# Supplementary File B. Summary of detailed information of the articles included in the meta-analysis

Our meta-analysis incorporated studies with a weighted mean follow-up duration of 5.53 years (adjusted for sample size), and all three external validation datasets similarly comprised 5-year follow-up data, thereby establishing this as a validated 5-year prediction model.

The definitions of the risk factors were as follows: Central obesity was defined as a waist circumference ≥102 cm for males and ≥88 cm for females. Exercise referred to intentional activities performed for the purpose of physical fitness and did not include activities required for work or other obligations. BMI was calculated by dividing weight (kg) by the square of height (m). WHtR was obtained by dividing waist circumference (cm) by height (cm). Hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg, measured on three or more separate occasions. Fatty liver was diagnosed via ultrasound examination. A family history of diabetes referred to having one or more first-degree relatives with diabetes. Reduced HDL-C was defined as <40 mg/dL for males and <50 mg/dL for females. Hyperuricemia was defined as serum uric acid (SUA) levels ≥420 μmol/L for males and ≥360 μmol/L for females.

S1 Table. Summary characteristics of included studies

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Risk factor | *RR* (95%*CI*) |  | *P* |  | Number of Study |
| Gender |  |  |  |  | 26(1-26) |
| Female | 1 | - | - | - |  |
| Male | 1.288(1.023,1.622) | 0.973 | 0.032 | 0.25 |  |
| Age | 1.042(1.023,1.061) | 0.963 | <0.001 | 0.04 | 23(2, 5, 6, 9, 11-13, 16-19, 22, 23, 25, 27-35) |
| Smoking |  |  |  |  | 12(3, 6-8, 10, 11, 18, 21-24, 30) |
| No | 1 | - | - | - |  |
| Yes | 1.433(1.187,1.73) | 0.963 | <0.001 | 0.36 |  |
| Central obesity |  |  |  |  | 6(24, 26, 31, 36-38) |
| No | 1 | - | - | - |  |
| Yes | 1.666(1.132,2.45) | 0.967 | <0.001 | 0.51 |  |
| Exercise |  |  |  |  | 10(3, 6, 9, 22, 23, 39-43) |
| Yes | 1 | - | - | - |  |
| No | 1.233(1.032,1.475) | 0.927 | 0.021 | 0.21 |  |
| BMI (kg/m2) |  |  |  |  |  |
| 18.5-23.9 | 1 | - | - | - |  |
| <18.5 | 0.673(0.602,0.752) | 0.231 | <0.001 | -0.40 | 5(1, 3, 30, 44, 45) |
| 24.0-27.9 | 1.74(1.417,2.137) | 0.936 | <0.001 | 0.55 | 10(8, 20, 36, 46-52) |
| ≥28 | 2.492(1.87,3.32) | 0.940 | <0.001 | 0.91 |
| WHtR |  |  |  |  | 6(36, 37, 44, 53-55) |
| ≤0.5 | 1 | - | - | - |  |
| >0.5 | 2.509(1.649,3.817) | 0.899 | <0.001 | 0.92 |  |
| Hypertension |  |  |  |  | 13(1-3, 6, 8, 15, 21, 31, 39, 44, 51, 52, 56) |
| No | 1 | - | - | - |  |
| Yes | 1.379(1.121,1.697) | 0.976 | 0.002 | 0.32 |  |
| Fatty liver |  |  |  |  | 9(6, 7, 20, 23, 26, 34, 41, 57, 58) |
| No | 1 | - | - | - |  |
| Yes | 2.427(1.753,3.359) | 0.939 | <0.001 | 0.89 |  |
| Family history of diabetes |  |  |  |  | 17(7, 10, 11, 18, 21, 27-32, 43, 44, 51, 52, 54, 59, 60) |
| No | 1 | - | - | - |  |
| Yes | 1.621(1.514,1.737) | 0.498 | <0.002 | 0.48 |  |
| FBG (mg/dl) |  |  |  |  | 6(1, 24, 30, 44, 52, 61) |
| <100 | 1 | - | - | - |  |
| 100-109 | 3.637(2.405,5.501) | 0.979 | <0.003 | 1.29 |  |
| 110-125 | 11.767(8.28,16.722) | 0.970 | <0.004 | 2.47 |  |
| Low HDL-C |  |  |  |  | 4(26, 31, 38, 62) |
| No | 1 | - | - | - |  |
| Yes | 1.128(1.05,1.213) | 0.010 | 0.001 | 0.12 |  |
| TG (mmol/L) |  |  |  |  | 7(12, 22, 26, 30, 31, 38, 62) |
| <1.7 | 1 | - | - | - |  |
| ≥1.7 mmol/l | 1.783(1.451,2.191) | 0.883 | <0.001 | 0.58 |  |
| High Uric Acid |  |  |  |  | 5(1, 2, 63-65) |
| No | 1 | - | - | - |  |
| Yes | 1.203(1.066,1.358) | 0.640 | 0.003 | 0.18 |  |
