Plagiarism Checker X Originality Report

Similarity Found: 13%

Date: Wednesday, February 24, 2021
Statistics: 691 words Plagiarized / 5316 Total words
Remarks: Low Plagiarism Detected - Your Document needs Optional Improvement.

/

INTRODUCTION Diabetes Mellitus (DM) has developed as a major public health problem worldwide; according to the World Health Organization (WHO), there are around 347 million people with DM globally, and its exponential growth. It is estimated that DM will be the seventh leading cause of death in the world in 20301. According to the Ministry of Health of the Republic of Indonesia2, Indonesia is estimated to ranked 4th as the country with the most diabetes mellitus, with an estimated 21.3 million sufferers in 2030.

It is an estimation there are still many (around 50%) people with DM who have not been diagnosed in Indonesia. Also, only two-thirds of those diagnosed undergo treatment, both non-pharmacological and pharmacological3. Increasing the prevalence of DM in Indonesia must be prevented, so finding effective ways to identify individuals at risk of DM and preventing DM is a significant public health priority. Finnish Diabetes Risk Score (FINDRISC) is a simple and non-invasive screening tool to identify individuals at risk of Type 2 Diabetes Mellitus (T2DM)4.

The diagnosis of T2DM can be based on the measurement of Fasting Plasma Glucose (FPG), but this method is invasive, time-consuming, and expensive. Besides, FPG has not been able to identify individuals at high risk of T2DM when the condition is normoglycemic. FINDRISC is a simple and non-invasive screening tool5. Finnish Diabetes Risk Score is a Diabetes Mellitus risk assessment tool originating from Europe. Existing diabetes mellitus risk assessment tools from Europe or America cannot be adopted in Asian countries without prior validation. An instrument's performance should be evaluated and validated in a local setting6.

In this study, the Indonesian version of FINDRISC was used. This aims to find the validity and reliability of the screening tool that can be managed independently being adapted to the local language. This study is expected to contribute to obtaining a valid Indonesian version of the FINDRISC questionnaire so it can be a reference for detecting T2DM through risk scoring in healthy patients, and the increased DM cases in Indonesia can be prevented. Research on the Indonesian version of the FINDRISC questionnaire's validity and reliability has never been carried out in previous research in Indonesia.

Moreover, the difference between this study and previous studies in another country is seen from patient characteristics. In this study, research was carried out in the Special Region of Yogyakarta (Daerah Istimewa Yogyakarta; DIY) area with respondents who are native to the region who live in the DIY area and can be proven by the ownership of a local Identity Card (Kartu Tanda Penduduk). The efficacy of FINDRISC has been demonstrated in research of Tankova et al.7 in European populations.

The FINDRISC has been used successfully as an instrument for screening risk and detecting T2DM in individuals who have not been diagnosed in the community. There is a positive relationship between the prevalence of prediabetes with the odds ratio (OR) = 1.15) and diabetes with OR = 1.48. In addition, based on the validity test, it was found that the ROC-AUC value for detecting undiagnosed T2DM was 0.75 for the total population, 0.74 for men, and 0.78 for women (p = 0.04)8. The FINDRISC questionnaire has been validated in Europe with the subject of Early Middle-Aged Adults using the cohort method to detect undiagnosed T2DM.

The results showed that the ROC-AUC for undiagnosed T2DM was 0.824 with an optimal cut-off =14 (sensitivity = 68%, specificity = 81.7%). The research states that FINDRISC can be applied for screening, especially undiagnosed T2DM and dysglycemia among vulnerable groups in Europe9. Based on other references, conducted a validity test of the FINDRISC questionnaire on Slovenian Working Population in Europe using the cross-sectional method to screening subjects with undiagnosed T2DM.

The results showed that the validation of the FINDRISC questionnaire for screening undiagnosed T2DM in a working population in the Slovenian region stated results for men with a cut-off point =7 (sensitivity 100% and 0.78 AUC) and women with a cut-off point =13 (sensitivity 60.0 % and 0.78 AUC)10. The two references to previous studies were carried out in European regions. The FINDRISC questionnaire needs to be validated beforehand to be used in the Asian region6. Therefore, this study aims to determine the validity and reliability of the Indonesian version of FINDRISC in Yogyakarta.

FINDRISC score assessment is based on clinical characteristics such as age, body mass index (BMI), waist circumference, physical activity, consumption of vegetables and fruits, antihypertensive drugs, and history of high blood sugar levels11. MATERIALS AND METHODS Research design and sampling method This study was an observational study with a cross-sectional design that observed the FINDRISC score with fasting blood sugar levels observed at the same time to test the validity and reliability of the Indonesian version of FINDRISC on healthy respondents in Yogyakarta. The sampling technique used the convenience sample method by choosing healthy respondents willing to become research respondents according to the inclusion and exclusion criteria.

