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PHYSICAL ACTIVITY, DIET, AND DIABETES MELLITUS STATUS AMONG OLDER ADULTS IN MEDAN SUNGGAL: A CROSS-SECTIONAL STUDY

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ABSTRACT

Diabetes mellitus (DM) is common among older adults, and physical activity and diet are modifiable correlates. This cross-sectional study examined the association of physical activity and diet with DM status among 38 adults aged 60 years and older in Medan Sunggal District, Medan. DM status, physical activity and diet were obtained by structured interview, and the data were analyzed with IBM SPSS Statistics 32. Thirteen respondents (34.2%) had DM. DM was more prevalent among those with poor physical activity (58.8% vs 14.3%; PR 4.12; 95% CI 1.34-12.63; Fisher p = 0.006) and poor diet (63.6% vs 22.2%; PR 2.86; 95% CI 1.24-6.60; p = 0.024). These are crude cross-sectional associations in a small sample, open to confounding and reverse causation, and do not show that either factor causes DM.

Keywords: *Diabetes mellitus, Diet, Older adults, Physical activity, Prevalence ratio*

ABSTRAK

Diabetes melitus (DM) banyak dialami lansia, dan aktivitas fisik serta pola makan merupakan faktor yang dapat dimodifikasi. Penelitian potong lintang ini menganalisis hubungan aktivitas fisik dan pola makan dengan status DM pada 38 lansia berusia 60 tahun ke atas di Kecamatan Medan Sunggal, Kota Medan. Status DM, aktivitas fisik, dan pola makan diperoleh melalui wawancara terstruktur, kemudian data dianalisis dengan IBM SPSS Statistics 32. Sebanyak 13 responden (34,2%) menyandang DM. Prevalensi DM lebih tinggi pada lansia dengan aktivitas fisik kurang (58,8% vs 14,3%; RP 4,12; IK 95% 1,34-12,63; uji eksak Fisher p = 0,006) dan pola makan kurang baik (63,6% vs 22,2%; RP 2,86; IK 95% 1,24-6,60; p = 0,024). Hubungan ini bersifat kasar dan potong lintang pada sampel kecil, dapat dipengaruhi perancu dan kausalitas terbalik, sehingga tidak menunjukkan hubungan sebab-akibat.

Kata Kunci: Aktivitas fisik, Diabetes melitus, Lansia, Pola makan, Rasio prevalensi

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1. INTRODUCTION

Diabetes mellitus (DM) is a chronic disease of elevated blood glucose that leads to cardiovascular, kidney and nerve complications. The number of adults with diabetes worldwide rose from about 198 million in 1990 to 828 million in 2022 (NCD Risk Factor Collaboration [NCD-RisC], 2024), and type 2 diabetes accounts for almost all cases in older adults (GBD 2021 Diabetes Collaborators, 2023). Aging brings declining insulin sensitivity, loss of muscle mass and more visceral fat, compounded by multimorbidity and frailty (Bellary et al., 2021). Nearly one in five people aged 65-99 years had diabetes (Sinclair et al., 2020), and incidence among adults aged 55 and older has risen since 1990 (Yu et al., 2025; Huang et al., 2025).

Indonesia had an estimated 20.4 million adults with diabetes in 2024, the fifth highest number in the world (International Diabetes Federation [IDF], 2025). The 2023 Indonesian Health Survey found that 11.7% of people aged 15 years and older had blood glucose levels in the diabetic range (Badan Kebijakan Pembangunan Kesehatan [BKPK], 2024), while older adults now make up about 12% of the population (Badan Pusat Statistik [BPS], 2024). National figures of this kind show the size of the problem, but they say little about how DM is distributed among older adults living in a particular urban neighborhood.

Physical activity and diet are the two lifestyle factors most often targeted in diabetes prevention and control (ADA Professional Practice Committee for Diabetes, 2026; Kanaley et al., 2022). Prospective evidence links diets high in refined grains, red and processed meat and sugar-sweetened beverages to a higher incidence of type 2 diabetes (Neuenschwander et al., 2019), and higher physical activity is associated with a lower prevalence of diabetes (Li et al., 2023). Indonesian studies among older adults have reported associations between low physical activity, poor eating patterns and DM (Halawa et al., 2024; Rahmadini et al., 2025; Arfatunnisah et al., 2026), although some found an association for activity but not for diet (Siswanto et al., 2026). Most of these studies were conducted in health centers or rural villages, used different cut-offs, and seldom stated how DM was ascertained.