| TYG |  |  |  |  | 5(66-70) |
| <8.25 | 1 | - | - | - |  |
| 8.25-8.6 | 1.73(1.245,2.406) | 0.614 | 0.001 | 0.55 |  |
| 8.6-9.0 | 2.426(2.027,2.904) | 0.409 | <0.001 | 0.89 |  |
| ≥9.0 | 3.993(2.971,5.368) | 0.557 | <0.001 | 1.38 |  |

S2 Table Basic information and quality evaluation results of 80 papers

| Number | First Author | Publication Year | Title | Journal Name | Population Source | Study Period | Sample Size | Quality |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | J. Zhao | 2019 | Triglyceride is an independent predictor of type 2 diabetes among middle-aged and older adults: a prospective study with 8-year follow-ups in two cohorts | J Transl Med | Tianjin, China | 2009-2017 | 7241 | high |
| 2 | X. Liu | 2016 | Prediction of the 20-year incidence of diabetes in older Chinese: Application of the competing risk method in a longitudinal study | Medicine (Baltimore) | Beijing, China | 1992-2012 | 1857 | high |
| 3 | T. Y. Tai | 1992 | Association of body build with non-insulin-dependent diabetes mellitus and hypertension among Chinese adults: a 4-year follow-up study | Int J Epidemiol | Taiwan, China | 1986-1990 | 1873 | middle |
| 4 | B. Wu | 2021 | [A cohort study on plasma uric acid levels and the risk of type 2 diabetes mellitus among the oldest old in longevity areas of China] | Zhonghua Yi Xue Za Zhi | China | 2008-2018 | 2213 | middle |
| 5 | M. Z. Wang | 2021 | The Combined Effect of Dyslipidemia on the Incidence of Type 2 Diabetes: A Prospective Cohort Study in Northwest of China | Biomed Environ Sci | China | 2011-2015 | 30546 | middle |
| 6 | X. Y. Yang | 2016 | [Body mass index, waist circumference and waist-to-height ratio associated with the incidence of type 2 diabetes mellitus: a cohort study] | Zhonghua Yu Fang Yi Xue Za Zhi | Henan, China | 2007-2014 | 11643 | high |
| 7 | Y. Z. Zhang | 2017 | [Association of alcohol use and incidence of type 2 diabetes mellitus in the middle-aged and elderly male population: a prospective cohort study] | Zhonghua Yu Fang Yi Xue Za Zhi | Hubei, China | 2008-2013 | 6784 | high |
| 8 | X. Y. Chen | 2016 | [Association between body mass index and its change and type 2 diabetes mellitus risk in a prospective study] | Zhonghua Liu Xing Bing Xue Za Zhi | China | 2006-2015 | 1867 | high |
| 9 | X. Xing | 1996 | [Predictable value of fasting blood glucose level for the incidence of non-insulin-dependent diabetes mellitus] | Zhonghua Nei Ke Za Zhi | Daqing, China | 1986-1992 | 341 | high |
| 10 | F. Xu | 2014 | Joint associations of physical activity and hypertension with the development of type 2 diabetes among urban men and women in Mainland China | PLoS One | Nanjing, China | 2004-2010 | 4550 | high |
| 11 | H. Yamazaki | 2016 | Lack of Independent Association Between Fatty Pancreas and Incidence of Type 2 Diabetes: 5-Year Japanese Cohort Study | Diabetes Care | Sapporo, Japan | 2008-2013 | 813 | high |
| 12 | M. Yoshimoto | 2023 | Sex differences in predictive factors for onset of type 2 diabetes in Japanese individuals: A 15-year follow-up study | J Diabetes Investig | Japan | 2004-2020 | 748 | high |
| 13 | Z. Song | 2022 | Metabolically healthy obesity, transition to unhealthy phenotypes, and type 2 diabetes in 0.5 million Chinese adults: the China Kadoorie Biobank | Eur J Endocrinol | China | 2004-2014 | 432763 | high |
| 14 | M. Liu | 2018 | Distribution of metabolic/obese phenotypes and association with diabetes: 5 years' cohort based on 22,276 elderly | Endocrine | Beijing, China | 2013-2018 | 4909 | high |