The Indonesian version of FINDRISC was obtained from Mr. M. Rifqi Rokhman (unpublished work). The questionnaires were obtained using the forward-backward translation method from the original version of FINDRISC. The specified inclusion criteria were participants aged =18 years and had been fasting for at least eight hours and were native to Yogyakarta. The exclusion criteria in the study were participants who were using drugs that could affect blood glucose levels (i.e., thiazides, beta-blockers, and

steroids), participants with diseases or clinical conditions that affected blood glucose levels (i.e.,

anorexia nervosa, hepatitis, and pancreatic tumor) and pregnant women. Number of samples and data collections According to the inclusion and exclusion criteria, the study population was the native DIY population who live in DIY, which can be proven with an Identity Card. Data collection was conducted in the Universitas Ahmad Dahlan environment involving the academic community of UAD. The research was conducted in May-June 2019, which coincides with the Ramadhan. Data collection was carried out every 13.00 hours after the respondent had fasted for eight hours. The sample size in this study for a single proportion with a 95% confidence interval was 60.

The participants' process of collecting data would be explained about the procedures and research information—participants who were willing to fill informed consent. Furthermore, participants fill in sociodemographic data and measure BMI. The BMI measurement was done by measuring the participant's weight and height. After that, the participant's waist circumference was measured by positioning the measuring device in the participants' navel area. Participants would be measured by fasting blood sugar and T2DM risk assessment using the Indonesian version of the FINDRISC questionnaire.

The FINDRISC assessment was conducted by interviewing according to question items on the participant's information sheet. The univariable analysis used descriptive statistical analysis to describe demographics, patient characteristics (gender, age, education, BMI, abdominal circumference, physical activity 30 minutes/day, daily consumption of vegetables or fruit, history of routine antihypertensive drug consumption for one month, previous history of high blood sugar levels, family history of Diabetes Mellitus, fasting blood glucose status as well as the relationship between the FINDRISC score and risk factors).

Numeric variables would be provided in mean values ± SD, and categorical variables would be provided in presentations. The validity test was carried out by using the ROC analysis, with AUC being used as the validity parameter. The diagnostic test was performed with a 2 x 2 tabulation to determine sensitivity and specificity values, positive predictive value (PPV), negative predictive value (NPV), likelihood ratio positive (LR+), and likelihood ratio negative (LR-). Interpretation of AUC values ??was classified as valid if the scores obtained were more than 0.7012, while the reliability test was performed with internal consistency, which was assessed using Cronbach's alpha.

Cronbach's alpha scores were categorized as reliable if the scores obtained were more than 0.713. Ethics approval This research had received ethical approval from the

research ethics committee of the School of Dentistry, Universitas Gadjah Mada in Yogyakarta with ethics clearance certificate number No. 0095/KKEP/FKG-UGM/EC/2019. RESULTS AND DISCUSSION The study obtained 60 test respondents who suitable for the inclusion and exclusion criteria.

The research results were then carried out with descriptive statistics and statistical analysis to determine the questionnaire's validity and reliability. Table I presents a descriptive analysis of respondents with nominal data, and characteristics are presented with means and deviation. In contrast, Table II shows a descriptive analysis of respondents with categorical data characteristics. Based on descriptive statistical analysis, there are as many as 14 respondents who experienced uncontrolled fasting blood sugar. These respondents were not previously diagnosed with T2DM.

According to International Diabetes Federation14, it was estimated that globally as many as 212.4 million people or half (50%) of all people who suffer from T2DM aged 20-79 years did not know that they had T2DM. Based on data, 14 respondents have a FINDRISC more than 10 at risk-score. According to Saaristo et al.15, further laboratory testing was used to detect prediabetes was carried out on respondents with a FINDRISC risk score of 10, and to detect undiagnosed T2DM was carried out at respondents with a FINDRISC risk score of 12.

In contrast, those with a FINDRISC risk score of 14 were considered candidates for further testing for possible glucose abnormalities. Based on the descriptive statistical analysis, the male respondents were 28 respondents, while the female respondents were 32. Two respondents had uncontrolled blood glucose status in male respondents, and in female respondents, 12 respondents had uncontrolled blood glucose status.

This was relevant to Trisnawati and Setyorogo16, which shows the prevalence of T2DM in women was higher than men because the women physically could increase BMI. Women also had monthly cycle syndrome (premenstrual syndrome) and post-menopause to make the distribution accumulated due to hormonal processes. However, according to American Diabetes Association17, gender was not a risk factor for T2DM. In the International literature, it was not mentioned that gender was one of the triggers of T2DM. Diabetes mellitus was influenced by genetic factors, obesity, environmental factors, and pregnancy. Based on data, the respondents' average age was 44.52 years with a standard deviation of 12.6. There were 30 respondents aged <45 years and 30 respondents aged =45 years.

In respondents aged <45, three respondents had uncontrolled blood glucose status, while in the research subject group =45 years 11 respondents had uncontrolled blood

glucose status. According to Song et al.18, the risk in the group of respondents aged =45 tends to be higher than those aged <45. This was because the risk of T2DM was higher in aging conditions. Aging could cause a shift in oxidative redox by weakening the mitochondria's metabolism, resulting in reduced mitochondrial function. Mitochondria contribute to decreased glucose uptake, so decreased mitochondrial function could lead to resistance.

This was relevant to research by Soelistijo et al.3, which stated that the risk for someone suffering from glucose intolerance increases with age. At the age of 45 years, routine checks should had been performed. At present, people with T2DM reach 90-95% of the total population of people with T2DM generally aged over 45 years. At the research, the respondents' education level was divided into high and low education. The separation of the two categories was based on the length of education; if the length of education was less than or equal to 12 years, it was stated in the low educated category.