Medan Sunggal is one of the urban districts of Medan City, North Sumatra. Community-based data on older adults in urban Medan that report how physical activity and diet were categorized, which effect measure was used and which statistical test was applied are still

scarce. This study therefore aimed to examine the association of physical activity and diet with DM status among older adults in Medan Sunggal.

2. RESEARCH METHOD

This was an analytic cross-sectional study conducted in Medan Sunggal District, Medan City, North Sumatra. The source population was older adults aged 60 years and older (*lansia*, following BPS, 2024) living in the district. Thirty-eight older adults were included through non-random sampling, and all of them were interviewed with the same structured questionnaire. DM status was the outcome and was recorded as DM or no DM during the structured interview. Because this is a cross-sectional study, DM status reflects existing (prevalent) cases at the time of data collection, not new cases.

Physical activity was assessed with four items: frequency per week, duration per session, usual intensity, and the balance between sitting and moving. Diet was assessed with four items: frequency of high-sugar foods, frequency of fatty and fried foods, daily servings of vegetables and fruit, and irregular eating. Item scores within each domain were summed, and the total score was used to classify physical activity and diet as good or poor. All data were collected by structured interview.

Data were analyzed with IBM SPSS Statistics version 32 (IBM Corp., Armonk, NY, USA). Univariate analysis described each variable as frequencies and percentages, and the 95% confidence interval (CI) of DM prevalence was calculated with the Wilson method. For the bivariate analysis, the crude prevalence ratio (PR) was calculated as the proportion with DM in the poor category divided by the proportion in the good category, with a 95% CI by the log (Katz) method. Expected cell counts were checked before applying the chi-square test; because the diet table had one expected count below 5 (3.8) and the sample was small, the two-sided Fisher's exact test was used for both associations (Kim, 2017). Statistical significance was set at $p < 0.05$.

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3. RESULT AND DISCUSSION

Results

Table 1. Participant Characteristics and Diabetes Mellitus Status (n = 38)

Characteristic	n	%
Sex		
Male	6	15.8
Female	32	84.2
Highest education		
Elementary school	9	23.7
Junior high school	6	15.8
Senior high school	17	44.7
College/university	6	15.8
Diabetes mellitus status		
DM	13	34.2
No DM	25	65.8

Of the 38 participants, 32 (84.2%) were female and 6 (15.8%) male (Table 1). The largest group had completed senior high school (44.7%). Thirteen participants (34.2%; 95% CI 21.2-50.1%) had DM.

Table 2. Physical Activity and Diet Items and Categories (n = 38)

Physical activity	n	%	Diet	n	%
Frequency of physical activity			**High-sugar foods**		
Never	11	28.9	Every day	1	2.6
1-2 times/week	18	47.4	1-2 times/week	18	47.4
3-4 times/week	6	15.8	3-4 times/week	8	21.1
≥5 times/week	3	7.9	Rarely/never	11	28.9
Duration per session			**Fatty and fried foods**		
Never	12	31.6	Every day	1	2.6
0-14 minutes	14	36.8	1-2 times/week	17	44.7
15-29 minutes	6	15.8	3-4 times/week	11	28.9
30-60 minutes	6	15.8	Rarely/never	9	23.7
Most frequent intensity			**Vegetables and fruit per day**		
Light	26	68.4	Not every day	7	18.4
Moderate	6	15.8	1-2 servings	21	55.3
Vigorous	6	15.8	3-4 servings	10	26.3
Daily pattern			**Irregular eating**		
Mostly sitting	10	26.3	Often	13	34.2
Balanced	16	42.1	Sometimes	22	57.9
Mostly moving	12	31.6	Never	3	7.9
Physical activity category			**Diet category**		
Poor	17	44.7	Poor	11	28.9
Good	21	55.3	Good	27	71.1

Physical activity was low (Table 2): 28.9% never exercised, 47.4% did so only 1-2 times per week, and 68.4% mainly did light activity. By total score, 21 participants (55.3%) had good and 17 (44.7%) poor physical activity.

