

International Journal of Health Sciences
Available online at www.sciencescholar.us
E-ISSN: 2550-696X
Int. J. of Health Sci.
DOI: 10.53730

How to Cite:
Ferdous, J., Mahmud, M. Y., & Banik, M. C. (2026). Poor sleep quality and its associated factors among patients with type 2 diabetes mellitus attending an upazila health complex in Bangladesh: A cross-sectional study. *International Journal of Health Sciences*, *10*(S1), 414–429. https://doi.org/10.53730/ijhs.v10nS1.16036

Poor sleep quality and its associated factors among patients with type 2 diabetes mellitus attending an upazila health complex in Bangladesh: A cross-sectional study

Jannatul Ferdous
MSc in Nursing, Senior Staff Nurse, Raipur Upazila Health Complex, Lakshmipur, Bangladesh.
ORCID ID: https://orcid.org/0009-0003-9946-3290

Md. Yeasin Mahmud
Junior Consultant (Anesthesia and Pain Medicine), Raipur Upazila Health Complex, Lakshmipur, Bangladesh.

Dr. Mithun Chandra Banik
Medical Officer, MBBS, MD, Raipur Upazila Health Complex, Lakshmipur, Bangladesh.

***Abstract*---Background:** Sleep problems may negatively impact diabetes management and overall well-being. But studies examining sleep quality among rural Bangladeshi adults suffering from T2DM remain few. This study examines sleep quality of and its associated factors among adult patients with T2DM visiting a rural health facility. **Methods:** A facility-based cross-sectional study was carried out among 108 adult T2DM patients at Raipur Upazila Health Complex, Lakshmipur, Bangladesh, via convenience sampling. The data were collected by using a structured questionnaire and the Pittsburgh Sleep Quality Index (PSQI; Cronbach's α=0.681). **Results:** In all, 106 (98.1%; 95% CI: 93.5-99.5%) respondents had poor sleep quality, whereas only two (1.9%) had good sleep quality. Preliminary bivariate analyses revealed statistically significant relationships of sleep quality

***Corresponding author**: Ferdous, J.; Email: ssnjannatul2604@gmail.com*
Submitted: 27 September 2026, Revised: 18 October 2026, Accepted: 01 November 2026

categories with age (p=0.03), occupation, monthly family income, family type, sleep duration, and nighttime awakenings (all p≤0.001). Some variables of demographics and diabetes did not show any statistically significant relationship. **Conclusion:** In the present study population, poor quality sleep was very common, indicating the need to include sleep evaluation in diabetic patients' clinical practice. These results should be taken with caution due to the limited number of subjects with good quality sleep and the convenient sample.

***Keywords*---**Type 2 diabetes mellitus, sleep quality, Pittsburgh Sleep Quality Index, associated factors, Bangladesh.

Introduction

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and impaired insulin secretion, and it imposes a growing burden on health systems in low- and middle-income countries (International Diabetes Federation, 2025). Sleep is increasingly recognized as a modifiable component of diabetes care: poor sleep quality may impair glycemic control, increase the risk of complications and reduce quality of life (Alghamdi et al., 2023). In people with T2DM, sleep may be further disrupted by nocturia, restless legs syndrome and emotional distress (Nasir et al., 2022).

The reported prevalence of poor sleep quality among people with diabetes varies widely between settings. Estimates include 47.2% in Gondar (Birhanu et al., 2020), 55.6% in Jimma (Jemere et al., 2019), 50.7% among patients with T2DM in Bahir Dar (Zewdu et al., 2022) and a pooled 48.5% across Ethiopian studies (Abate et al., 2024), compared with 32% in a Malaysian primary-care clinic (Nasir et al., 2022), 12% in an Indian cohort (Pavan et al., 2023), 82% in Pakistan (Hamayal et al., 2025) and more than half of patients in Mogadishu (Mohamed et al., 2025). Correlates reported across these studies include poor glycemic control, comorbidity and depression (Birhanu et al., 2020; Zewdu et al., 2022), as well as age, income, education, diabetes duration and metformin use (Hamayal et al., 2025); smaller studies have linked poorer sleep to uncontrolled blood glucose (Amelia et al., 2020; Babu et al., 2020). Cross-sectional studies in Malaysia, Iraq and Türkiye have likewise examined sleep quality and its correlates in T2DM (Esen & Zeren Öztürk, 2025; Salih & Al-Qazaz, 2024; Saparwan et al., 2023).

