-2999Published Date: **30 June 2021**

ORIGINAL RESEARCH

The Incidence of Metabolic Syndrome and the Valid Blood Pressure Cutoff Value for Predicting Metabolic Syndrome Within the Normal Blood Pressure Range in the Population Over 40 Years Old in Guiyang, China

Ma L, Li H, Zhuang H, Zhang Q, Peng N, Hu Y, Han N, Yang Y, Shi L

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2973-2983Published Date: **30 June 2021**REVIEW 

An Overview of Similarities and Differences in Metabolic Actions and Effects of Central Nervous System Between Glucagon-Like Peptide-1 Receptor Agonists (GLP-1RAs) and Sodium Glucose Co-Transporter-2 Inhibitors (SGLT-2is)

Wen S, Nguyen T, Gong M, Yuan X, Wang C, Jin J, Zhou L

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2955-2972Published Date: **29 June 2021**CLINICAL TRIAL REPORT 

Lifestyle and Work-Related Factors Associated with Work Ability and Work Participation for People with Obesity: A Prospective Observational Study After Vocational Rehabilitation

Linge AD, Jensen C, Laake P, Bjørkly SK

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2943-2954Published Date: **29 June 2021**

ORIGINAL RESEARCH

Evaluation Through the Optical Coherence Tomography Analysis of the Influence of Non-Alcoholic Fatty Liver Disease on the Gingival Inflammation in Periodontal Patients

Surlin P, Didilescu AC, Lazar L, Arsenie CC, Camen A, Popescu DM, Gheorghe DN, Osiac E, Rogoveanu I

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2935-2942

Published Date: **29 June 2021**

ORIGINAL RESEARCH 

Efficacy of a Combination of Metformin and Vildagliptin in Comparison to Metformin Alone in Type 2 Diabetes Mellitus: A Multicentre, Retrospective, Real-World Evidence Study

Mohan V, Zargar A, Chawla M, Joshi A, Ayyagari U, Sethi B, Gaurav K, Patted URH, Bhagat SV, Mane AI

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2925-2933

Published Date: **29 June 2021**

ORIGINAL RESEARCH

Thymoquinone Preserves Pancreatic Islets Structure Through Upregulation of Pancreatic β -Catenin in Hypothyroid Rats

Faddladdeen K, Ali SS, Bahshwan S, Ayuob N

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2913-2924

Published Date: **29 June 2021**

ORIGINAL RESEARCH 

Quality of Life Differences in Pre- and Post-Educational Treatment in Type 1 Diabetes Mellitus During COVID-19

Rochmah N, Faizi M, Hisbiyah Y, Triastuti IW, Wicaksono G, Endaryanto A, Soetjipto

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2905-2911

Published Date: **28 June 2021**

ORIGINAL RESEARCH

Foveal Avascular Zone Does Not Correspond to Choroidal Characteristics in Patients with Diabetic Retinopathy: A Single-Center Cross-Sectional Analysis

Sidorczuk P, Pieklarz B, Konopinska J, Saeed E, Mariak Z, Dmuchowska D

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2893-2903

Published Date: **28 June 2021**

ORIGINAL RESEARCH 

Decreased Physiological Serum Total Bile Acid Concentrations in Patients with Type 2 Diabetic Peripheral Neuropathy

Yan P, Wan Q, Zhang Z, Tang Q, Wu Y, Xu Y, Miao Y, Zhao H, Liu R

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2883-2892

Published Date: **28 June 2021**

ORIGINAL RESEARCH

A Clinical Study on Gestational Diabetes Mellitus and the Hearing of Newborns

Zhou JH, Yu K, Ding H, Zhu ZH, Han LH, Zhang T

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2879-2882

Published Date: **28 June 2021**

ORIGINAL RESEARCH

Relationship Between Serum Neopterin Level and Peripheral Arterial Plaque in Patients with Type 2 Diabetes

Wan RH, Yuan Y, Hao W, Zheng LY, Lu J

[Diabetes, Metabolic Syndrome and Obesity 2021](#), 14:2871-2878

Published Date: **28 June 2021**

ORIGINAL RESEARCH 

Changes in Body Weight, Dysglycemia, and Dyslipidemia After Moderately Low-Carbohydrate Diet Education (LOCABO Challenge Program) Among Workers in Japan

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Professor Gian Paolo Fadini

EDITOR IN CHIEF

Dr. Fadini is full Professor of Endocrinology at the University of Padova and Associate Medical Director at the Division of Metabolic Diseases of the University Hospital of Padova. Dr. Fadini also directs the Laboratory of Experimental Diabetology at the Veneto Institute of Molecular Medicine.



Professor Fadini

Dr. Fadini's teaching activity is directed to students of the M.D. course in Medicine and Surgery and of the Specialty course in Endocrinology and Metabolism.