Respondents who had higher education were 27, while those with low education were 33. In high education research respondents, eight respondents had uncontrolled blood glucose status, and in low education research respondents, six respondents had uncontrolled blood glucose status. Based on research data, level education did not affect the incidence of T2DM. This was in accordance with Ekpenyong et al.19, which reported that the incidence of T2DM was due to other confounding effects such as adiposity index, lifestyle, and genetic predisposition.

Based on risk score data, in high education research respondents, five respondents had high score risk (=10), and in low education research respondents, nine respondents had high score risk. This was in line with Steele et al.20, which reported a relationship between the incidences of T2DM with low-educated individuals that were found to be a greater risk for developing T2DM compared to individuals with high education. There were variables considered to explain the proportion of education relationship with the occurrence of T2DM. Based on research, the average BMI of the respondents was 24.91±4.40. In this study, 25 respondents were overweight, with a BMI of =25.

Of 25 respondents with a BMI of =25, nine respondents had uncontrolled blood glucose status. According to Trisnawati and Setyorogo16, the BMI, together with other variables, had a significant relationship with T2DM. The group with the greatest risk of T2DM was the obese group, with a probability of 7.14 times greater than the normal BMI group. Obesity causes increased secretion of non-esterified fatty acids (NEFAs) in plasma, which could trigger insulin resistance. This causes a decrease in glucose transport into muscle cells, increases fat breakdown, and then leads the liver to increase glucose production. Apart from that, insulin sensitivity was also influenced by other factors: the distribution

of body fat.

Individuals who were obese have a greater fat distribution in their abdomen than any other part of the body. Abdominal fat was considered more lipolytic than subcutaneous fat, nor does it readily respond to insulin's antilipolytic action.21. In addition to BMI, waist circumference was also one factor that influences T2DM incidence. Assessment with BMI did not depend on age and gender. However, BMI cannot be used for pregnant women and muscular people such as athletes. Waist circumference was the best predictor for the risk of degenerative diseases22. Based on the study, the average waist circumference of all respondents was 89.31 ± 10.32 cm.

In the FINDRISC questionnaire, the risk assessment of respondents' waist circumference was divided into three categories. Based on research by Septyaningrum and Santi23, after analyzing the Pearson correlation coefficient to assess the relationship between waist circumference and blood glucose levels, it was found that both had the highest Pearson correlation coefficient of 0.424, higher than the correlation coefficient between the BMI index and waist circumference ratio. Based on the respondents' physical activity, 46 respondents did physical activity 30 minutes/day, and 14 respondents did not.

In 14 respondents who did not have physical activity 30 minutes/day, three respondents had uncontrolled blood glucose. This was supported by Trisnawati and Setyorogo16, which shows a significant relationship between physical activity and the incidence of T2DM. Respondents with strenuous physical activity had a lower risk of suffering from T2DM compared with people with mild daily physical activity (OR 0.239) (95% CI 0.071 0.802).

Physical activity was directly related to fasting blood glucose levels in people with T2DM, in which high intensity of the physical activity would affect the speed of blood glucose recovery in muscles. During physical activity, muscles use stored glucose, so the stored glucose was reduced. To fill the deficiency in muscles, the body would take glucose in the blood. Therefore, endogenous glucose would be increased to maintain a balance of blood glucose levels24. In terms of vegetable or fruit consumption, 52 respondents routinely ate vegetables and fruit, and eight respondents did not.

In eight respondents who did not routinely consume vegetables and fruit, seven respondents had uncontrolled blood glucose. According to Li et al.25, a higher intake of fruit or green leafy vegetables was significantly associated with reducing the risk of T2DM. Based on Bazzano et al.26, fruits, vegetables, and cereals were the primary fiber source. Dietary fiber had been shown to delay the absorption of carbohydrates after meals and reduce insulinemic responses to carbohydrates. Fiber also increases satiety,

reduces hunger, and reduces energy intake to contribute to weight control and avoid obesity.

Table I. Characteristics research respondents in nominal Respondent characteristics _Average ± SD _ _Age _44.52 ± 12.6 _ _BMI _24.915 ± 4.3994 _ _Waist circumference _89.317 ± 10.323 _ _Fasting blood glucose _103.43 ± 30.524 _ _ Based on the history of antihypertensive drugs' routine consumption for one month, 11 respondents had a history of consuming routine antihypertensive drugs for one month, and seven respondents had uncontrolled blood glucose status. Based on Taylor et al.27, research, the use of diuretics such as thiazides and ß-blockers was independently associated with a higher risk of T2DM. According to Weycker et al.28, the antihypertensive calcium channel blocker (CCB) and angiotensin II receptor blocker (ARB) groups had a higher risk of developing T2DM.