| 15 | M. H. Seo | 2011 | Association of lipid and lipoprotein profiles with future development of type 2 diabetes in nondiabetic Korean subjects: a 4-year retrospective, longitudinal study | J Clin Endocrinol Metab | Seoul, Korea | 2005-2009 | 5577 | middle |
| 16 | M. Xue | 2020 | Identification of Potential Type II Diabetes in a Large-Scale Chinese Population Using a Systematic Machine Learning Framework | J Diabetes Res | Xinjiang, China | 2018 | 582438 | middle |
| 17 | H. Sanada | 2012 | High body mass index is an important risk factor for the development of type 2 diabetes | Intern Med | Fukushima, Japan | / | 1554 | high |
| 18 | C. H. Kim | 2008 | Fatty liver is an independent risk factor for the development of Type 2 diabetes in Korean adults | Diabet Med | Asan, Korea | 2000-2005 | 5372 | high |
| 19 | W. Liu | 2020 | Obesity at a young age is associated with development of diabetes mellitus: A prospective cohort study in rural China | Postgrad Med | Tianjin, China | 1991-2014 | 971 | high |
| 20 | H. Nakajima | 2022 | Low aspartate aminotransferase/alanine aminotransferase ratio is a predictor of diabetes incidence in Japanese people: Population-based Panasonic cohort study 5 | Diabetes Metab Res Rev | Osaka, Japan | 2008-2018 | 70688 | high |
| 21 | T. Miyakoshi | 2016 | Development of new diabetes risk scores on the basis of the current definition of diabetes in Japanese subjects [Rapid Communication] | Endocr J | Matsumoto, Japan | / | 4159 | high |
| 22 | M. Iwasaki | 2021 | Fast walking is a preventive factor against new-onset diabetes mellitus in a large cohort from a Japanese general population | Sci Rep | Japan | 2008-2011 | 167684 | middle |
| 23 | Xintian Cai | 2020 | A nomogram of 5-year risk of type 2 diabetes in Chinese population | Journal of Hainan Medical University | China | 2010-2016 | 22936 | middle |
| 24 | Feng Sun | 2013 | Type 2 diabetes prevalence and estimated risks on developing type 2 diabetes within 5 years for adults aged 35-74 based on Chinese Taiwan MJ health-checkup database | Chinese Journal of Disease Control and Prevention | Taiwan, China | 1997-2006 | 24220 | middle |
| 25 | Lvyun Zhu | 2009 | A followed-up survey of diabetic risk factors in the simple obesity | China Journal of Modern Medicine | Shijiazhuang, China | 2000-2007 | 524 | middle |
| 26 | Sijie Deng | 2019 | The relationship between the waist circumference phenotype of hypertriglyceridemic and the risk of prediabetes and type 2 diabetes mellitus | Tianjin Medical Journal | Sichuan, China | 2011-2016 | 1722 | high |
| 27 | Jingchao Liu | 2012 | Impact of lifestyle and obesity on the occurence of type 2 diabetes ： a prospective study in Jiangsu province | Chinese Journal of Preventive Medicine | Jiangsu, China | 1999-2007 | 3461 | high |
| 28 | Yunrui Bai | 2023 | Correlation between gamma-glutamyl transpeptidase development track and new-onset type 2 diabetes mellitus in a health examination cohort | Chinese Journal of Diabetes | Liaoning, China | 2015-2020 | 1566 | middle |
| 29 | Qun Yan | 2020 | Evaluation about the efficiency of Shanghai Pudong Diabetes Risk Score for screening type 2 diabetes | Chinese Journal of Diabetes | Shanghai, China | 2002-2007 | 810 | middle |
| 30 | Jiachen Li | 2019 | Association of body mass index and waist circumference with major chronic diseases in Chinese adults | Chinese Journal of Epidemiology | China | 2004-2016 | 428113 | high |
| 31 | Kai Wu | 2011 | Predictive value of serum uric acid on type 2 diabetes mellitus | Chinese Journal of Epidemiology | China | 1992-2007 | 1061 | high |