Dr. Fadini research activities are devoted to the study of diabetic complications, stem cells in diabetes, wound healing, metabolic syndrome and insulin resistance, oxidative stress, longevity gene pathways in metabolic diseases. With a series of clinical translational studies on endothelial progenitor cells, Dr. Fadini research activity has contributed to the understanding of how diabetes induces vascular damage and compromised endothelial repair. He then has moved to consider the bone marrow as a target of diabetic complications, which regulates vascular stem cells and regeneration. In the field of clinical diabetes, Dr. Fadini designed and coordinated studies using routinely accumulated clinical data on cardiovascular outcomes and real-world effectiveness of glucose lowering medications, including the nationwide Italian DARWIN study series.

Dr. Fadini has received prestigious international prizes, including the Morgagni Silver Medal and the EASD (European Association for the Study of Diabetes) Minkowski prize.

Dr. Fadini has been Associate Editor for Atherosclerosis, Journal of Endocrinological Investigation and Nutrition Metabolism & Cardiovascular Disease, and is current board member of European Heart Journal, Cardiovascular Diabetology, and Diabetes Obesity & Metabolism.

Dr. Fadini has published more than 330 articles in peer-review journals, with H-index of 58.

Prof. Dr. Muthuswamy Balasubramanyam

ASSOCIATE EDITOR IN CHIEF

Dr. Balasubramanyam has recently been elected as Fellow of the National Academy of Medical Sciences (India) and is at present Dean of Research Studies & Senior Scientist at the Madras Diabetes Research Foundation, Chennai, India. He obtained his PhD degree in 1987 from Sri Venkateswara University, Tirupati. During 1991 to 1995, he worked as a Post-Doctoral Scientist at the Hypertension Research Center of the University of Medicine and Dentistry of New Jersey (UMDNJ), Newark, USA on "Cell signaling & Molecular medicine aspects with special reference to diabetes". During 1996-99, he served as a faculty at the Center for Biotechnology, Anna University, Chennai. He joined the Madras Diabetes



Prof. Dr. Balasubramanyam

Research Foundation in 1999 and instrumental in many of its academic developments including infrastructure for basic science and translational studies. He has over 115 original research publications and many awards to his credit.

Dr. Balasubramanyam's specialization and research interests include: Disease-Biology and molecular medicine with special reference to diabetes and its vascular complications, metabolic syndrome & obesity, molecular mechanisms of accelerated ageing, redox signaling and 'biomarkers' of oxidative stress, role of microinflammation, ER stress, telomere biology, the gut (microbiota) connection to diabetes, proteomics/epigenetics/miRNA profiling in fat and skeletal muscle with special reference to insulin signaling and drug discovery, metabolomics, exposomics, stem cell research, role of endocrine disruptors, bio-prospecting molecular targets of herbal action and development of cell-based, high-throughput assays as well as point-of-care (POC) medical devices. Dr. Balasubramanyam is also an elected Member of the Asia-Pacific International Molecular Biology Network (A-IMBN). He has recently received the prestigious Endeavour Executive Fellowship from the Education Department of Govt. of Australia. He serves as an Expert Committee member in many funding agencies of Govt. of India. At national and international levels, he serves as an expert member of multiple grant review panels and on the editorial advisory boards of multi-disciplinary journals.

Prof. Dr. Antonio Brunetti

ASSOCIATE EDITOR IN CHIEF

Dr. Antonio Brunetti is a Professor in Endocrinology at the University "Magna Græcia" of Catanzaro, Italy. He graduated in medicine and specialized in Endocrinology and Metabolism at the University of Catania, Italy. In 1992 he obtained the PhD degree in Endocrine and Metabolic Sciences from the University of Naples, Italy, while he was working at the Division of Diabetes & Endocrine Research, University of California San Francisco (UCSF), USA. During his PhD programme at UCSF, Prof. Brunetti led and was the principal investigator of a series of studies that helped to clarify most of the molecular mechanisms involved in insulin action and the regulation of insulin receptor gene expression in muscle, liver and fat.



Prof. Dr. Brunetti

Over the past 15 years his research activity has mostly focused on the molecular genetics of insulin resistance and type 2 diabetes, followed by the discovery of a novel mechanism for insulin resistance in a subset of diabetic patients. These studies have helped to identify critical components of the transcriptional machinery that governs insulin receptor gene expression, indicating that defects in the architectural factor HMGA1 (the most important among these components) may cause "HMGA1opathy", a novel insulin resistance subphenotype observed in patients with either rare forms of insulin resistance or common type 2 diabetes. The results obtained from these studies have provided insights into previously unexplored aspects of insulin resistance and have been presented in various international conferences and published in leading peer reviewed journals.

His current research includes the study of chronic inflammation and hypoxia in fat and their role in the development of obesity-related insulin resistance in the effort to identify new biological targets and biomarkers of early disease. The actual researching activity is also centered on the study of gestational diabetes mellitus (GDM) and the identification of early predictors of GDM and glucose intolerance during pregnancy.

From 2008 to 2016 he coordinated the PhD programme in Endocrine-Metabolic and Nutritional Sciences at the University "Magna Græcia" of Catanzaro. Currently he is a member of the PhD programme in Biomarkers of chronic and complex diseases, and Director of the Operative Unit of Endocrinology and Metabolism at the Azienda Ospedaliero-Universitaria "Mater Domini", University "Magna Græcia" of Catanzaro, Italy. At national and international levels, he has served as member of multiple editorial boards, and is an active member of various professional societies.