The study explained that when comparing the antihypertensive risk of the CCB and ARB groups to the incidence of T2DM, patients who started treatment with valsartan were less likely to develop T2DM than patients who started treatment with amlodipine. Table II. Characteristics research respondents in categorical Respondent characteristics _n _Fasting blood glucose _Finnish Diabetes Risk Score _ _ _ _High (=126 mg/dL) _Normal (<126 mg/dL) _High Risk (=10) _Low Risk (<10) _ _ _n= 60 _n= 14 _n= 46 _n= 14 _n= 46 _ _Sociodemographic _ _a. Gender _ _Male _28 (46.7) _2 (7.13) _26 (92.87) _1 (3.57) _27 (96.42) _ _Female _32 (53.5) _12 (27.5) _20 (62.5) _13 (40.63) _19 (59.37) _ _b. Age _ _<45 _18 (30) _0 (0) _18 (100) _0 (0) _18 (100) _ _>45 _42 (70) _14 (33.33) _28 (66.66) _14 (33.33) _28 (66.66) _ _c. Education _ _Low _33 (55) _6 (18.18) _27 (81.81) _9 (27.27) _24 (72.72) _ _High _27 (45) _8 (29.62) _19 (70.37) _5 (18.51) _22 (81.48) _ _FINDRISC questionnaire _ _a. Body Mass Index _ _=25 _25 (41.6) _9 (36) _16 (64) _5 (20) _20 (80) _ _<25 _35 (59.3) _5 (14.58) _30 (85.71) _9 (25.71) _26 (74.28) _ _b. Waist circumference _ _94 cm (male)/ 80 cm (female) _21 (35) _1 (4.76) _20 (95.23) _0 (0) _21 (100) _ _94-102 cm (male)/ 80-88 cm (female) _18 (30) _3 (16.67) _15 (83.33) _5 (27.77) _13 (72.22) _ _>102 cm (male)/ >88 cm (female) _21 (35) _10 (47.62) _11 (52.38) _9 (42.86) _12 (57.14) _ _c.

Physical activity 30 minutes/day _ _Yes _46 (80) _11 (23.91) _35 (76.09) _11 (23.92) _35 (76.08) _ _No _14 (20) _3 (21.43) _11 (78.57) _3 (21.43) _11 (78.57) _ _d. Vegetable or fruit daily consumption _ _Yes _52 (86.6) _7 (13.46) _45 (86.54) _6 (11.54) _46 (88.46) _ _No _8 (13.4) _7 (87.5) _1 (12.5) _8 (100) _0 (0) _ _e. Routine one-month antihypertensive drug consumption history _ _Yes _11 (18.3) _7 (63.63) _4 (36.36) _8 (72.72) _3 (27.27) _ _No _49 (81.6) _7 (14.28) _42 (85.71) _6 (12.25) _43 (87.75) _ _f. History of high blood sugar levels _ _Yes _8 (13.33) _7 (87.5) _1 (12.5) _8 (100) _0 (0) _ _No _52 (86.66) _7 (13.46) _45 (86.53) _6 (11.54) _46 (88.46) _ _g. Family history with diabetes mellitus _ _Yes _9 (15) _7 (77.78) _2 (22.22) _9 (100) _0 (0) _ _No _51 (85) _7 (16.98) _44 (83.02) _5 (8.33) _46 (91.67) _

_Note: the numbers in parentheses represent the percentage Based on the respondents with a history of previous high blood sugar levels, eight respondents had a history of previous high blood sugar levels, and of these eight people, seven respondents had uncontrolled blood glucose status. Respondents who had experienced high blood sugar tend to experience uncontrolled blood sugar.

This was following the research of Gayatri29, which states a relationship between fasting blood sugar levels and T2DM, and the risk of respondents who had high fasting blood sugar levels compared to low fasting blood sugar to experience T2DM is 1.167 times. Based on the respondents' assessment with a family history of T2DM, nine respondents had a family history of T2DM. Of the nine respondents with a family history of T2DM, seven respondents had uncontrolled blood glucose status. In the study from Isnaini and Ratnasari30, it was found that people who had a family history of T2DM were 10,938 times more likely to suffer from T2DM than people who did not have a family history of T2DM. In the study of Geetha et al.31, there was an increased risk if the family with a history of T2DM was the mother, compared if the family with a history of T2DM was the father. People with a family history of T2DM were more prone to early attacks of T2DM and developing complications.

Statistical analysis validity and reliability T The validity test was carried out using the current validity type. The type of current validity (concurrent validity) refers to the conformity of the measurement results between the measuring instrument being tested and the ideal measuring instrument (gold standard) at the same time. They evaluated the validity of the questionnaire with ROC curve analysis, FINDRISC's performance in predicting diabetes in a cross-sectional setting in the outstanding category with an AUC value of 0.935 (95% CI 0.865 1.00), and a cut-off point of 10.

Cut-off points were used to determine the score value of how someone was said to be sick or diseased. Respondents with a score of <10 are categorized as normal risk, while respondents with a score of 10 were categorized as prediabetes. As shown in Figure 1, sensitivity was plotted on the y-axis in the ROC curve, and false-positive values (1 specificity) were plotted on the x-axis. The better an instrument, the steeper the ROC curve's top and the higher the area under the curve (AUC). The optimal cut-points assessment on curves was seen based on the curve's peak points formed by the cut-off sensitivity and 1 specificity7. This was following the study from Bernabe-Ortiz et al.32, which found an AUC ROC value of 0.69 (95% CI: 0.64 0.74).

The value was higher than the accuracy diagnostic LA FINDRISC was 0.68 (95% CI: 0.63 0.74), and Peruvian Risk was 0.64 (95% CI: 0.58 0.70). However, there was no significant difference in the diagnostic accuracy of the risk scores mentioned above (p = 0.15). /

Figure 1. ROC curve FINDRISC score in identifying diabetes mellitus In addition to determining the quality of the Indonesian version of the FINDRISC questionnaire as a tool for identifying patients with uncontrolled blood glucose levels, diagnostic test assessments were carried out by assessing sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (+LR), and the negative likelihood ratio (-LR).

