RISK FACTORS INFLUENCING THE INCIDENCE OF PREDIABETES BASED ON SCREENING ACTIVITIES AT THE INTEGRATED NON-COMMUNICABLE DISEASES DEVELOPMENT POST (POSBINDU PTM) IN MEDAN KOTA DISTRICT HEALTH CENTER

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ABSTRAK

Faktor risiko prediabetes sama dengan DMT2 seperti riwayat keluarga diabetes, jenis kelamin perempuan, obesitas, dan lain sebagainya. Deteksi dini prediabetes dapat membuka pintu untuk intervensi pencegahan DMT2. Jenis penelitian ini adalah deskriptif analitik dengan desain cross sectional. Metode pengumpulan data berupa rekam medis dan obeservasi lapangan. Berdasarkan hasil uji spearman diperoleh bahwa tidak terdapat hubungan yang signifikan antara jenis kelamin (p-value=0, 609, Correlation Coefficient=-0.079, hubungan berlawanan), riwayat keturunan diabetes (p-value=0.298, Correlation Coefficient=0.160, hubungan searah), dan obesitas (p-value=0.382, Correlation Coefficient=-0.135, hubungan berlawanan) dengan kejadian prediabetes berdasarkan skrining pada kegiatan Posbindu PTM di Puskesmas Simpang Limun dan Puskesmas Teladan. Tidak terdapat hubungan yang signifikan antara jenis kelamin, riwayat keluarga diabetes, dan obesitas dengan kejadian prediabetes berdasarkan skrining pada kegiatan Posbindu PTM di Puskesmas Simpang Limun dan Puskesmas Teladan.

ABSTRACT

Risk Factors Influencing The Incidence of Prediabetes Based on Screening Activities at The Integrated Non-Communicable Diseases Development Post (Posbindu Ptm) in Medan Kota District Health Center. The risk factors for prediabetes are the same as those for T2DM, such as a family history of Diabetes, female gender, obesity, and so on. Early detection of prediabetes can open the door for T2DM prevention interventions. This type of research is descriptive-analytic with a cross-sectional design. Data collection methods include medical records and field observation. Based on the results of the Spearman test, it was found that there was no significant relationship between gender (p-value=0.609, Correlation Coefficient=-0.079, opposite relationship), hereditary history of Diabetes (p-value=0.298, Correlation Coefficient=0.160, unidirectional relationship), and obesity (p-value=0.382, Correlation Coefficient=-0.135, opposite relationship) with the incidence of prediabetes based on screening at Posbindu PTM activities at Simpang Limun Health Center and Teladan Health Center. There is no significant relationship between gender, family history of Diabetes, and obesity with the incidence of prediabetes based on screening at Posbindu PTM activities at the Simpang Limun Health Center and Teladan Health Center.

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INTRODUCTION

Non-Communicable Diseases (NCDs) have increased in the past decade. NCDs can reduce an individual's productivity and quality of life. NCDs are chronic, requiring treatment with significant costs and extended time. One such NCD is Diabetes Mellitus (DM). As a metabolic disorder, DM is characterized by hyperglycemia and is associated with defects in insulin secretion, insulin action, or both. If left unchecked, it can lead to long-term complications, disabilities, and dysfunction of various organs.[1-3]

The International Diabetes Federation (IDF) estimates that 537 million people (10.5%) worldwide aged 20-79 years suffer from Diabetes. By 2030, this number is projected to increase to 643 million (11.3%); by 2045, it will reach 783 million (12.2%). In Southeast Asia, the number of diabetes patients is approximately 90.2 million (8.7%), while Indonesia ranks fifth globally with 19.5 million cases, expected to rise to 28.6 million by 2045.[4] Based on Riskesdas data, the prevalence of DM in Indonesia was 1.1% in 2007, 2.1% in 2013, and 2% in 2018, with North Sumatra having a relatively high prevalence of 2.03%, exceeding the national average. Urban areas in North Sumatra have a prevalence of 2.43%, and Medan City has a prevalence of 2.31%.[5–8] The number of new and old DM patient visits at Puskesmas Simpang Limun in 2020 was 458 visits and 346 visits in 2021.[9] Meanwhile, the number of Referrals Back (PRB) for DM patients at Puskesmas Teladan was 334 individuals.[10]

Prediabetes often precedes the onset of Type 2 Diabetes Mellitus (T2DM).[11] Prediabetes refers to individuals with Impaired Fasting Glucose (IFG) and Impaired Glucose Tolerance (IGT). This condition is at high risk of progressing to Type 2 Diabetes Mellitus (T2DM) and related complications[4] Research in Switzerland indicates that prediabetes affects 30.9% of the population, with 79.9% identified based on HbA1c levels. In 2021, IDF estimated that 541 million adults (10.6%) had Impaired Glucose Tolerance (IGT), with 319 million adults (6.2%) experiencing Impaired Fasting Glucose (IFG). By 2045, it is projected that 730.3 million people (11.4%) worldwide will have IGT, and 440.8 million people (6.9%) will have IFG. The prevalence of IFG (8.8%) in Southeast Asia is higher than that of IGT (5.4%).[4]