Evidence from Bangladesh is limited. A recent preprint from a single primary diabetes care centre (n = 180) described sleep quality and quality of life among adults with T2DM (Zaman et al., 2024), but data from upazila health complexes, which provide first-contact secondary care to largely rural populations, are scarce. We therefore assessed sleep quality with the Pittsburgh Sleep Quality Index (PSQI) among patients with T2DM attending the Raipur Upazila Health Complex, described their sociodemographic and clinical characteristics, and examined the associations of these characteristics with sleep quality.

Methods

Study design and setting

This cross-sectional study followed the STROBE reporting guideline (von Elm et al., 2007). It was conducted at the Raipur Upazila Health Complex, Lakshmipur, Bangladesh, which provides outpatient and inpatient services to patients with T2DM, over a six-month period [04-05-2026].

Participants and sampling

Eligible participants were adults with T2DM diagnosed according to World Health Organization criteria (fasting plasma glucose ≥7.0 mmol/L, 2-h plasma glucose ≥11.1 mmol/L, or HbA1c ≥6.5%) who attended the facility for follow-up and provided written informed consent. Patients who were critically ill or unable to respond, who declined consent, or who were absent during data collection were excluded. The required sample size was calculated with the single-proportion formula ($Z = 1.96$, $p = 0.5$, $d = 0.05$), yielding 385 for an infinite population. Applying the finite-population correction to the approximately 150 eligible patients in the facility register gave 109; 108 participants were recruited by convenience sampling.

Data collection instruments

A structured, pre-tested questionnaire comprised three sections: (A) sociodemographic characteristics (age, sex, marital status, education, usual place of living, occupation, monthly family income and family type); (B) clinical and health-related characteristics (comorbidity, duration of diabetes, current treatment, diabetic complications, blood sugar control, physical exercise, usual sleep duration, use of sleep medication, nocturnal awakenings and self-reported sleep quality); and (C) the PSQI. Blood sugar control was classified from the latest HbA1c or random blood glucose as well controlled (HbA1c <7% or RBS <180 mg/dL), moderately controlled (HbA1c 7–8% or RBS 180–250 mg/dL) or poorly controlled (HbA1c >8% or RBS >250 mg/dL).

The PSQI is a 19-item self-rated instrument assessing sleep over the preceding month across seven components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction), each scored 0–3 to give a global score of 0–21 (Buysse et al., 1989). A global score >5 defined poor sleep quality and a score of 0–5 good sleep quality. A validated Bangla version of the PSQI was used. Content validity of the questionnaire was established by eight experts (four nursing professionals, two physicians, one statistician and one Bangla language editor), and a pilot test with 20 participants, who were excluded from the main study, assessed feasibility and clarity. Internal consistency of the seven PSQI components in the study sample was acceptable (Cronbach's $\alpha = 0.681$; $n = 108$, no missing data).

Data collection procedure

After permission from the facility authorities and ethical clearance, the researcher explained the purpose of the study to eligible patients, obtained written informed consent and administered the questionnaire. Completed forms were checked for completeness.

Ethical considerations

The study was approved by the Institutional Ethical Review Board of Enam Medical College & Hospital, Savar, Dhaka (Memo No. EMC/IERB/2026/05-6; [04-05-2026]) and was conducted in accordance with the Declaration of Helsinki (World Medical Association, 2013). Written informed consent was obtained from all participants, and confidentiality and anonymity were maintained.

Statistical analysis

Data were analyzed with IBM SPSS Statistics "version26". Categorical variables are presented as frequencies and percentages; the prevalence of poor sleep quality is presented with a 95% Wilson confidence interval. Associations between sleep quality (good vs poor) and categorical variables were tested with Pearson's x^2 test. Because only two participants had good sleep quality, expected cell counts were <5 in at least half of the cells of every cross-tabulation, and the x^2 approximation is unreliable; exact p-values were therefore computed from the tabulated counts using the Freeman–Halton extension of Fisher's exact test (probability ordering) and were used for inference. Two-sided $p < 0.05$ was considered statistically significant. Categories with no participants were omitted from the association tests. Multivariable modelling was not feasible given the outcome distribution.

Results

Participant characteristics

Data from 108 patients were analyzed (Tables 1 and 2). Most participants were aged 46–60 years (51.9%) or >60 years (41.7%), and none was younger than 31 years. Women constituted 58.3% of the sample, 89.8% were married and the remainder (10.2%) were widowed. Educational attainment was low: 12.0% were illiterate, 44.4% had primary and 35.2% secondary education. Participants were mainly self-employed (48.1%) or homemakers (46.3%); 50.0% reported a monthly family income below 10,000 BDT, and 86.1% lived in joint families.