This value could be obtained from the tabulation of the FINDRISC score 2 x 2 and fasting blood glucose status, as presented in Table III. Table III. Tabulation of 2 x 2 FINDRISC score and fasting blood glucose FINDRISC Score _Fasting Blood Glucose _Total _ _ _=126 _<126 _ _ _=10 _12 _2 _14 _ _<10 _2 _44 _46 _ _ The study results obtained a sensitivity value of 85%, indicating that the Indonesian version of the FINDRISC questionnaire could measure research respondents with uncontrolled blood glucose levels with a high-risk level of 85%.

According to Waspadji33, similar research was categorized as good if it had a sensitivity value of =70%, so this research was categorized as good. This study's specificity value was 95%, which indicates that the Indonesian version of the FINDRISC questionnaire could measure respondents who had controlled blood glucose levels with a low-risk level of 95%. This specificity value indicates that as many as 95 respondents out of 100 study respondents had controlled blood glucose levels and had a low blood sugar risk score.

Based on Waspadji33, a study was categorized as very good if it had a specificity value of =90%, so this research could be considered very good. A PPV of 85% was obtained in this study. This shows that the Indonesian version of the FINDRISC questionnaire could predict respondents with uncontrolled blood glucose levels with a high-risk score of 85%. Simultaneously, an NPV value of 95% was obtained, which indicates that the Indonesian version of the FINDRISC questionnaire could predict study respondents with controlled blood glucose levels with a low-risk score of 95%.

From this study, the +LR value obtained was 5.66, indicating that respondents had a chance to detect diabetes mellitus by 5.66 times higher when measured by the FINDRISC Score. According to Akobeng34, similar research was categorized as sufficient if it had +LR >2 so that in this study, it could be categorized as sufficient. This study's -LR value was 0.15, indicating that the respondent had a 0.15 times lower chance of detecting diabetes mellitus when measured by the FINDRISC Score. Based on Akobeng34, a study was categorized as very good if it had a value of -LR <0.2, so this research could be considered very good.

The results of all diagnostic parameters can be seen in Table IV. Table IV. Diagnostic test parameters Diagnostic Test Parameters _Value _Category _ _Sensitivity (Sn) _85% _Good _ _Specificity (Sp) _95% _Very Good _ _Positive Predictive Value (PPV) _85% _- _ _Negative Predictive Value (NPV) _95% _- _ _Positive Likelihood Ratio (+LR) _5.66 _Fair _ _Negative Likelihood Ratio (-LR). _0.15 _Very Good _ _ The reliability assessment was carried out using Cronbach's alpha to measure the reliability of the indicators used in the research questionnaire.

The Cronbach's alpha value of the Indonesian version of the FINDRISC questionnaire in this study was 0.727. Cronbach's alpha results indicate that the FINDRISC research questionnaire's reliability performance in this study was in the acceptable category, with AUC values ??in the range of 0.7 to 0.79. CONCLUSION The Indonesian version of the FINDRISC questionnaire used in this study could be concluded as valid.

The Indonesian version of the FINDRISC questionnaire was categorized as reliable by providing accurate and consistent measurement results from repeated measurement. The Indonesian version of the FINDRISC questionnaire could be used in populations in the Special Region of Yogyakarta and could detect individuals at high risk of diabetes. As suggestions for further research, it was necessary to determine the type of exercise and the daily frequency that would be determined in the assessment, as well as the portions of fruits and vegetables that would be determined as a reference in the assessment. ACKNOWLEDGMENT The author would like to thank the respondents who were willing to participate in this study and Mr. M. Rifqi Rokhman, who allowed the Indonesian version of the FINDRISC questionnaire to be used as an instrument in this study.

REFERENCES Ishaque A, Shahzad F, Muhammad FH, Usman Y, Ishaque Z. Diabetes risk assessment among squatter settlements in Pakistan: A cross-sectional study. Malays Fam Physician. 2016;11(2-3):9-15. Ministry of Health of the Republic of Indonesia. InfoDatin Pusat Data dan Informasi Kementerian Kesehatan RI: Hari Diabetes Sedunia Tahun 2018. Jakarta, Indonesia: Ministry of Health of the Republic of Indonesia; 2018. Soelistijo SA, Novida H, Rudijanto A, Soewondo P, Suastika K, Manaf A, et al. Konsensus Pengelolaan Dan Pencegahan Diabetes Melitus Tipe 2 Di Indonesia. Jakarta, Indonesia: Perkumpulan Endokrinologi Indonesia; 2015. Wu Y, Ding Y, Tanaka Y, Zhang W.

