

**ORIGINAL ARTICLE**

**The Relationship between Sleep Quality and Hba1c Levels in Type 2 Diabetes mellitus Patients at Dr. Pirngadi Medan in 2019**

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**Abstract:** Diabetes Mellitus (DM) type 2 is a type of DM with the most sufferers in Indonesia and the world. One of the factors that can affect blood glucose control for people with type 2 diabetes is sleep disturbance. Poor sleep quality causes abnormal glucose tolerance, insulin resistance, and reduced response to insulin, which increases HbA1C levels. The purpose of this study was to determine the relationship between sleep quality and HbA1C levels in type 2 DM patients. This study used an analytic correlation design with a cross-sectional study design. 47 respondents were selected by purposive sampling technique at Dr. Pirngadi Regional General Hospital Medan in 2019. We conducted this research from December 2019 to February 2020. Respondent data was obtained through interviews with the Pittsburgh Sleep Quality Index (PSQI) we obtained a questionnaire and HbA1C levels from the results of the respondents' HbA1C examination in the last three months, which can be seen in the patient's status. We carried data analysis using the SPSS version 21 program out univariate and bivariate using the Spearman test with a confidence level of 95% ( $\alpha = 0.05$ ) showed a p-value = 0.003 < 0.05 and a value of  $r = 0.423$ . So that a significant relationship was obtained with a weak correlation between sleep quality and HbA1C levels.

**Keywords:** Diabetes Mellitus, Sleep Quality, HbA1C, PSQI

**INTRODUCTION**

Diabetes mellitus (DM) is a chronic condition associated with hyperglycemia due to a deficiency in insulin secretion or an inability to secrete insulin at all. Indonesia is in the 6th rank with the highest number of DM sufferers in the world. Based on the International Diabetes Federation (IDF) in

2017, it predicts an increase in the number of people with diabetes in Indonesia from 159 million in 2017 to 183 million in 2045.<sup>1,2</sup>

Based on the Basic Health Research (Riskesdas) in 2018, the prevalence of DM for people over 15 years of age in Indonesia was 8.5%, increased from 2013 which was

only 6.9%, and in North Sumatra, the prevalence of DM incidence from 2013 to the year 2018 increased from 1.8% to 2.0%. Lifestyle such as smoking, alcohol consumption, and physical activity affect the increase in prevalence. Physical activity is related to the occurrence of DM, one of which is sleep quality.<sup>3,4</sup>

According to the National Sleep Foundation in 2018, good quality sleep has a sleep duration of 7-9 hours a day to keep the body functioning optimally. Lack of sleep is a significant risk factor for type 2 diabetes, although it is often overlooked. Short and continuous sleep duration results in increased blood sugar levels and cortisol levels because the hormone insulin is secreted decreases.<sup>5</sup>

According to the American Diabetes Association (ADA), hemoglobin A1C is glycated (bound) hemoglobin with glucose in the blood. HbA1C is used as one of the tests to diagnose DM and helps in monitoring how well the treatment has been given to patients because it can describe the average blood sugar control over the last 2-3 months in DM patients. For this examination, the patient does not need to fast.<sup>6,7</sup>

The results of a study conducted by Wirawan N et al. Showed that there was no relationship between sleep quality and HbA1C in elderly patients at the internal medicine clinic of Sanglah Hospital. While the research of Tentero IN et al, there is a relationship between type 2 diabetes and sleep quality in patients at Pancara Kasih General Hospital GMIM Manado.<sup>8,9</sup>

Based on the results of research that has been done before, the authors are interested in further researching the relationship between sleep quality and HbA1C levels in patients with type-2 diabetes.

## METHODS

This study is an analytic correlation with a cross-sectional design conducted at the Regional General Hospital Dr. Pirngadi Medan from December 2019 to February 2020. Purposive sampling technique was used to select samples and obtained 47 respondents.

The data was collected through interviews with the Pittsburgh Sleep Quality Index (PSQI) questionnaire and through the patient's status in the form of laboratory results to check HbA1C levels. After all, data has been collected, then the data is processed using the Spearman test in the version 21 SPSS (Statistical Packages For Social Science) program. This study was conducted after obtaining ethical clearance from the research ethics committee of the Faculty of Medicine, University of HKBP Nommensen.

## RESULTS

Based on table 1, it can be seen that the majority of respondents have poor sleep quality and have HbA1C levels above normal. The distribution of respondents based on age is fairly even and seen from their marital status, all respondents are married.