Prof. Dr. Juei-Tang Cheng

ASSOCIATE EDITOR IN CHIEF

Dr. Cheng is a chair-professor at the Chang Jung Christian University and he also serves as a Senior Investigator in Chi-Mei Medical Center. During his PhD thesis research in pharmacology at Shizuoka Pharmaceutical College in Japan, he demonstrated that calcium-induced calcium release in smooth muscle. Then, he was invited as an associate professor at Tajen Pharmaceutical College in Taiwan. He found a nature fruit Guava in the alleviation of diabetic disorders. In 1986, he moved to the National Cheng Kung University to serve as an associate professor



in pharmacology. He continued his favorite target, effects of natural products on diabetic complications. Depending on several findings, he promoted to the professor in the same university. Therefore, Dr. Cheng directed graduate students to investigate the pathophysiology of diabetes and the role of peptides in neuroendocrinology. He characterized the mediation neuropeptide Y in diabetic disorders and established the major role of beta-endorphin in metabolic regulation. In 1996, Dr. Cheng became the chairman of the Research Center for Traditional Chinese Medicine in his university. He used herbal products to demonstrate several findings in the alleviation of diabetic disorders. Therefore, Dr. Cheng got the Fellowship (FCP) from the American College of Clinical Pharmacology. He developed the role of opioid mu-receptors in the metabolic regulation and suggested endogenous receptors are helpful in the regulation of metabolism. Additionally, mediation of endogenous imidazoline receptors in diabetes has also been demonstrated in several publications. Since 2009, Dr. Cheng was retired and moved to the present university. His current research includes a systems biology approach to study the processes of metabolic disorders in efforts to identify new targets for the handling of diabetes and/or metabolic syndrome.

Prof. Dr. Cheng

Dr. Cheng has been an active member of the American Diabetes Association (ADA) and New York Academy of Sciences, where he has been involved in the development of basic research to assist handling of metabolic disorders. At national and international levels, he has served as a member of grant review panels and on the editorial advisory boards of multiple journals.

Professor Jing Sun

ASSOCIATE EDITOR IN CHIEF

Professor Jing Sun is Professor of Biostatistics at the School of Medicine and Dentistry, Griffith University, Fellow of International Engineering and Technology Institute (IETI), and IETI Australian Society President. She has been leading and teaching post graduate health and medical statistics in Griffith's health faculty since 2006, with over 2500 postgraduate students completing her quantitative research and statistics course. Jing leads large scale collaboration of Chronic Diseases/Mental Illness randomised controlled trials and cohort studies that led to advances in our understanding of prognosis treatment of patients with cardiovascular disease, diabetes and mental disorders in the era of effective lifestyle based rehabilitation and cognitive behavioural therapy. She has a longstanding interest in chronic disease prevention and intervention program development using tele-health approaches and has recently developed a project using wearable technology to monitor chronic disease patients' health. She has been invited to various international and Australian national conferences as a keynote speaker, and chaired the measurement component of the Inaugural Australia-China Science and Technology conference, and the second conference held in Chongqing, China. She has authored over 195 papers in highly esteemed journals on various advanced data science based analytical methods, ranging from multi-level, meta-analysis to machine learning methods. Her other research interests include methodology for epidemiology and health services research and the epidemiology of COPD and maternal and preterm infants birth and development outcomes research.



Professor Sun

Dr Konstantinos Tziomalos

ASSOCIATE EDITOR IN CHIEF

Konstantinos Tziomalos is Assistant Professor of Internal Medicine at the First Propedeutic Department of Internal Medicine of the Medical School, Aristotle University of Thessaloniki, in AHEPA Hospital, Thessaloniki, Greece. He completed his residency at the Second Propedeutic Department of Internal Medicine of the Medical School, Aristotle University of Thessaloniki, in Hippokraton Hospital, Thessaloniki, Greece. He then served as a clinical research fellow at the Department of Clinical Biochemistry (Vascular Prevention Clinic), Royal Free Campus, University College London Medical School, University College London, UK and as a post-doctorate research fellow at the Stem Cell Institute and Cardiovascular Research Laboratory, Division of Cardiology, Miller School of Medicine, University of Miami, USA. His research interests include dyslipidemia, stroke and cardiovascular disease prevention. He has authored more than 300 peer-reviewed scientific articles, which have received more than 6000 citations.



Dr Tziomalos

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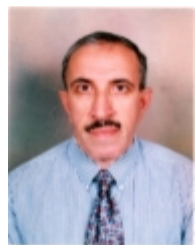
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Hassan Hosseinzadeh, Senior Lecturer, Academic Program Director, Master of Public Health (MPH), School of Health & Society, University of Wollongong, NSW, Australia.

Professor Ostenson SWEDEN

Claes-Göran Östenson, Professor of Endocrinology, Department of Molecular Medicine and Surgery, Karolinska Institutet, Stockholm, Sweden.