Risk Factors Contributing to Type 2 Diabetes and Recent Advances in the Treatment and Prevention. Int J Med Sci. 2014;11(11):1185-1200. doi:10.7150/ijms.10001 Costa B, Barrio F, Piñol JL, Cabré JJ, Mundet X, Sagarra R, et al. Shifting from glucose diagnosis to the new HbA1c diagnosis reduces the capability of the Finnish Diabetes Risk Score (FINDRISC) to screen for glucose abnormalities within a real-life primary healthcare

preventive strategy. BMC Med. 2013;11:45. doi:10.1186/1741-7015-11-45 Dugee O, Janchiv O, Jousilahti P, Sakhiya A, Palam E, Nuorti JP, et al. Adapting existing diabetes risk scores for an Asian population: a risk score for detecting undiagnosed diabetes in the Mongolian population. BMC Public Health. 2015;15:938. doi:10.1186/s12889-015-2298-9 Tankova T, Chakarova N, Atanassova I, Dakovska L. Evaluation of the Finnish Diabetes Risk Score as a screening tool for impaired fasting glucose, impaired glucose tolerance and undetected diabetes. Diabetes Res Clin Pract. 2011;92(1):46-52. doi:10.1016/j.diabres.2010.12.020 Zhang L, Zhang Z, Zhang Y, Hu G, Chen L. Evaluation of Finnish Diabetes Risk Score in screening undiagnosed diabetes and prediabetes among U.S. adults by gender and race: NHANES 1999-2010. PLoS One. 2014;9(5):e97865. doi:10.1371/journal.pone.0097865 Mavrogianni C, Lambrinou CP, Androutsos O, Lindström J, Kivelä J, Cardon G. Evaluation of the Finnish Diabetes Risk Score as a screening tool for undiagnosed type 2 diabetes and dysglycaemia among early middle-aged adults in a large-scale European cohort.

The Feel4Diabetes-study. Diabetes Res Clin Pract. 2019;150:99-110. doi:10.1016/j.diabres.2019.02.017 Štiglic G, Fijacko N, Stožer A, Sheikh A, Pajnkihar M. Validation of the Finnish Diabetes Risk Score (FINDRISC) questionnaire for undiagnosed type 2 diabetes screening in the Slovenian working population. Diabetes Res Clin Pract. 2016;120:194-7. doi:10.1016/j.diabres.2016.08.010 Kulkarni M, Foraker RE, McNeill AM, Girman C, Golden SH, Rosamond WD, et al. Evaluation of the Modified FINDRISC Diabetes Score to Identify Individuals at High Risk for Diabetes among Middle-aged White and Black ARIC Study Participants.

Diabetes Obes Metab. 2017;19(9):1260-6. doi:10.1111/dom.12949 Hosmer DW, Lemeshow S, Sturdivant RX. Applied Logistic Regression. 3rd edition. New Jersey, US: John Wiley & Sons, Inc; 2013. Hair Jr JF, Black WC, Babin BJ, Anderson RE. Multivariate Data Analysis. 7th edition. New Jersey, US: Prentice Hall; 2014. International Diabetes Federation. International Diabetes Federation Diabetes Atlas. 9th edition. Brusesels, Belgium: International Diabetes Federation; 2019. Saaristo T, Peltonen M, Lindström J, Saarikoski L, Sundvall J, Eriksson JG, et al. Cross-sectional evaluation of the Finnish Diabetes Risk Score: a tool to identify undetected type 2 diabetes, abnormal glucose tolerance and metabolic syndrome.

Diab Vasc Dis Res. 2005;2(2):67-72. doi:10.3132/dvdr.2005.011 Trisnawati SK, Setyorogo S. Faktor Risiko Kejadian Diabetes Melitus Tipe II Di Puskesmas Kecamatan Cengkareng Jakarta Barat Tahun 2012. Jurnal Ilmiah Kesehatan. 2013;5(1):6-11. American Diabetes Association. Standards of Medical Care in Diabetes—2019 Abridged for Primary Care Providers. Clin Diabetes. 2019;37(1):11-34. doi:10.2337/cd18-0105 Song J, Lee WT, Park KA, Lee JE. Association between risk factors for vascular dementia and adiponectin.

Biomed Res Int. 2014;2014:261672. doi:10.1155/2014/261672 Ekpenyong CE, Akpan UP, Ibu JO, Nyebuk DE.

Gender and age specific prevalence and associated risk factors of type 2 diabetes mellitus in Uyo metropolis, South Eastern Nigeria. Diabetol Croat. 2012;41(1):17-28. Steele CJ, Schöttker B, Marshall AH, Kouvonen A, O'Doherty MG, Mons U, et al. Education achievement and type 2 diabetes-what mediates the relationship in older adults? Data from the ESTHER study: a population-based cohort study. BMJ Open. 2017;7(4):e013569. doi:10.1136/bmjopen-2016-013569 Al-Goblan AS, Al-Alfi MA, Khan MZ. Mechanism linking diabetes mellitus and obesity. Diabetes Metab Syndr Obes. 2014;7:587-91. doi:10.2147/dmso.s67400 Triwinarto A, Muljati S, Jahari AB.

Cut-Off Point Indeks Massa Tubuh (Imt) Dan Lingkar Perut Sebagai Indikator Risiko Diabetes Dan Hipertensi Pada Orang Dewasa Di Indonesia. Penelitian Gizi Makanan J Nutr Food Res. 2012;35(2):119-35. Septyaningrum N, Santi M. Lingkar Perut Mempunyai Hubungan Paling Kuat Dengan Kadar Gula Darah. Jurnal Berkala Epidemiologi. 2014;2(1):48-58. doi:10.20473/jbe.V2I12014.48-58 Nurayati L, Adriani M. Hubungan Aktifitas Fisik Dengan Kadar Gula Darah Puasa Penderita Diabetes Melitus Tipe 2. Amerta Nutr. 2017;1(2):80-7. doi:10.20473/amnt.v1i2.2017.80-87 Li M, Fan Y, Zhang X, Hou W, Tang Z.