Hypertension was the predominant comorbidity (85.2%), followed by cardiovascular disease (11.1%). Diabetes had been diagnosed 6–10 years earlier in 38.9% and more than 10 years earlier in 25.9%. Most participants received insulin therapy (72.2%), and 78.7% had moderately controlled blood sugar. Cardiovascular complications (43.5%) and neuropathy (27.8%) were the most frequently recorded complications. Seventy per cent (70.4%) did not exercise, 54.6% reported sleeping <5 h per night and 17.6% used sleep medication. Nocturnal awakenings occurred at least weekly in 94.4% (daily in 28.7%).

Table 1. Sociodemographic characteristics of patients with type 2 diabetes mellitus (n = 108)

Characteristic	n	%
Age (years)		
18–30	0	0.0
31–45	7	6.5
46–60	56	51.9

Characteristic	n	%
>60	45	41.7
Sex		
Male	45	41.7
Female	63	58.3
Marital status		
Married	97	89.8
Single	0	0.0
Widowed	11	10.2
Divorced	0	0.0
Educational status		
Illiterate	13	12.0
Primary school	48	44.4
Secondary school (SSC)	38	35.2
Higher secondary (HSC) and above	9	8.3
Usual place of living		
Upazila town	63	58.3
District town	0	0.0
Rural area/village	45	41.7
Occupation		
Employed (government/private)	3	2.8
Self-employed	52	48.1
Homemaker	50	46.3
Unemployed	3	2.8
Monthly family income (BDT)		
<10,000	54	50.0
10,001–15,000	23	21.3
15,001–20,000	28	25.9
>20,000	3	2.8
Family type		
Joint	93	86.1
Nuclear	15	13.9

BDT, Bangladeshi taka. Percentages are calculated from the total sample (n = 108).

Table 2. Clinical and health-related characteristics of patients with type 2 diabetes mellitus (n = 108)

Characteristic	n	%
Medical history (comorbidity)		
Hypertension	92	85.2

Characteristic	n	%
Cardiovascular disease	12	11.1
Respiratory disease	4	3.7
Kidney disease	0	0.0
Duration of diabetes (years)		
<1	0	0.0
1–5	38	35.2
6–10	42	38.9
>10	28	25.9
Current treatment		
Oral hypoglycaemic agents	10	9.3
Insulin therapy	78	72.2
Combination therapy	20	18.5
Diet and lifestyle only	0	0.0
Diabetic complications		
Neuropathy	30	27.8
Retinopathy	7	6.5
Nephropathy	0	0.0
Foot ulcers	3	2.8
Cardiovascular complications	47	43.5
None	21	19.4
Blood sugar control‡		
Well controlled	15	13.9
Moderately controlled	85	78.7
Poorly controlled	8	7.4
Physical exercise		
Regular	7	6.5
Irregular	25	23.1
None	76	70.4
Sleep duration per night (h)		
<5	59	54.6
5–6	38	35.2
6–7	11	10.2
>7	0	0.0
Use of sleep medication		
Yes	19	17.6
No	89	82.4
Nocturnal awakenings		
Never	6	5.6
1–2 times/week	34	31.5

Characteristic	n	%
3–4 times/week	37	34.3
Daily	31	28.7
Self-reported sleep quality		
Very good	6	5.6
Good	34	31.5
Fair	37	34.3
Poor	31	28.7

‡ Based on the latest HbA1c or random blood sugar (see Methods). Percentages are calculated from the total sample (n = 108).

Sleep quality

Overall, 106 of 108 participants (98.1%; 95% CI 93.5–99.5%) had a global PSQI score >5 and were classified as poor sleepers, whereas two (1.9%) had good sleep quality. Component-level responses are shown in Table 3. More than half of participants reported sleep duration <5 h (54.6%), habitual sleep efficiency <65% (54.6%) and sleep disturbances at least three times per week (54.6%); 34.3% and 28.7% rated their sleep quality as fairly bad and very bad, respectively, and 67.6% reported daytime dysfunction almost every day or every day. Sleep medication was used by 17.6% of participants.