| 32 | N. Dai | 2020 | Internal fat mediates the impact of age on diabetes onset in chinese people between 30 and 44 years old | Endocrinologia, Diabetes y Nutricion | China | 2004-2008 | 16042 | middle |
| 33 | Y. Li | 2017 | A Point-based Prediction Model for Predicting 10-year Risk of Developing Type 2 Diabetes Mellitus in Japanese Men: Aichi Workers' Cohort Study | Circulation | Japan | 2002-2015 | 3540 | high |
| 34 | M.-K. Ting | 2018 | Predicting Type 2 Diabetes Mellitus Occurance Using Three-Dimensional Anthropometric Body Surface Scanning Measurements: A Prospective Cohort Study | Journal of Diabetes Research | Taiwan, China | 2000-2013 | 8450 | high |
| 35 | M. Sakurai | 2013 | Family history of diabetes, lifestyle factors, and the 7-year incident risk of type 2 diabetes mellitus in middle-aged Japanese men and women | Journal of Diabetes Investigation | Japan | 2003-2010 | 3517 | high |
| 36 | L. Chen | 2021 | Association Between Aspartate Aminotransferase to Alanine Aminotransferase Ratio and Incidence of Type 2 Diabetes Mellitus in the Japanese Population: A Secondary Analysis of a Retrospective Cohort Study | Diabetes Metabolic Syndrome and Obesity-Targets and Therapy | Japan | 2004-2015 | 15291 | high |
| 37 | K. W. Lee | 2022 | Concurrent presence of high serum uric acid and inflammation is associated with increased incidence of type 2 diabetes mellitus in Korean adult population | Scientific Reports | Korea | 2007-2016 | 4152 | high |
| 38 | A. C. Tsai | 2015 | Determinants of new-onset diabetes in older adults-Results of a national cohort study | Clinical Nutrition | Taiwan, China | 1999-2003 | 2995 | middle |
| 39 | K.-C. Sung | 2012 | Combined Influence of Insulin Resistance, Overweight/Obesity, and Fatty Liver as Risk Factors for Type 2 Diabetes | Diabetes Care | Korea | 2003-2008 | 12853 | high |
| 40 | J. D. Kim | 2020 | Serum Transferrin Predicts New-Onset Type 2 Diabetes in Koreans: A 4-Year Retrospective Longitudinal Study | Endocrinology and Metabolism | Korea | 2005-2009 | 30699 | middle |
| 41 | A. R. Cho | 2021 | C-reactive protein-to-albumin ratio and 8-year incidence of type 2 diabetes: the Korean genome and epidemiology study | Acta Diabetologica | Korea | 2001-2014 | 5904 | high |
| 42 | D.-Y. Lee | 2017 | Association between alcohol consumption pattern and the incidence risk of type 2 diabetes in Korean men: A 12-years follow-up study | Scientific Reports | Korea | 2001-2012 | 1772 | high |
| 43 | T. Hayashi | 1999 | High normal blood pressure, hypertension, and the risk of type 2 diabetes in Japanese men - The Osaka Health Survey | Diabetes Care | Japan | 1981-1997 | 7594 | high |
| 44 | S. Akter | 2015 | Smoking, Smoking Cessation, and the Risk of Type 2 Diabetes among Japanese Adults: Japan Epidemiology Collaboration on Occupational Health Study | Plos One | Japan | 2008-2013 | 53930 | middle |
| 45 | L. Shi | 2013 | Physical Activity, Smoking, and Alcohol Consumption in Association with Incidence of Type 2 Diabetes among Middle-Aged and Elderly Chinese Men | Plos One | China | 2002-2011 | 51464 | middle |
| 46 | Y. Fan | 2020 | Waist Circumference and its Changes Are More Strongly Associated with the Risk of Type 2 Diabetes than Body Mass Index and Changes in Body Weight in Chinese Adults | Journal of Nutrition | China | 2008-2012 | 10419 | middle |
| 47 | C. Cao | 2022 | Association between central obesity and incident diabetes mellitus among Japanese: a retrospective cohort study using propensity score matching | Scientific Reports | Japan | 1994-2016 | 15453 | high |