For diet (Table 2), about half ate high-sugar or fatty foods 1-2 times per week, 55.3% ate only 1-2 servings of vegetables and fruit daily, and 92.1% ate irregularly at least sometimes. Overall, 27 participants (71.1%) had a good diet and 11 (28.9%) a poor diet.

Table 3. Diabetes Mellitus Status by Physical Activity and Diet Category (n = 38)

Variable	DM n (%)	No DM n (%)	Total	PR (95% CI)	p*
Physical activity					
Poor	10 (58.8)	7 (41.2)	17	4.12 (1.34-12.63)	0.006
Good	3 (14.3)	18 (85.7)	21		
Diet					
Poor	7 (63.6)	4 (36.4)	11	2.86 (1.24-6.60)	0.024
Good	6 (22.2)	21 (77.8)	27		

DM was more prevalent among participants with poor physical activity than among those with good physical activity (58.8% vs 14.3%; PR 4.12; 95% CI 1.34-12.63; p = 0.006) and among those with a poor diet than among those with a good diet (63.6% vs 22.2%; PR 2.86; 95% CI 1.24-6.60; p = 0.024) (Table 3). The wide intervals reflect the small number of cases.

Discussion

About one in three participants had DM, and DM was more common among those with poor physical activity or a poor diet. Because exposure and outcome were measured at the same time, the PR describes how DM is distributed across categories, not a prospective risk.

The activity profile fell well short of the weekly volume recommended for older adults (Bull et al., 2020). The observed association with DM agrees with village and posyandu studies of older adults (Rahmadini et al., 2025; Siswanto et al., 2026; Arfatunnisah et al., 2026), a health center study in North Sumatra (Halawa et al., 2024), and national survey data in which self-reported DM differed by activity level among 97,339 older adults (Permatasari et al., 2026). Among older adults who already have type 2 diabetes, higher activity has been linked to lower blood glucose (Prodyanatasari et al., 2025). Physical activity improves insulin sensitivity and muscle glucose uptake, which makes the direction plausible (Kanaley et al., 2022), but reverse causation is equally plausible here: complications, fatigue or frailty that accompany DM in later life can reduce activity (Bellary et al., 2021).

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Diet showed a similar pattern. The association between poor diet and DM is consistent with studies in health centers and workplaces (Halawa et al., 2024; Yuheni et al., 2025; Mulyanto & Saifudin, 2025; Khatimah et al., 2025), but not with every study of older adults (Siswanto et al., 2026), and the prospective evidence on specific foods and type 2 diabetes is stronger than for broad diet scores (Neuenschwander et al., 2019). Older adults diagnosed with DM are often advised to change their diet, so the direction of bias for diet is uncertain.

Several limitations must be stated. The sample was small, so the CIs are wide and the estimates could change substantially with a few more cases. Participants were not randomly selected, and 84.2% were women, which limits generalization. The PRs are crude: age, sex, body mass index, family history of DM, education and medication use were not controlled, and the two exposures were not analyzed together. Activity and diet were self-reported with a questionnaire whose validity and reliability are not reported. DM status was obtained by interview rather than by a blood glucose test, so undiagnosed DM, which is common in Indonesia (IDF, 2025), may have placed some participants with DM in the no-DM group.

4. CONCLUSION

Among 38 older adults in Medan Sunggal, 34.2% had DM. DM was more prevalent among those with poor physical activity (PR 4.12) and poor diet (PR 2.86), with both associations statistically significant by Fisher's exact test. These are crude cross-sectional associations from a small, non-random sample; they may reflect confounding or reverse causation and do not establish that low activity or poor diet causes DM. They do support continued attention to regular physical activity and healthy, regular meals in posyandu lansia programs, and they call for larger studies with clear DM ascertainment, validated instruments and multivariable or longitudinal analysis.

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