Table 3. Distribution of Pittsburgh Sleep Quality Index component responses (n = 108)

PSQI component	Response (component score)	n	%
Subjective sleep quality	Very good (0)	6	5.6
	Fairly good (1)	34	31.5
	Fairly bad (2)	37	34.3
	Very bad (3)	31	28.7
Sleep latency	<15 min (0)	6	5.6
	15–30 min (1)	34	31.5
	31–60 min (2)	37	34.3
	>60 min (3)	31	28.7
Sleep duration	>7 h (0)	0	0.0
	6–7 h (1)	11	10.2
	5–6 h (2)	38	35.2
	<5 h (3)	59	54.6
Habitual sleep efficiency	>85% (0)	0	0.0
	75–84% (1)	11	10.2
	65–74% (2)	38	35.2
	<65% (3)	59	54.6

PSQI component	Response (component score)	n	%
Sleep disturbances	Not during past month (0)	0	0.0
	<1/week (1)	11	10.2
	1–2/week (2)	38	35.2
	≥3/week (3)	59	54.6
Use of sleep medication	Never (0)	89	82.4
	Occasionally (1)	14	13.0
	Almost every day (2)	4	3.7
	Every day (3)	1	0.9
Daytime dysfunction	No problem (0)	0	0.0
	Occasionally (1)	35	32.4
	Almost every day (2)	50	46.3
	Every day (3)	23	21.3

Component scores (0–3) are shown in parentheses; higher scores indicate poorer sleep.

Factors associated with sleep quality

Table 4 and Table 5 present the associations of sociodemographic and clinical characteristics with sleep quality. In exact tests, poor sleep quality was significantly associated with monthly family income, family type, sleep duration, nocturnal awakenings and self-reported sleep quality (all exact $p \leq 0.027$). Both participants with good sleep quality belonged to nuclear families (2 of 15 nuclear vs 0 of 93 joint families; exact $p = 0.018$), and both had family incomes above 15,000 BDT. Both slept 6–7 h per night (2 of 11 vs 0 of 97 sleeping <6 h; exact $p = 0.010$), and both reported no nocturnal awakenings and "very good" self-rated sleep (2 of 6 vs 0 of 102; exact $p = 0.003$ for each).

Pearson's test suggested significant associations with age ($x^2 = 6.80$, df = 2, $p = 0.033$) and occupation ($x^2 = 17.36$, df = 3, $p < 0.001$), but these were not supported by exact tests (exact $p = 0.126$ and 0.109, respectively). No significant association was found with sex, marital status, education, place of living, comorbidity, duration of diabetes, treatment, diabetic complications, blood sugar control, physical exercise or use of sleep medication (exact $p \geq 0.157$).

Table 4. Association between sociodemographic characteristics and sleep quality (PSQI) among patients with type 2 diabetes mellitus (n = 108)

Variable / category	Good sleep n (%)	Poor sleep n (%)	Total n	x^2 (df)	Pearson *p*	Exact *p*†
Age (years)				6.80 (2)	0.033	0.126
31–45	1 (14.3)	6 (85.7)	7			
46–60	1 (1.8)	55 (98.2)	56			

Variable / category	Good sleep n (%)	Poor sleep n (%)	Total n	x^2 (df)	Pearson *p*	Exact *p*†
>60	0 (0.0)	45 (100.0)	45			
Sex				1.46 (1)	0.228	0.509
Male	0 (0.0)	45 (100.0)	45			
Female	2 (3.2)	61 (96.8)	63			
Marital status				0.23 (1)	0.631	1.000
Married	2 (2.1)	95 (97.9)	97			
Widowed	0 (0.0)	11 (100.0)	11			
Educational status				0.56 (3)	0.906	1.000
Illiterate	0 (0.0)	13 (100.0)	13			
Primary	1 (2.1)	47 (97.9)	48			
Secondary	1 (2.6)	37 (97.4)	38			
HSC and above	0 (0.0)	9 (100.0)	9			
Usual place of living				2.85 (1)	0.091	0.171
Upazila town	0 (0.0)	63 (100.0)	63			
Rural area/village	2 (4.4)	43 (95.6)	45			
Occupation				17.36 (3)	<0.001	0.109
Employed	1 (33.3)	2 (66.7)	3			
Self-employed	1 (1.9)	51 (98.1)	52			
Homemaker	0 (0.0)	50 (100.0)	50			
Unemployed	0 (0.0)	3 (100.0)	3			
Monthly family income (BDT)				18.27 (3)	<0.001	**0.027**
<10,000	0 (0.0)	54 (100.0)	54			
10,001–15,000	0 (0.0)	23 (100.0)	23			
15,001–20,000	1 (3.6)	27 (96.4)	28			
>20,000	1 (33.3)	2 (66.7)	3			
Family type				12.63 (1)	<0.001	**0.018**
Joint	0 (0.0)	93 (100.0)	93			
Nuclear	2 (13.3)	13 (86.7)	15			