Prediabetes shares the same risk factors as T2DM. Research by Paramita et al. indicates that first-degree relatives with a history of T2DM are six times more likely to develop T2DM due to increased blood glucose levels.[12] Additional risk factors associated with T2DM in younger individuals include a family history of Diabetes, female gender, and low socioeconomic status. According to IDF, in 2021, the prevalence of IGT increases with age (20-79 years), while IFG is higher in individuals aged 60-64 years.[4]

Diabetes Mellitus is considered one of the NCDs often referred to as "the silent killer." The initial development of DM is frequently asymptomatic and detected only after the disease has reached a chronic or advanced stage. However, early detection of Diabetes can be achieved through routine health checks. Early detection of prediabetes opens the door for interventions to prevent the onset of Type 2 Diabetes.[4] Therefore, the Ministry of Health has issued policies through Regulation of the Minister of Health No. 71 of 2015 concerning the four pillars of NCD control, including early detection programs for NCD risk factors through Integrated NCD Development Posts (Posbindu). The 2020-2024 NCD program focuses on preventing and controlling NCD risk factors and early detection.[3]

As the incidence of Diabetes Mellitus increases, so does the prevalence of prediabetes. Therefore, screening for risk factors associated with prediabetes is necessary to detect diabetes mellitus early and provide appropriate management to prevent complications.[13] [14]. This has led the

researcher to investigate the risk factors affecting the incidence of prediabetes based on screening activities at Integrated NCD Development Posts (Posbindu PTM) at the Medan City Health Centers, represented by Puskesmas Simpang Limun and Puskesmas Teladan. The risk factors for prediabetes include gender, family history of Diabetes, and obesity.

METHOD

This research is a descriptive-analytic study with a cross-sectional design. Sampling was done using purposive sampling. The study was conducted at Posbindu, managed by Puskesmas Simpang Limun and Puskesmas Teladan. The population of this study consisted of all individuals who underwent screening at the Posbindu PTM at Puskesmas Simpang Limun and Puskesmas Teladan. The sample included all individuals meeting the inclusion criteria. The inclusion criteria were individuals who attended Posbindu PTM at Puskesmas Simpang Limun and Puskesmas Teladan from October to December 2022, were willing to participate, fasted for at least 8 hours before blood sampling, and had a fasting blood glucose level indicating prediabetes. Exclusion criteria included refusal to participate, use of Diabetes medication, and insulin use. Sampling was conducted using non-probability sampling, specifically purposive sampling. The total sample for this study was 44 respondents. Data collection methods included medical records and observation of fasting glucose levels. Respondents fasted for at least 8 hours before their blood was tested using a glucometer. Data were collected for respondents with fasting glucose levels of 100-125 mg/dL. Information and examination results were obtained from medical records at Puskesmas Simpang Limun and Puskesmas Teladan. Data analysis included univariate and bivariate analysis. Bivariate analysis used Spearman's test with a significance level of $P < 0.05$.

RESULTS

The following are the results of the statistical tests conducted in this study:

Table 1. Frequency Distribution of Respondent Characteristics

Respondent Characteristics		(n)	(%)
Gender	Male	24	54.5
	Female	20	45.5
Tota1l		44	100.0

Based on the data table, of the 44 respondents in this study, 24 (54.5%) were male, while 20 (45.5%) were female.

Table 2. Frequency Distribution of Variables

Variables Table		(n)	(%)
Prediabetes	Yes	44	100
Obesity	No	12	27.3
	Yes	32	72.7
Family History	No Yes	28	63.6
	Yes	16	36.4
Tota1l		44	100

The data table shows that all respondents in this study experienced prediabetes, with 44 representing 100%. Regarding obesity, the data indicates that 12 respondents (27.3%) did not meet the criteria for obesity, while 32 respondents (72.7%) were classified as obese. For family history, 28 respondents (63.6%) did not have a family history of Diabetes, and 16 respondents (36.4%) had a family history of Diabetes.

Table 3. Relationship Between Gender and Prediabetes

			Gender	Predia1betes
Spea1rma1n's rho	Gender	Correla1tion Coefficient	1,000	-0,079
		Sig. (2-ta1iled)		0,609
		N	44	44
	Predia1betes	Correla1tion Coefficient	-0,079	1,000
		Sig. (2-ta1iled)	0,609	
		N	44	44

Based on the data table, the relationship between gender and prediabetes yielded a Sig. (2-tailed) value of 0.609 > 0.05. Therefore, it can be concluded that there is no significant relationship between gender and prediabetes. The correlation coefficient for this study is -0.079, indicating a very weak negative correlation between gender and prediabetes, meaning that the relationship between these two variables is minimal and inverse.

Tabel 4. Hubungan Riwayat Keturunan dengan Prediabetes

			Family History	Predia1betes
Spea1rma1n's rho	**Family History**	Correla1tion Coefficient	1,000	0,160
		Sig. (2-ta1iled)		0,298
		N	44	44
	Predia1betes	Correla1tion Coefficient	0,160	1,000
		Sig. (2-ta1iled)	0,298	
		N	44	44

Based on the data table, the relationship between family history and prediabetes yielded a Sig. (2-tailed) value of 0.298 > 0.05. Therefore, it can be concluded that there is no significant relationship between family history and prediabetes. The correlation coefficient is 0.160, indicating a very weak positive correlation between family history and prediabetes, meaning that the relationship between these two variables is minimal and positive.