Dr Rajab UNITED STATES

Amer Rajab, Department of Surgery, Ohio State University Medical Center, Columbus, Ohio, USA

Dr Riggs UNITED STATES

Amy Jo Riggs, Health and Kinesiology Department, Georgia Southern University, GA, USA

Professor Stewart UNITED STATES

Kerry Stewart, Professor of Medicine, Director, Clinical and Research Exercise Physiology, John Hopkins University School of Medicine, MD, USA.

Dr Yang CANADA

Wen-Zhu Yang, Lethbridge Research Centre, Agriculture and Agri-Food Canada, Canada

Dr Zhao CHINA MAINLAND (PRC)

Allan Z. Zhao, Ph.D., Member, the National 1000 Talents Program; Distinguished Professor, The Institute of Biomedical and Pharmaceutical Sciences, Guangdong University of Technology, Guangzhou, Guangdong Province, People's Republic of China

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Quality of Life Differences in Pre- and Post-Educational Treatment in Type I Diabetes Mellitus During COVID-19

Nur Rochmah^{1,2}
Muhammad Faizi^{1,2}
Yuni Hisbiyah^{1,2}
Ike Wahyu Triastuti²
Garindra Wicaksono²
Anang Endaryanto^{1,2}
Soetjipto^{1,3}

¹Doctoral Program of Medical Science, Faculty of Medicine, Universitas Airlangga, Surabaya, East Java, Indonesia;

²Department of Child Health, Dr. Soetomo General Hospital, Faculty of Medicine, Universitas Airlangga, Surabaya, East Java, Indonesia; ³Department of Biochemistry, Faculty of Medicine, Universitas Airlangga, Surabaya, East Java, Indonesia

Purpose: The coronavirus-19 (COVID-19) pandemic requires the use of online media to ensure monitoring of type 1 diabetes mellitus (T1DM) in children. Thus, this study aims to determine whether online education effectively improves the quality of life (QoL) in children with T1DM during the coronavirus-19 pandemic.

Patients and Methods: The study, conducted from March to October 2020, utilized the paired *t*-test before and after online education. Moreover, it adopts the recommended Pediatric Quality of Life Inventory (PedsQL) 3.2 diabetes module for the 33 patients registered in the Pediatric Endocrine Outpatient Clinic of Dr. Soetomo Hospital, Surabaya, Indonesia.

Results: The QoL of all children ($p = 0.011$), parents ($p = 0.001$), and both children and parents (overall; $p = 0.002$) have shown significant improvement after the treatment. The QoL of parents, as a subcriterion, improved after the treatment. However, the improvement in the children in subcriterion treatment II ($p = 0.186$) was not significant.

Conclusion: Online education has proven to create a better QoL almost in all children with T1DM during the coronavirus-19 pandemic.

Keywords: T1DM, COVID-19, children, online education, PedsQL

Introduction

The coronavirus-19 (COVID-19) pandemic was declared by the World Health Organization (WHO) Emergency Committee as a global health emergency.¹ This pandemic has inadvertently impacted health systems in that the primary health services have given up for a long time. It has also influenced health, physical, psychological, and socioeconomic sectors in many countries.²⁻⁶ Especially for the psychological aspect, COVID-19 pandemic on pediatric patients with chronic diseases, particularly type 1 diabetes, are more vulnerable and at higher risk for developing dangerous feelings, such as uncertainties, distraction, irritability, and fear. Also, They are at risk of acute stress disorder, adjustment disorder, and grief.⁷ Thus, quality of life (QoL) will be impaired.³ Moreover, the American Diabetes Association recommends that patients with type 1 diabetes mellitus (T1DM) and their families be given comprehensive education and support.⁸

T1DM is the most common chronic disease, with approximately 70,000 children diagnosed worldwide each year. It has an incidence rate of <1 case/year/100 individuals in the Asian population, which is relatively lower than in the Caucasian population.⁹ A rise of approximately 40% (70 children) in new T1DM

Correspondence: Nur Rochmah
Department of Child Health, Dr.
Soetomo General Hospital, Faculty of
Medicine, Universitas Airlangga, Jl.
Mayjend Prof. Dr. Moestopo No. 6-8,
Airlangga, Gubeng, Surabaya, East Java,
60286, Indonesia
Tel +62 81703501118
Email nur-r@fk.unair.ac.id

visits was recorded in Indonesia from 2002 to 2014 according to the data from Dr. Soetomo General Hospital, Surabaya.¹⁰ On one hand, the China Center for Disease Control reported 2143 infections <18 years old as of August 2020.¹¹ On the other hand, a report from the COVID-19 task force in Indonesia shows that the infection rate in children is 11.4%, with 3.2% mortality. This mortality rate is relatively the highest compared to other countries, including America, Italy, and Korea.¹²