Row percentages are shown. † Freeman–Halton exact test; significant values ($p < 0.05$) are in bold. Pearson's x^2 is reported for transparency; expected counts were <5 in ≥50% of cells for every variable, so Pearson *p*-values are unreliable. Categories with no participants (age 18–30 years, single, divorced, district town) were omitted.

Table 5. Association between clinical and health-related characteristics and sleep quality (PSQI) among patients with type 2 diabetes mellitus (n = 108)

Variable / category	Good sleep n (%)	Poor sleep n (%)	Total n	x^2 (df)	Pearson *p*	Exact *p*†
Medical history				0.35 (2)	0.838	1.000
Hypertension	2 (2.2)	90 (97.8)	92			
Cardiovascular disease	0 (0.0)	12 (100.0)	12			
Respiratory disease	0 (0.0)	4 (100.0)	4			
Duration of diabetes (years)				3.75 (2)	0.153	0.187
1–5	2 (5.3)	36 (94.7)	38			
6–10	0 (0.0)	42 (100.0)	42			
>10	0 (0.0)	28 (100.0)	28			
Current treatment				0.78 (2)	0.676	1.000
Oral hypoglycaemic agents	0 (0.0)	10 (100.0)	10			
Insulin therapy	2 (2.6)	76 (97.4)	78			
Combination therapy	0 (0.0)	20 (100.0)	20			
Diabetic complications				8.44 (4)	0.077	0.157
Neuropathy	0 (0.0)	30 (100.0)	30			
Retinopathy	0 (0.0)	7 (100.0)	7			
Foot ulcers	0 (0.0)	3 (100.0)	3			
Cardiovascular complications	0 (0.0)	47 (100.0)	47			
None	2 (9.5)	19 (90.5)	21			
Blood sugar control‡				2.28 (2)	0.320	0.382
Well controlled	1 (6.7)	14 (93.3)	15			
Moderately controlled	1 (1.2)	84 (98.8)	85			
Poorly controlled	0 (0.0)	8 (100.0)	8			
Physical exercise				0.89 (2)	0.642	0.507
Regular	0 (0.0)	7 (100.0)	7			
Irregular	1 (4.0)	24 (96.0)	25			
None	1 (1.3)	75 (98.7)	76			
Sleep duration per night (h)				17.97 (2)	<0.001	**0.010**
<5	0 (0.0)	59 (100.0)	59			
5–6	0 (0.0)	38 (100.0)	38			
6–7	2 (18.2)	9 (81.8)	11			
Use of sleep medication				0.44 (1)	0.510	1.000
Yes	0 (0.0)	19 (100.0)	19			

Variable / category	Good sleep n (%)	Poor sleep n (%)	Total n	x^2 (df)	Pearson *p*	Exact *p*†
No	2 (2.2)	87 (97.8)	89			
Nocturnal awakenings				34.64 (3)	<0.001	**0.003**
Never	2 (33.3)	4 (66.7)	6			
1–2 times/week	0 (0.0)	34 (100.0)	34			
3–4 times/week	0 (0.0)	37 (100.0)	37			
Daily	0 (0.0)	31 (100.0)	31			
Self-reported sleep quality				34.64 (3)	<0.001	**0.003**
Very good	2 (33.3)	4 (66.7)	6			
Good	0 (0.0)	34 (100.0)	34			
Fair	0 (0.0)	37 (100.0)	37			
Poor	0 (0.0)	31 (100.0)	31			

Row percentages are shown. † Freeman–Halton exact test; significant values ($p < 0.05$) are in bold. ‡ Based on latest HbA1c or random blood sugar. Categories with no participants (kidney disease, diabetes <1 year, diet and lifestyle only, nephropathy, sleep >7 h) were omitted. Sleep duration, nocturnal awakenings and self-reported sleep quality overlap conceptually with PSQI components (see Discussion).