Table 5. Relationship Between Obesity and Prediabetes

			Obesity	Predia1betes
Spea1rma1n's rho	Obesity	Correla1tion Coefficient	1,000	-0,135
		Sig. (2-ta1iled)		0,382
		N	44	44
	Predia1betes	Correla1tion Coefficient	-0,135	1,000
		Sig. (2-ta1iled)	0,382	
		N	44	44

Based on the data table, the relationship between obesity and prediabetes shows a Sig. (2-tailed) value of 0.382 > 0.05. Therefore, obesity does not have a significant relationship with prediabetes. The correlation coefficient is -0.135, indicating that the correlation between obesity and prediabetes is weak and negative.

DISCUSSION

This study involved a sample with characteristics where, according to gender, males were the most prevalent, with 24 individuals (54.5%), and the difference compared to females was not too far, with 20 individuals (45.5%). Cheema et al.'s study also observed increased incidence associated with males, linked to age and residing in urban areas with less physical activity and high sugar and fat consumption. Males are more likely to experience GDPT due to smoking habits, which are more common among males. Other studies also show that individuals with smoking habits are 2.67 times more likely to suffer from Diabetes compared to non-smokers, and smoking habits are more frequently observed in males. Smoking can cause a decrease in insulin sensitivity and affect the endothelial lining, leading to insulin resistance. Prolonged exposure to nicotine and smoking habits can increase free radicals, which disrupt insulin function and damage beta cells in the pancreas. Nicotine can also stimulate the release of cortisol, an insulin antagonist hormone. This can lead to continuous glucose breakdown, disrupting insulin function (insulin resistance). These findings are consistent with the Riskesdas 2018 report, which indicates that the percentage of KGDP is higher in males (14.9%) compared to females (11.2%).

Based on the population data categorized by gender in Medan Kota District for 2021, the number difference is insignificant, with females numbering 45,578 and males numbering 42,147. According to Table 4.3, it can be concluded that the relationship between gender and prediabetes is not significant. This result aligns with previous studies by Susetyowati et al. and Sukenty et al., which found that the relationship between gender and high blood glucose or prediabetes status is insignificant. In this study, the researcher did not determine an equal number of both genders in

the sample during the POSBINDU period from October to December 2022, resulting in more male respondents who showed impaired fasting blood glucose than female respondents who showed normal KGD.

This study indicates that the number of prediabetes cases without a family history of Diabetes is higher, with 28 respondents (63.6%), compared to those with a family history of Diabetes, which is 16 respondents (36.4%). According to Table 4.4, it can be concluded that there is no significant relationship between family history and prediabetes. This result is inconsistent with Paramita et al.'s study, which found that individuals with a family history of Diabetes have a sixfold higher risk of experiencing prediabetes. Family history also involves environmental conditions that can trigger prediabetes.

Parents who pass on genetic risks are associated with gene mutations that can increase gene expression in the pancreatic islets, disrupting insulin secretion, decreasing plasma insulin, and reducing insulin sensitivity, thus increasing the risk of type 2 diabetes in their offspring. However, this condition can be modified by adopting a healthy lifestyle. Family history of Diabetes plays a crucial role in the occurrence of prediabetes if supported by factors such as minimal physical activity, obesity, age, smoking habits, and poor eating patterns. This study shows that the number of prediabetes cases with obesity is higher, with 32 respondents (72.7%) compared to those without obesity, which is 12 respondents (27.3%). This result is consistent with previous research by Sukenty et al., which indicated that prediabetes respondents are more likely to be obese. Obesity plays a significant role in insulin resistance, the pathogenesis of prediabetes that causes glucose not to enter muscle cells, liver cells, or fat cells. This condition causes the liver to produce excess glucose and become uncontrolled, leading to prediabetes. According to Table 4.5, it can be concluded that there is no significant relationship between obesity and prediabetes.

CONCLUSION

1. The relationships between gender, family history of diabetes mellitus, and obesity with prediabetes at the Simpang Limun and Telaudans health centers are not significant.
2. Smoking habits, commonly found among males, increase the likelihood of males experiencing GDPT. Smoking can decrease insulin sensitivity and affect endothelial function, ultimately leading to insulin resistance.
3. A family history of Diabetes mellitus plays a significant role in the occurrence of prediabetes if accompanied by a lifestyle with low physical activity, obesity, age, smoking habits, and poor dietary patterns.
4. Obesity plays a crucial role in insulin resistance, which is the pathogenesis of prediabetes. This condition causes glucose to fail to enter muscle, liver, or fat cells. The liver produces excessive glucose, which remains uncontrolled, leading to prediabetes.
5. Prediabetes is commonly found among males, individuals without a family history of Diabetes mellitus, and those who are obese.

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