Fruit and vegetable intake and risk of type 2 diabetes mellitus: meta-analysis of prospective cohort studies. BMJ Open. 2014;4(11):e005497. doi:10.1136/bmjopen-2014-005497 Bazzano LA, Serdula MK, Liu S. Dietary intake of fruits and vegetables and risk of cardiovascular disease. Curr Atheroscler Rep. 2003;5(6):492-9. doi:10.1007/s11883-003-0040-z Taylor EN, Hu FB, Curhan GC. Antihypertensive Medications and the Risk of Incident Type 2 Diabetes. Diabetes Care. 2006;29(5):1065-70. doi:10.2337/dc05-2366 Weycker D, Edelsberg J, Vincze G, Kjeldsen SE, Jamerson K, Khan ZM, et al. Risk of diabetes in a real-world setting among patients initiating antihypertensive therapy with valsartan or amlodipine.

J Hum Hypertens. 2007;21(5):374-80. doi:10.1038/sj.jhh.1002159 Gayatri RW. Hubungan Faktor Riwayat Diabetes Mellitus Dan Kadar Gula Darah Puasa Dengan Kejadian Diabetes Mellitus Tipe 2 Pada Pasien Usia 25-64 Tahun Di Puskesmas Kendal Kerep Kota Malang. Preventia Indones J Public Health. 2019;4(1):1-7. doi:10.17977/um044v4i1p56-62 Isnaini N, Ratnasari R. Faktor risiko mempengaruhi kejadian Diabetes mellitus tipe dua. Junal Kebidanan dan Keperawatan Aisyiyah. 2018;14(1):59-68. doi:10.31101/jkk.550 Geetha A, Gopalakrishnan S, Umadevi R. Study on the impact of family history of diabetes among type 2 diabetes mellitus patients in an urban area of Kancheepuram district, Tamil Nadu. Int J Community Med Public

Health. 2017;4(11):4151-6. doi:10.18203/2394-6040.ijcmph20174819 Bernabe-Ortiz A, Perel P, Miranda JJ, Smeeth L. Diagnostic accuracy of the Finnish Diabetes Risk Score (FINDRISC) for undiagnosed T2DM in Peruvian population. Prim Care Diabetes. 2018;12(6):517-25. doi:10.1016/j.pcd.2018.07.015 Waspadji S.

Pengkajian Status Gizi: Studi Epidemiologi. Jakarta, Indonesia: Fakultas Kedokteran Universitas Indonesia; 2003. Akobeng AK. Understanding diagnostic tests 1: sensitivity, specificity and predictive values. Acta Paediatr. 2007;96(3):338-41. doi:10.1111/j.1651-2227.2006.00180.x

INTERNET SOURCES:

<1% - https://www.onlinelibrary.wiley.com/doi/full/10.1111/ceo.12696
<1% - http://www.diabetesincontrol.com/diabetes-leading-cause-of-death/
<1% - https://www.sciencedirect.com/science/article/pii/S0168822720308159
<1% - https://www.academia.edu/14368265/A_European_Evidence_Based_Guideline_for_the_Prevention_of_Type_2_Diabetes
<1% - https://www.researchgate.net/publication/283283192_Take_action_to_prevent_diabetes_-_the_IMAGE_toolkit_for_the_prevention_of_type_2_diabetes_in_Europe
<1% - https://www.researchgate.net/publication/231214952_The_Korean_Version_of_the_Connor-Davidson_Resilience_Scale_An_Extended_Validation
<1% - https://ps.psychiatryonline.org/doi/full/10.1176/ps.2006.57.12.1795
<1% - https://issuu.com/dpu-ucl/docs/2020-05-16_grounded_learning_2018-2019
<1% - https://www.researchgate.net/publication/23687953_The_Finnish_Diabetes_Risk_Score_Is_Associated_with_Insulin_Resistance_and_Progression_towards_Type_2_Diabetes
<1% - https://www.researchgate.net/publication/38058049_Early-stage_atherosclerosis_in_newly_diagnosed_untreated_type_2_diabetes_mellitus_and_impaired_glucose_tolerance
<1% - https://www.researchgate.net/publication/255974089_The_performance_of_the_Finnish_Diabetes_Risk_Score_a_modified_Finnish_Diabetes_Risk_Score_and_a_simplified_Finnish_Diabetes_Risk_Score_in_community-based_cross-sectional_screening_of_undiagnosed_type_
<1% - https://www.researchgate.net/publication/340583719_Self-medication_practice_literacy_and_associated_factors_among_university_students_in_Yogyakarta