Many patients have impaired glucose control during the pandemic period.¹³ Consequently, children with T1DM are vulnerable to COVID-19 infection.¹⁴ However, studies have shown that education is the key to successful diabetes management.¹⁵ Thus, the healthcare system needs to explain the condition of this pandemic, management for prevention, and the importance of continuing diabetes treatment during the pandemic. The effect of lockdown in some countries restricts individual movement. Therefore, daily activities are affected, which can influence the QoL in some aspects.¹⁶ Several components in the Pediatric Quality of Life Inventory (PedsQL), such as diabetes symptoms, treatment barrier, treatment adherence, worry, and communication, are at risk of worsening during the pandemic.¹⁷ Therefore, several studies have stated that pandemic conditions can cause a decrease in QoL in T1DM patients, especially children and adolescents.^{13,18}

It has been previously reported that online education can promote relationship quality and knowledge improvement.^{17,19} Especially in pandemic conditions, it could lead to lack of doctor and patient contact which results in a reduction of parent's motivation to care their child's condition which results in a further decrease in QoL.²⁰ Consequently, this study aims to determine whether online education is effective in improving QoL in children with T1DM during the COVID-19 pandemic.

Patients and Methods

Sample

This study involved children and adolescents, as well as their parents, diagnosed with T1DM according to the International Society for Pediatric and Adolescent Diabetes guidelines. The patients were registered at the Pediatric Endocrinology Outpatient Clinic of Dr. Soetomo Hospital, Surabaya, Indonesia. The inclusion criteria for this study were age (5–18 years), diagnosed with T1DM, registered at the Pediatric Endocrinology Outpatient Clinic of Dr. Soetomo Hospital, treatment status (already started

treatment), and hospital visits (visited the hospital with parents). The sample was randomly obtained after we share the information in mobile application. Those who willing to join our interactive session were our sample population. Consequently, 33 patients (18 boys and 15 girls) were included in this study.

Community Treatment

Treatment activities were in the form of knowledge sharing through online education with the preparation of educational manuals and videos using Zoom web conference. In addition, parents were given learning materials such as educational videos and powerpoint presentations about the guide and treatment of T1DM during the COVID-19 pandemic. Online education was about the COVID-19 infection, the importance of continuing proper diabetes treatment during the pandemic, and the equipment for personal prevention. The online meeting began with explaining the T1DM child care method at home and advice to be applied at home, presented by a pediatric diabetes specialist. Followed by a one by one sharing session of experiences from each participant regarding the process of nursing for the children during the COVID-19 pandemic period. After sharing the experience, a pediatric diabetes specialist reviewed whether the actions taken by each family and motivated the family. This meeting session is conducted only once in about 120 minutes. Post-test evaluation applied after education is done. Post-intervention QoL data were obtained two months intervals. Then, we collect some feedback on satisfaction with participants by personal chat on a mobile application. All participants were satisfied with the sharing session because they can share their problems and find solutions in the sharing session.

Data Collection

This study used a cross-sectional design and was performed from March to October 2020. Retrospective data were taken from medical records, and the subjects were interviewed to collect data based on PedsQL. Before the interview, the subject's consents were obtained. This process was carried out during their visit to the Pediatric Endocrine Outpatient Clinic of Dr. Soetomo Hospital, Surabaya, Indonesia.

The Personal Characteristic Form

The children's form consisted of demographics (eg, gender, weight, age, and illness-related topics such as diabetes duration, age at diagnosis, and glycated hemoglobin levels). The parent's form consists of questions about marital status, educational background, and family income.

Nutritional Status

Nutritional status was classified according to the World Health Organization (WHO), Body Mass Index (BMI) for age values defined for children and adolescents (5–18 years old): severe malnutrition ($z < -3$), moderate malnutrition ($-3 < z < -2$), normal ($-2 < z \leq 1$), overweight ($1 < z < 2$), and obese ($z > 2$).¹⁷ The subjects were grouped into four groups (severe malnutrition, moderate malnutrition, normal, and overweight/obese).

Educational Background

The educational background was classified based on the government program of 9-year compulsory education; hence, the governmental program of our country divided it into three groups: <9 years, 9–12 years, and >12 years.

Socioeconomic Status

The socioeconomic status was defined based on the world bank scale of Indonesia, which is middle-low and regional minimum wage from the government of each city. We divided into three groups based on the regional minimum wage: low, medium, and high.

Pediatric Quality of Life Inventory

The patient's QoL was assessed using the PedsQL 3.2 diabetes module by Varni et al for children based on the patient's age.²¹ The PedsQL questionnaire has been translated by a credible sworn translator into Bahasa Indonesia that used to assess the quality of life of the children with T1DM. It assessed the aspects of diabetes (15 items; diabetes symptoms), treatment barriers (evaluated the obstacles or problems during treatment; treatment I, 5 items), treatment adherence (treatment II, six items), worry (3 items), and communication (4 items) with reverse-scored items. Five- and three-point scales exist for the Child Report for Young Children (5–7 years old). In the 5-point scale, 0, 1, 2, 4, and 4 never represented, almost never, sometimes, often, and almost always, respectively. However, in the 3-point scale, 0, 2, and 4 represented not at all, sometimes, and a lot, respectively. These scores were transformed to a 0–100 scale, where 0 = 100, 1 = 75, 2 = 50, and 4 = 0. Lower scores demonstrate more diabetes symptoms and management problems. This PedsQL has tested its validity and reliability by showing good results in the study by Varni et al.²² In addition, validity is assessed by predicting the morbidity and disease burden of the patients and their parents. Consequently, reliability is when results were consistent after several tests.²¹ Moreover, the validity and reliability of the

PedsQL questionnaire have been tested by Statistics of Universitas Airlangga and it has been reported to be valid. The questionnaire was shared online with the participants by the same team during the study.