**Table 1. Respondent Characteristics**

Subject Distribution	Frequency (n)	%
<b>Age</b>		
26 – 34 years old	1	2,1
35 - 44 years old	2	4,3
45 – 54 years old	10	21,3
55 – 64 years old	34	72,3
<b>Gender</b>		
Male	14	29,8
Female	33	70,2
<b>Educational level</b>		
Elementary	9	19,1
Junior high school	13	27,7
Senior high school	16	34,1
University	9	19,1
<b>Marital status</b>		
Married	47	100
Not married	0	0
<b>Sleeping quality</b>		
Good	3	6,4
Bad	44	93,6
<b>HbA1C level</b>		
<6,5	3	6,4
>6,5	44	93,6

Based on Table 2, it was found that the majority of respondents had poor sleep quality with HbA1C levels above normal. Furthermore, the normality test was carried out with Shapiro-Wilk and obtained a significance value of  $0.00 < 0.05$ , so it can be concluded that the data were not normally distributed. The data were then analyzed by using the Spearman test and the p-value was obtained = 0.003, where the p-value  $< 0.05$ , then a correlation test was carried out on the data and obtained a value

of  $r = 0.423$  so that it can be concluded that there is a significant relationship with a weak correlation between sleep quality and HbA1C levels at people with diabetes mellitus type 2 in Dr. Pirngadi Medan in 2019.

## DISCUSSION

In this study, most people with type 2 diabetes were 55-64 years old. This is by the 2013 Riskesdas that the age group of most DM sufferers is 55-64 years old. This is because the older a person gets, the body's function decreases, such as a decrease in insulin secretion so that the body is less than optimal for controlling blood glucose.<sup>10,11</sup>

In this study, the majority of type 2 DM sufferers were female, namely 33 people (70.2%) more than men who were only 14 people (29.8%). This result is by Riskesdas 2013 which states that the number of DM sufferers is female more than male.<sup>10</sup> This is the same as the research conducted by Sasmiyanto which involved 100 people with diabetes who are followers of the ProLanis program in Jember Regency, namely 80 more female sufferers (80%).<sup>12</sup> This is because women often consume sweet foods or ready-to-eat snacks so that blood sugar levels in women are more at risk than men.<sup>13</sup>

**Table 2. Relationship of Sleep Quality with HbA1C Levels in Type 2 DM Patients**

		HbA1C level		Total	P-value	r-value
		Normal	Diabetes			
Sleeping quality	Good	3	0	3	0,003	0,423
	Bad	0	44	44		
Total		3	44	47		

This study stated that the high school education level experienced diabetes with a total of 16 people (34%) and the least number of patients with a few elementary education levels who experienced diabetes was only 9 people (19.1%). This result is also in line with Sasmiyanto's research which involved 100 people with diabetes who are followers of the Prolanis program in Jember Regency, namely there are 54 people (54%) with high school education and 10 people (10%) with elementary education.<sup>12</sup> These results refute the theory which states that a person's level of education affects their knowledge so that there is awareness of a disease. This conclusion is in line with the research conducted by Destiani AB and Chondro F which stated that there was no statistically significant relationship between HbA1C levels and educational levels in type 2 DM patients at Sumber Waras Hospital.<sup>14</sup>

This study stated that the most type 2 DM patients were in the category of poor sleep quality with a total of 44 people (93.6%) while in the category of good sleep quality there were 3 people (6.4%). Based on the PSQI questionnaire the number of scores from components 1-7, the average patient got a score > 5, which means that the quality of sleep is poor, where most of the patients said it was difficult to sleep, often woke up at night, felt hot at night and did not take medication to help. sleep.

This study found that those who had high HbA1C levels were 44 people (93.6%) and those with normal HbA1C levels were 3 people (6.4%). High levels of HbA1C also indicate high levels of glucose in the blood so that the body seeks to reduce

excess glucose from the body through the kidneys, which excrete glucose with water and electrolytes. This is what causes DM sufferers to experience symptoms of frequent urination (polyuria) which results in cell dehydration and frequent thirst (polydipsia) so that these symptoms affect daily activities including sleep quality.<sup>15,16</sup>

Based on Table 2, shows the data analysis about the relationship between sleep quality and HbA1C levels. The results of the analysis test using Spearman show a significant relationship and the results of the correlation test show that the strength of the correlation is weak. These results are in line with research conducted by Gunawan SC in 2017 which stated that there was a significant and weak relationship between HbA1C levels and sleep quality in patients with type 2 diabetes mellitus.<sup>17</sup>

At night there is a decrease in insulin secretion and sensitivity so that if the quality of sleep of DM sufferers is disturbed, it can cause an increase in cortisol and growth hormone (GH) levels, where these two hormones in the blood can be in the form of glucose so that it will cause hyperglycemia. The lack of sleep duration also results in increased appetite, which can lead to obesity. The opposite situation can also occur where people with type 2 diabetes experience symptoms of polyuria and nocturia, which interfere with the quality of their sleep.<sup>18</sup>

Therefore, DM sufferers need to be able to optimize their sleep time so that they get good quality sleep to maintain glucose

stability in the blood which affects the stability of HbA1C levels.

## CONCLUSION

In this study it can be concluded that the characteristics of the respondents are the majority of women with an average age of 55-64 years and the majority of high school education, the majority of respondents have poor sleep quality and uncontrolled HbA1C levels and there is a significant relationship with the strength of the weak correlation between sleep quality and HbA1C levels in people with type 2 diabetes.

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