<1% - https://www.sciencedirect.com/science/article/pii/S2387020617303042
<1% - https://idoc.pub/documents/buku-abstrak-icohap-1-eljmm951exl1
<1% - https://www.science.gov/topicpages/u/universitas+sumatera+utara.html
<1% - https://www.researchgate.net/publication/46255610_Training_in_the_fasted_state_improves_glucose_tolerance_during_fat-rich_diet
<1% - https://wellcomeopenresearch.org/articles/3-162
<1% - https://www.easynotecards.com/print_list/106765
<1% - https://pubs.asahq.org/anesthesiology/article/112/4/1023/10681/Statistical-Evaluation-of-a-Biomarker
<1% - https://jpro.springeropen.com/articles/10.1186/s41687-019-0157-7
<1% - https://bmcmusculoskeletdisord.biomedcentral.com/articles/10.1186/s12891-018-2034-6
<1% - https://www.sciencedirect.com/science/article/pii/S0168822710006418
<1% - https://quizlet.com/414206200/final-exam-stats-flash-cards/
<1% - https://vtagit.info/diabetescauses1/diabetes-type-1-causes.us?diabetescausestype=diabetescausestype
<1% - https://www.sciencedirect.com/science/article/pii/S0160412019303587
<1% - https://www.frontiersin.org/articles/10.3389/fendo.2019.00049/full
<1% - https://onlinelibrary.wiley.com/doi/10.1111/jgh.15353
<1% - https://www.researchgate.net/publication/265555417_Causes_of_type_2_diabetes_in_China
<1% - https://www.researchgate.net/publication/235750435_Very_severely_obese_patients_have_a_high_prevalence_of_type_2_diabetes_mellitus_and_cardiovascular_disease
<1% - https://academic.oup.com/edrv/article/25/5/807/2355272
<1% - https://www.researchgate.net/publication/261610984_Correlation_between_Body_Mass_Index_and_Waist_Circumference_in_Patients_with_Metabolic_Syndrome
<1% - https://www.coursehero.com/file/p4ttmqkd/WC-than-respondents-who-did-not-involve-in-in-moderate-intensity-physical/
<1% - https://www.scribd.com/document/432851136/Cjr-Biology-Umum
<1% - https://www.sciencedirect.com/science/article/pii/S016882271830072X
<1% - https://www.researchgate.net/publication/321494533_Fruit_and_vegetable_intake_and_p

re-diabetes_a_case-control_study
<1% -
https://www.researchgate.net/publication/289117838_Dietary_fiber_and_satiety_The_effects_of_oats_on_satiety
<1% -
https://www.researchgate.net/publication/282523390_Blood_Pressure_Control_Associates_and_Antihypertensive_Pharmacotherapy_Patterns_in_Tikur_Anbessa_General_Specialized_Hospital_Chronic_Care_Department_Addis_Ababa_Ethiopia
<1% -
https://journalimplantdent.springeropen.com/articles/10.1186/s40729-020-00231-9
<1% -
https://www.researchgate.net/publication/5332668_Patient_Adherence_With_Amlodipine_Lisinopril_or_Valsartan_Therapy_in_a_Usual-Care_Setting
<1% -
https://dishaphs.info/preonlinetest/pre-diabetes-online-test.bing?testonlinepre=testonlinepre
<1% - https://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0231291
<1% - https://www.sciencedirect.com/science/article/pii/S2590093519300256
<1% - https://www.spsstests.com/2015/02/how-to-test-validity-questionnaire.html
<1% - https://quizlet.com/4705010/research-methods-flash-cards/
<1% -
https://www.researchgate.net/publication/49670754_Validation_of_the_Finnish_Diabetes_Risk_Score_FINDRISC_questionnaire_for_screening_for_undiagnosed_type_2_diabetes_dysglycaemia_and_the_metabolic_syndrome_in_Greece
<1% - https://pophealthmetrics.biomedcentral.com/articles/10.1186/1478-7954-9-49
<1% - https://www.sciencedirect.com/science/article/pii/S1751991818302444
<1% - https://www.ahajournals.org/doi/10.1161/JAHA.119.013845
<1% - https://pubs.acs.org/doi/10.1021/acsnano.9b06395
<1% -
https://journals.lww.com/jnr-twna/Fulltext/2020/12000/Psychometric_Testing_of_an_Indonesian_Version.9.aspx
<1% -
https://www.researchgate.net/publication/40909063_Reliability_and_validity_of_the_Greek_translation_of_the_MOS-HIV_health_survey_in_HIV-infected_individuals
<1% -
https://www.researchgate.net/publication/340787742_The_College_Academic_Self-Efficacy_Scale_CASES_An_Indonesian_Validation_to_Measure_the_Self-Efficacy_of_Students
<1% -
https://www.researchgate.net/publication/9069428_Nursing_and_health_care_in_Indonesia

<1% - https://www.mdpi.com/rss/journal/socsci
<1% - http://scholar.unand.ac.id/49511/4/DAFTAR%20PUSTAKA.pdf
1% - https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-13-633
1% - https://europepmc.org/article/PMC/PMC7880001
1% - https://www.clemson.edu/cbshs/faculty-staff/profiles/lz3
1% - https://www.domusmedica.be/sites/default/files/Opvolgrapport%20Diabetes%20Mellitus%20Type%202%202017.pdf
1% - https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0191316
<1% - https://www.frontiersin.org/articles/10.3389/fendo.2019.00451/full
<1% - https://www.ahajournals.org/doi/abs/10.1161/circulationaha.115.018585
<1% - https://www.ijcmph.com/index.php/ijcmph/issue/view/32