| 48 | M. Hirano | 2014 | Low high-density lipoprotein cholesterol level is a significant risk factor for development of type 2 diabetes: Data from the Hawaii-Los Angeles-Hiroshima study | Journal of Diabetes Investigation | Japan | 1988-2010 | 2205 | high |
| 49 | R. Gong | 2021 | Associations of TG/HDL Ratio with the Risk of Prediabetes and Diabetes in Chinese Adults: A Chinese Population Cohort Study Based on Open Data | International Journal of Endocrinology | China | 2010-2016 | 116855 | middle |
| 50 | Y. Zhu | 2023 | The association between fatty liver index and onset of diabetes: secondary analysis of a population-based cohort study | Bmc Public Health | Japan | 2004-2015 | 14280 | high |
| 51 | A. Hozawa | 2010 | Relation of Gamma-Glutamyltransferase and Alcohol Drinking with Incident Diabetes: the HIPOP-OHP Study | Journal of Atherosclerosis and Thrombosis | Japan | / | 3095 | middle |
| 52 | X. Liu | 2018 | Smoking and smoking cessation in relation to risk of diabetes in Chinese men and women: a 9-year prospective study of 0.5 million people | Lancet Public Health | China | / | 482589 | high |
| 53 | W. D. Li | 2015 | Comparison of effects of obesity and non-alcoholic fatty liver disease on incidence of type 2 diabetes mellitus | World journal of gastroenterology | China | 2008-2012 | 4736 | high |
| 54 | S. J. Han | 2017 | Incidence and predictors of type 2 diabetes among Koreans: a 12-year follow up of the Korean genome and epidemiology study | Diabetes research and clinical practice | Korea | 2001-2012 | 5633 | high |
| 55 | K. K. Sato | 2007 | Walking to work is an independent predictor of incidence of type 2 diabetes in Japanese men: the Kansai healthcare study | Diabetes care | Japan | 2000-2005 | 8576 | high |
| 56 | K. K. Sato | 2009 | Combined measurement of fasting plasma glucose and A1C is effective for the prediction of type 2 diabetes: the Kansai healthcare study | Diabetes care | Japan | 2000-2005 | 9116 | middle |
| 57 | K. T. Chen | 2003 | Impaired fasting glucose and risk of diabetes in Taiwan: follow-up over 3 years | Diabetes research and clinical practice | Taiwan, China | 1995-1996 | 600 | middle |
| 58 | N. M. Wat | 2001 | Central obesity predicts the worsening of glycemia in southern Chinese | International journal of obesity and related metabolic disorders | Hong Kong, China | 1995-1996 | 644 | middle |
| 59 | M. Zhang | 2016 | Development and Validation of a Risk-Score Model for Type 2 Diabetes: A Cohort Study of a Rural Adult Chinese Population | Plos One | China | 2007-2014 | 12849 | high |
| 60 | C. Tong | 2022 | Establishment of dynamic nomogram and risk score models for T2DM: a retrospective cohort study in Beijing | Bmc Public Health | Beijing, China | 2006-2017 | 44852 | high |
| 61 | X. Chen | 2017 | Risk score model of type 2 diabetes prediction for rural Chinese adults: the Rural Deqing Cohort Study | J Endocrinol Invest | China | 2006-2015 | / | middle |
| 62 | H. Hu | 2020 | Prediction of 5-year risk of diabetes mellitus in relatively low risk middle-aged and elderly adults | Acta Diabetol | China | 2008-2013 | 4833 | high |
| 63 | H. Wang | 2020 | A Retrospective Population Study to Develop a Predictive Model of Prediabetes and Incident Type 2 Diabetes Mellitus from a Hospital Database in Japan Between 2004 and 2015 | Med Sci Monit | Japan | 2004-2015 | / | high |
| 64 | M. Xu | 2020 | Hypertriglyceridemic Waist Phenotype and Lipid Accumulation Product: Two Comprehensive Obese Indicators of Waist Circumference and Triglyceride to Predict Type 2 Diabetes Mellitus in Chinese Population | J Diabetes Res | China | 2004-2013 | 15717 | high |