Data Evaluation

The SPSS 17.0 software (IBM SPSS; Armonk, NY, USA) was used to analyze data. The mean and standard deviation of each element were used to obtain the baseline and clinical characteristics data. The normality test was done using the Shapiro–Wilk test because the subject was <50. The data were normally distributed so that we continued to the paired *t*-test based on the statistic journal from Kim K. T., 2015.²³ Moreover, we have already consult to the statistician of Universitas Airlangga, the paired *t*-test was used to test the comparison test. $P < 0.05$ was considered statistically significant.

Results

This cross-sectional study included 33 children with T1DM (18 boys and 15 girls; 11.97 ± 2.91 years old). The baseline characteristics and history of the patients with T1DM are presented in Table 1. The average diabetes duration was 3.33 years, compared to the Asian demographic average was 5.48 years. The average age at diagnosis in our study was 67.75 months or 5.64 years old, similar to a study of Asian children population from Khanolkar et al 2016,²⁴ stated that the average age at diagnosis was 6.60 years old. The average HbA1c in our study was 10.06%, while the average in Asian children population was 9.1%, based on Khanolkar et al 2016. The participant's socioeconomic status was majority low, as well as a study of Khanolkar et al 2016 in Asia population.

The scores of the parents were in line with the scores of the children. On the one hand, the mean QoL scores for parents before and after online education were 75.29 and 76.51, respectively. On the other hand, the mean QoL scores for children before and after online education were 75.66 and 76.80, respectively. These results showed that linearity exists between the scores of the parents and children. The results of the treatment effect on the QoL of the subjects showed a significant PedsQL score before and after an online video conference ($p = 0.002$), and the mean difference was as high as 1.21 of the PedsQL score. Moreover, the most significant impact was observed in the scores of the parents ($p = 0.001$) and children ($p = 0.011$), with a difference of 1.22 and 1.14 of the PedsQL scores, respectively.

Table 1 Baseline Characteristics of Patients with T1DM

Characteristics	Mean (SD)	N (%)
Age (years)	11.97 (2.91)	33 (100)
Gender		
Boys	1.45 (0.50)	18 (54.5)
Girls		15 (45.5)
BMI	1.78 (0.48)	33 (100)
Nutritional status		
Severe malnutrition	2.0 (0.25)	1 (3)
Moderate malnutrition		1 (3)
Normal		30 (90.9)
Overweight/obese		1 (3)
Socioeconomic status		
Low	2.03 (0.81)	26 (78.8)
Medium		5 (15.2)
High		2 (6.1)
Parents' educational background (years)		
<9		3 (9.1)
9–12		21 (63.6)
>12		9 (27.3)
Diabetes duration (years)	3.33 (2.83)	
Age at diagnosis (months)	67.75 (10.02)	
HbA1c (during COVID-19)	10.06 (2.49)	33 (100)
HbA1c (last year)	9.20 (1.86)	33 (100)

Abbreviations: BMI, body mass index; SD, standard deviation; HbA1c, hemoglobin A1c.

The improvement in the scores of the parents (1.22) was more significant than the increase in the scores of the children (1.14). However, a significant increase in PedsQL score was shown overall. The PedsQL subcriteria are presented in Table 2. An increased result was found in all criteria except for treatment adherence for children ($p = 0.186$). Meanwhile, diabetes, treatment barrier, worry, and communication criteria significantly improved after the treatment ($p < 0.05$).

Discussion

This study found that online education is effective in improving the QoL in children with T1DM during the COVID-19 pandemic. The average of parents, and children's scores were increased. An increased mean score QoL before and after intervention showed that online education was clinically meaningful and improved QoL among the parents and children with T1DM. It is clinically meaningful because the parents feel satisfied with this interactive session and their worry reduced (worry aspect), for the treatment barrier

Table 2 Comparison of PedsQL Scores Before and After Online Education for Each Subcriteria

PedsQL Comparison		Mean (SD)	t	p
Diabetes	Parents	-1.15 (1.86)	-3.55	0.001
	Children	-0.67 (1.75)	-2.22	0.034
Treatment I	Parents	-1.51 (3.64)	-2.39	0.023
	Children	-1.67 (4.26)	-2.24	0.032
Treatment II	Parents	-0.98 (2.05)	-2.75	0.010
	Children	-0.37 (1.58)	-1.35	0.186
Worry	Parents	-1.38 (3.38)	-2.34	0.026
	Children	-1.35 (3.31)	-2.33	0.026
Communication	Parents	-1.10 (2.80)	-2.25	0.031
	Children	-1.65 (3.49)	-2.71	0.011