Discussion

In this cross-sectional study of 108 patients with T2DM attending an upazila health complex, 98.1% had poor sleep quality on the PSQI. Within this near-saturated outcome, exact tests identified associations with monthly family income and family type, together with short sleep duration, frequent nocturnal awakenings and poor self-rated sleep, which are closely related to PSQI components themselves. Associations with age and occupation that were apparent on Pearson's test were not sustained under exact testing.

Prevalence of poor sleep quality

The observed prevalence is considerably higher than that reported in Ethiopian hospital-based samples (47.2–55.6%) (47.2%–55.6%; Birhanu et al., 2020; Jemere et al., 2019), the Ethiopian pooled estimate of 48.5% (Abate et al., 2024), the 32% reported from Malaysia (Nasir et al., 2022) and the 12% reported from India (Pavan et al., 2023), and exceeds even the 82% reported from Pakistan (Hamayal et al., 2025). Mixed-disease samples have shown lower figures still; for example, 36.5% of patients with diabetes, hypertension or heart failure at a single Ethiopian referral hospital were poor sleepers (Edmealem et al., 2020). Such heterogeneity partly reflects differences in case mix, PSQI cut-offs and administration. The present sample was older (93.5% aged >45 years), predominantly low-income, largely insulin-treated (72.2%) and hypertensive (85.2%), with little physical activity (70.4% none), characteristics that plausibly

predispose to sleep disturbance (Birhanu et al., 2020; Hamayal et al., 2025). Selection of patients attending a health facility, convenience sampling and the use of the conventional >5 cut-off, which is sensitive but less specific in older, multimorbid populations, may also have inflated the estimate. Given that only two participants had good sleep quality, the possibility of systematic scoring or administration effects cannot be excluded, and the figure should be confirmed in an independent, probability-based sample.

Factors associated with sleep quality
Lower household income was associated with poor sleep, consistent with the income gradient reported in Pakistan (Hamayal et al., 2025). Financial strain, poor sleeping conditions and limited access to care are plausible pathways, although these were not measured. The finding that both good sleepers lived in nuclear families should be interpreted with caution: it rests on two individuals, and family structure has not, to our knowledge, been examined in the studies reviewed here, so crowding or household noise in joint families remain untested hypotheses. Likewise, the apparent protective effect of higher income (1 of 3 participants earning >20,000 BDT) derives from very few observations.

Short sleep duration, frequent nocturnal awakenings and poor self-rated sleep were strongly associated with poor PSQI-defined sleep quality. Because duration, disturbance and subjective quality are themselves scored within the PSQI, these associations largely reflect internal consistency of the instrument and should not be read as independent determinants. Notably, the null associations of age and occupation under exact testing illustrate how asymptotic tests can overstate evidence when the outcome is almost constant.

Several correlates reported elsewhere, namely duration of diabetes, glycemic control, treatment modality and comorbidity, were not significant here. In other studies, poor glycemic control, comorbidity and depression were associated with poorer sleep (Birhanu et al., 2020; Zewdu et al., 2022), and uncontrolled blood glucose was linked to poor sleep in smaller samples (Amelia et al., 2020; Babu et al., 2020). With 106 of 108 participants in the poor-sleep category, the present study had almost no capacity to detect such gradients, and the absence of association should not be interpreted as evidence of no effect. Glycemic control was also classified from either HbA1c or random glucose, which may have introduced misclassification.

Implications for practice and research
Whatever the exact rate sleep complaints seem common among patients who go to upazila-level diabetes services, where routine sleep assessment's not part of usual follow-up. A short PSQI screening, nurse-led sleep-hygiene counselling and looking at symptoms during regular visits are cheap ways that fit with advice to add sleep-quality checks to routine diabetes follow-up (Birhanu et al., 2020) and to give health education about sleep (Abate et al., 2024). Future studies should use probability-based sampling treat the PSQI as a continuous score look at depression, anxiety, frequent nighttime urination, body weight and breathing problems during sleep and use models that consider many factors at once.