| 65 | J. W. Lee | 2018 | The product of fasting plasma glucose and triglycerides improves risk prediction of type 2 diabetes in middle-aged Koreans | BMC Endocr Disord | Korea | / | 7708 | high |
| 66 | X. Han | 2018 | Development of a new scoring system to predict 5-year incident diabetes risk in middle-aged and older Chinese | Acta Diabetol | China | 2008-2013 | 4833 | high |
| 67 | H. Zhang | 2017 | A risk-score model for predicting risk of type 2 diabetes mellitus in a rural Chinese adult population: A cohort study with a 6-year follow-up | Diabetes Metab Res Rev | Luoyang, Henan, China | 2007-2014 | 15768 | high |
| 68 | Z. Lin | 2020 | A nomogram for predicting 5-year incidence of type 2 diabetes in a Chinese population | Endocrine | China | / | 32766 | middle |
| 69 | A. Nanri | 2015 | Development of Risk Score for Predicting 3-Year Incidence of Type 2 Diabetes: Japan Epidemiology Collaboration on Occupational Health Study | PLoS One | Japan | 2008-2013 | 37416 | middle |
| 70 | S. H. Choi | 2011 | Hemoglobin A1c as a diagnostic tool for diabetes screening and new-onset diabetes prediction: a 6-year community-based prospective study | Diabetes Care | Korea | 2001-2007 | 10038 | high |
| 71 | Hongyan Yang | 2022 | A prospective cohort study on the association between triglyceride-glucose index and type 2 diabetes | Chinese Preventive Medicine | Gansu, China | 2011-2015 | 30546 | high |
| 72 | Jiangping Wen | 2017 | Establishment of the new risk model for prediction of type 2 diabetes | Chinese Journal of Laboratory Medicine | Handan, Hebei, China | 2006-2013 | 4132 | high |
| 73 | Kai Liang | 2021 | A nomogram for risk estimation in progression to type 2 diabetes mellitus after a follow-up of 3 years in Chinese adults | Chinese Journal of Diabetes | China | 2012-2015 | 2788 | high |
| 74 | Yong Shao | 2021 | Non-alcoholic fatty liver disease increases the incidence rate of type 2 diabetes mellitus:a cohort study based on a rural town elderly population of southern Jiangsu | Chinese Journal of Hepatology | Jiangsu, China | 2007-2016 | 4867 | high |
| 75 | Xiangyu Yang | 2016 | Body mass index, waist circumference and waist-to-height ratio associated with the incidence of type 2 diabetes mellitus： a cohort study | Chinese Journal of Preventive Medicine | Henan, China | 2007-2014 | 11643 | high |
| 76 | X.-T. Cai | 2021 | Derivation and Validation of a Prediction Model for Predicting the 5-Year Incidence of Type 2 Diabetes in Non-Obese Adults: A Population-Based Cohort Study | Diabetes Metabolic Syndrome and Obesity | / | 1994-2016 | 12940 | high |
| 77 | T. Xu | 2022 | A nomogram model for the risk prediction of type 2 diabetes in healthy eastern China residents: a 14-year retrospective cohort study from 15,166 participants | Epma Journal | Jiangsu, China | 2006-2020 | 15166 | middle |
| 78 | S. H. Lee | 2014 | Predicting the development of diabetes using the product of triglycerides and glucose: the Chungju Metabolic Disease Cohort (CMC) study | PLoS One | Korea | 0 | / | high |
| 79 | D. Y. Lee | 2016 | Predictive Value of Triglyceride Glucose Index for the Risk of IncidentDiabetes: A 4-Year Retrospective Longitudinal Study | PLoS One | Korea | 4 | / | middle |
| 80 | M. Zhang | 2017 | Cumulative increased risk of incident type 2 diabetes mellitus with increasing triglyceride glucose index in normal-weight people: The Rural Chinese Cohort Study | Cardiovasc Diabetol | China | 0 | 5706 | high |

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