Abbreviations: PedsQL, Pediatric Quality of Life Inventory; SD, standard deviation.

aspect, their parents more courageous to control with the doctor in hospital, for the diabetes symptoms, complaints from patients are also reduced due to their routine control, for the adherence treatment, each patient has a glucose report book before and after meals, so parents are more obedient to the insulin dosage and insulin schedule, for the communication aspect, parents and children build more communication at home, their parents told us when they came to clinic to control. This study is consistent with a study from Dudley et al 2014 which stated that the way the health care team works together and implements technology and education dramatically affects the client's success. In that study, participants completed an initial semi-structured interview.²⁵ Another study from Algahtani et al 2021 stated that Community-based interventions are needed to mitigate the pandemic's negative effects and enhance the health and QoL of the general population. The online survey was the most feasible way to access the target population in light of the social-distance protocols implemented during the COVID-19 pandemic.²⁶ A significant improvement in each of the subcriteria was also found except for the treatment adherence criterion in children. This could be due to the child's lower ability to understand speech and writing compared to adults. Moreover, children are more likely to be visual and psychomotor learners.^{27,28} Online education has been studied in a systematic review by Giustini et al.²⁹ This research pointed out that evaluating health promotion through social media is tricky. However, benefits were noted from the existence of psychosocial support and psychological functioning. Online education is also safe during a pandemic.³⁰ The knowledge

of T1DM and its management significantly affects metabolic control and patient adherence to medical advice. Children with T1DM are vulnerable to COVID-19 infection. Many patients have impaired glucose control during the pandemic period because of their fear of going to hospital to see the doctor and have a routine control.³¹ Thus, many researchers want to evaluate the education of patients regarding T1DM.^{32,33} They conclude that education is needed to control T1DM in children, adolescents, and adults.

Abdul-Rasoul et al stated that patients with T1DM, especially children and adolescents, had lower QoL evaluated by PedsQL.³⁴ Similarly, parents had lower QoL compared with children. This result is consistent with the current study that parents had lower PedsQL scores than children, which may be caused by the parent's burden to guide and maintain the child and adolescent patients with T1DM. Thus, educating patients with T1DM is essential to maintain patient adherence and its effect on patient QoL.³² However, the study evaluating the efficacy of education to the improvement of the PedsQL score has not yet been conducted. This study found that QoL improvement was significant in all groups (parents and children). Moreover, the best improvement was shown by the treatment barrier score. Treatment barrier was related to patient–parent motivation and acceptance of the disease.²⁰ It is also related to doctor–patient contact, which has been significantly reduced due to social distancing during the COVID-19 pandemic.³⁵ Moreover, online education could be the solution to improve the treatment barrier component of the treatment.

The smallest improvement observed in this study was in treatment adherence score (Table 2). Consistent with the study by Vimalavathini et al, education only improves knowledge and attitude but is not a practical component that composes adherence.³² Treatment adherence is the most difficult to improve because it needs practical demonstration and mirroring from the doctor, which is limited due to the modularity of online education.³⁶

This study found that most patients were in the 8–12 years old group, which is consistent with other studies.^{28–30} Moreover, the T1DM incidence rate is lower in younger children (5–7 years old).³⁷ Table 1 shows that boys were more prevalent in this study, which is similar to a study by Redondo et al.³⁸ The patient socioeconomic status of this study is similar to the study by Mackey et al.³⁹ In addition, the socioeconomic status correlates with diet, activity, and doctor's compliance, thus affecting QoL. Another study demonstrated that socioeconomic inequalities, measured as low education and

occupational levels, were associated with an increased risk of complication T1D and worsening the disease.^{40,41}

Nevertheless, this study has a limitation. The number of T1DM cases in this study is lower than that in Caucasians although the study was conducted at a referral hospital in East Indonesia. Another limitation, this study is single-center, so that it is also difficult to conduct a controlled trial study for this case. Moreover, the challenge of handling T1DM is quite complicated in Indonesia because of limited resources. Thus, online education, besides maintaining routine control in pediatric endocrine outpatient clinics, will improve treatment. Consequently, QoL will also be improved. Moreover, no studies exist about online education during the COVID-19 pandemic. It is believed that this is the first online education that determines the differences between QoL in patients with T1DM before and after online education.

Conclusion

Online education during the COVID-19 pandemic has a good impact on promoting the QoL of patients with T1DM with the increment of PedsQL observed in parents and children. Although a face-to-face conference is limited due to the risk of COVID-19 transmission, the online video conference could substitute for education in some parts. Nevertheless, meeting sessions (eg, workshops or demonstrations) are essential for health promotion which cannot be substituted.

Data Sharing Statement

All subject data in our study are available upon request.

Ethical Approval

This study's ethical approval was granted by the ethics committee overseeing health research at Dr. Soetomo Hospital, Surabaya, Indonesia (Ref. No. 0123/LOE/301.4.2/IX/2020). All participants and their parents provided informed consent, and this study was conducted in accordance with the Declaration of Helsinki.