Strengths and limitations

Strengths include using a standard instrument that had been checked before written in the local language having complete data for every participant and using exact tests that fit small data tables. Limitations are many. First the study took place at one site and used a convenience sample, which limits how well the results can be applied to other places and may bring bias; about 72 % of the clinics record was used and the 20 pilot participants were left out. Second because the study looked at one point in time it cannot show cause and effect. Third sleep and health information was provided by the patients themselves. Could be incorrect because people may not remember properly or may want to appear better. There were no tools like actigraphy or sleep studies used. Fourth when almost everyone had sleep quality there was little difference between people, which made it hard to run analyses that take other factors into account. Fifth key factors that can affect sleep, such, as depression, anxiety, frequent nighttime urination, body weight, nerve pain and breathing problems during sleep were not studied. Sixth some listed variables (illnesses and complications) were grouped into single categories and blood sugar control combined two different tests, HbA1c and random glucose.

every patient with type-2 diabetes in this upazila health complex had bad sleep quality on the PSQI. Low income, living with a family short sleep time waking up often and rating sleep as bad – the last three match parts of the PSQI – were linked to poor sleep in the exact tests while age and job did not show a link. Because the problem is so common the results should be checked again in studies that use probability sampling at several sites and use analyses that adjust for other factors. Still simple and cheap sleep checks should be added to diabetes care in Bangladesh.

Conclusion

Almost all patients with T2DM in this upazila health complex sample had poor sleep quality on the PSQI. Lower income, joint-family living, and short sleep duration, frequent awakenings and poor self-rated sleep, the last three overlapping with PSQI constructs, were associated with poor sleep in exact tests, whereas age and occupation were not. Given the extreme prevalence, replication in larger, probability-based, multi-centre studies with adjusted analyses is needed before the magnitude of the problem and its determinants can be firmly established. Routine, low-cost sleep assessment should nevertheless be considered in diabetes follow-up care in Bangladesh.

Declarations

Ethics approval and consent to participate. Approved by the Institutional Ethical Review Board of Enam Medical College & Hospital, Savar, Dhaka (Memo No. EMC/IERB/2026/05-6; [04-05-2026]). Written informed consent was obtained from all participants.

Availability of data and materials. The datasets analyzed are available from the corresponding author on reasonable request.

Conflict of interests. The author declares no conflict of interests.

Funding. This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Authors' contributions.
Jannatul Ferdous: As the first and corresponding author, contributed to the study conception and design, methodology, data collection, data management, data analysis, interpretation of findings, and manuscript preparation. She coordinated communication with the journal and takes primary responsibility for the integrity of the work.
Md. Yeasin Mahmud: Contributed to the clinical aspects of the study, study methodology, interpretation of findings, and critical review and editing of the manuscript.
Dr. Mithun Chandra Banik: Contributed to clinical input, interpretation of findings, and critical review of the manuscript for important intellectual content.
All authors: Reviewed and approved the final version of the manuscript and agreed to be accountable for their respective contributions to the work.

Acknowledgements.
The authors thank the patients who participated, the staff and administration of Raipur Upazila Health Complex, the experts who validated the tool and the statistician for analytic support.

References

Abate, H. K., Azagew, A. W., Nega, G. A., Birru, S. M., & Mekonnen, C. K. (2024). Prevalence and determinants of poor sleep quality among diabetic patients in Ethiopia: Systematic review. *Frontiers in Public Health*, *12*, Article 1363408. https://doi.org/10.3389/fpubh.2024.1363408

Alghamdi, R. A., Alkanderi, R. A., Jaafari, M. A., Al Shehri, A. M., Alqahtani, H. A., Aldawsari, N. I., Aloqayli, R. I., Baothman, M. S., Aldandan, A. A., Alfauri, A. T., & Alzain, Q. A. (2023). Sleep quality and diabetes associated factors, effect and interventions. *International Journal of Community Medicine and Public Health*, *10*(11), 4468–4472. https://doi.org/10.18203/2394-6040.ijcmph20233496

Amelia, R., Harahap, J., Harahap, N. S., Wijaya, H., Ariga, R. A., Fujiati, I. I., & Rusdiana. (2020). Effect of sleep quality on blood glucose level of type 2 diabetes mellitus patients in Medan, Indonesia. *Open Access Macedonian Journal of Medical Sciences*, *8*(E), 574–577. https://doi.org/10.3889/oamjms.2020.5324

Babu, A., Janardhanan, S. V., Sreevidhya, R., & Sruthy, K. S. (2020). Sleep quality and glycemic control among patients with type II diabetes mellitus. *Indian Journal of Public Health Research & Development*, *11*(3), 41–46.