Informed Consent

Participants have received an explanation regarding the following research. The patient's personal data will be kept confidential. Participants who were willing to take part in the research filled out and send back the consent form via email. A parent of participant that consented will be interviewed with questionnaire based on PedsQL regarding the age.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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The authors declare that no conflicts of interest in this work.

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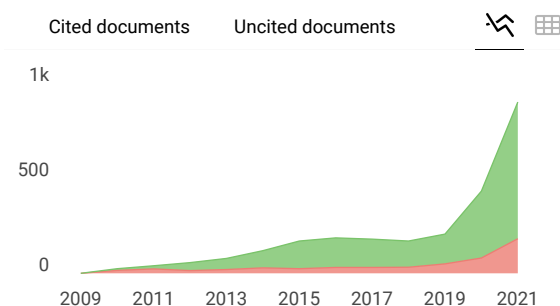
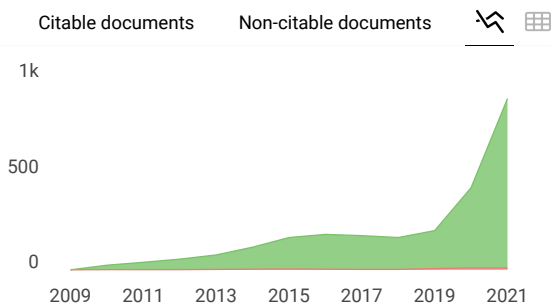
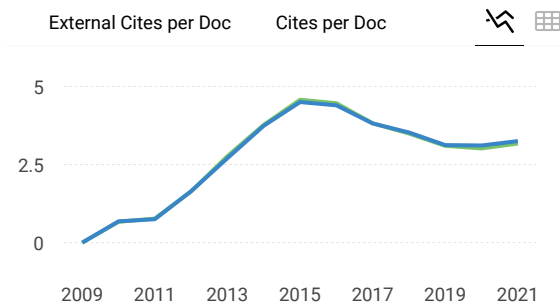
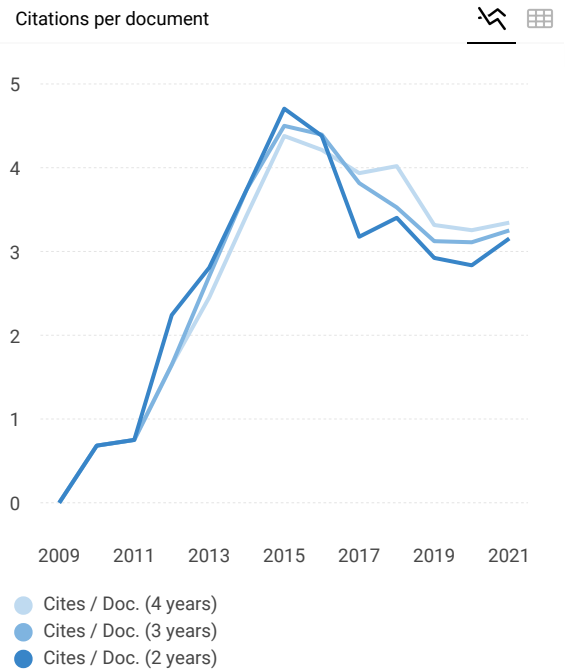
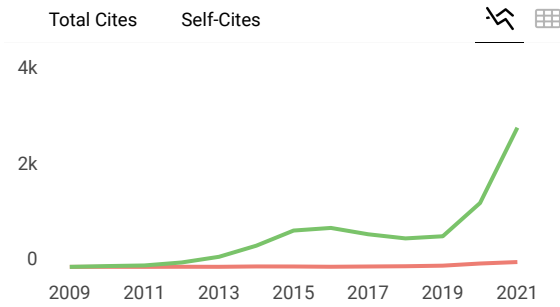
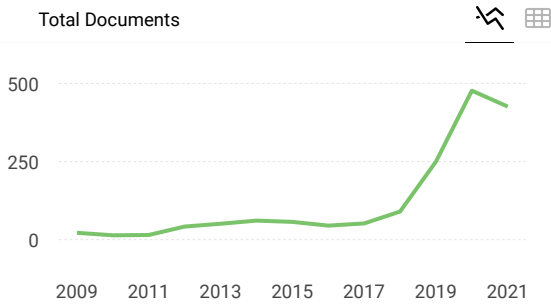
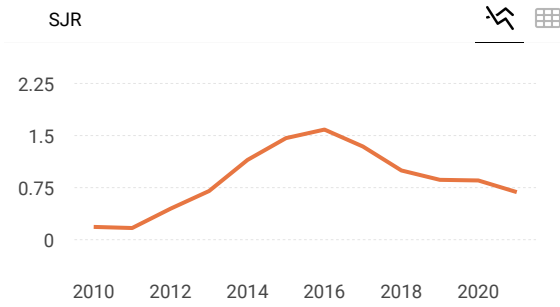
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