Birhanu, T. T., Salih, M. H., & Abate, H. K. (2020). Sleep quality and associated factors among diabetes mellitus patients in a follow-up clinic at the University of Gondar Comprehensive Specialized Hospital in Gondar, Northwest Ethiopia: A cross-sectional study. *Diabetes, Metabolic Syndrome and Obesity*, *13*, 4859–4868. https://doi.org/10.2147/DMSO.S285080

Buysse, D. J., Reynolds, C. F., III, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*, *28*(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4

Edmealem, A., Degu, S. G., Haile, D., Gedfew, M., Bewket, B., & Andualem, A. (2020). Sleep quality and associated factors among diabetes, hypertension, and heart failure patients at Debre Markos Referral Hospital, Northwest Ethiopia. *Sleep Disorders*, *2020*, Article 6125845. https://doi.org/10.1155/2020/6125845

Esen, E. S., & Zeren Öztürk, G. (2025). Analysis of sleep quality and related factors in patients with type 2 diabetes mellitus. *Clinical and Experimental Health Sciences*, *15*, 76–82. https://doi.org/10.33808/clinexphealthsci.1442009

Hamayal, M., Shahid, W., Wali, S., Ahmad, N., Ahmad, R., Iftikhar, I., Tahir, M. D., Hafeez, M., Haseeb, A., & Siddiqui, S. A. (2025). Prevalence and determinants of poor sleep quality among patients of diabetes mellitus: A tertiary hospital-based cross-sectional study. *Annals of Medicine and Surgery*, *87*(8), 4875–4881. https://doi.org/10.1097/MS9.0000000000002723

International Diabetes Federation. (2025). *IDF diabetes atlas* (11th ed.). https://diabetesatlas.org

Jemere, T., Mossie, A., Berhanu, H., & Yeshaw, Y. (2019). Poor sleep quality and its predictors among type 2 diabetes mellitus patients attending Jimma University Medical Center, Jimma, Ethiopia. *BMC Research Notes*, *12*(1), Article 488. https://doi.org/10.1186/s13104-019-4531-6

Mohamed, N. A., Haji Mohamud, R. Y., Hilowle, F. H., Ali, T. A., Mohamed, Y. A., Gabow, A. A., Mohamed, H. N., Sidow, N. O., Hassan, M. S., & Waberi, M. M. (2025). Assessment of sleep quality and its determinants among patients with type 2 diabetes mellitus in Mogadishu, Somalia: A cross-sectional study. *Diabetes, Metabolic Syndrome and Obesity*, *18*, 1949–1965. https://doi.org/10.2147/DMSO.S533810

Nasir, N. F. M., Draman, N., Zulkifli, M. M., Muhamad, R., & Draman, S. (2022). Sleep quality among patients with type 2 diabetes: A cross-sectional study in the East Coast region of Peninsular Malaysia. *International Journal of Environmental Research and Public Health*, *19*(9), Article 5211. https://doi.org/10.3390/ijerph19095211

Pavan, K., Vinay, B. C., Subramanya, C., Shetty, S., Shreyas, K., Ananthesh, L., Swathi, S., & Nayak, S. D. (2023). A cross-sectional study on the assessment of sleep quality and associated factors among diabetes mellitus patients. *Biomedical and Pharmacology Journal*, *16*(3), 1693–1699. https://doi.org/10.13005/bpj/2747

Salih, I. M., & Al-Qazaz, H. K. (2024). Sleep pattern and diabetes: Findings from a cross-sectional study in Iraq. *Eurasian Journal of Family Medicine*, *13*(1), 1–6. https://doi.org/10.33880/ejfm.2024130101

Saparwan, N., Tohit, N. M., & Salmiah, M. S. (2023). A cross-sectional study on the sleep quality among type 2 diabetes mellitus patients and its associated factors. *Medical Journal of Malaysia*, *78*(5), 627–634.

von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting

observational studies. *The Lancet*, *370*(9596), 1453–1457. https://doi.org/10.1016/S0140-6736(07)61602-X

World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, *310*(20), 2191–2194. https://doi.org/10.1001/jama.2013.281053

Zaman, F., Hossain, M. M., Rishad, M. K., Jubayer, M. M. M., & Asaduzzaman, M. (2024). *Sleep quality and quality of life in adults with type 2 diabetes in Bangladesh*. Preprints.org. https://doi.org/10.20944/preprints202412.0734.v1

Zewdu, D., Gedamu, H., Beyene, Y., Tadesse, M., Tamirat, M., & Muluke, S. (2022). Sleep quality and associated factors among type 2 DM patients and non-DM individuals in Bahir Dar governmental hospitals: Comparative cross-sectional study. *Sleep Science and Practice*, *6*, Article 10. https://doi.org/10.1186/s41606-022-00079-5