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Relationship of Sleep Quality with Health-Related Quality of Life in Type 2 Diabetic Patients of Twin Cities of Pakistan

Pakistan'ın İkiz Şehirlerindeki Tip 2 Diyabetik Hastalarda Uyku Kalitesinin Sağlıkla İlgili Yaşam Kalitesi ile İlişkisi

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Abstract

Objective: To determine the relationship of sleep quality with health-related quality of life (HRQOL). To find frequency of restless leg syndrome (RLS), and to compare sleep quality and HRQOL with or without RLS in diabetic patients.

Materials and Methods: This analytical cross-sectional study was conducted in twin cities of Pakistan from February 2023 to June 2023. A total of 377 participants of both genders aged 30 to 60 years having type 2 diabetes mellitus diagnosed in the last 5 years were selected using a non-probability convenience sampling technique whereas participants with any cardiac disease and uncontrolled hypertension were excluded. To determine sleep quality, HRQOL, and RLS, the European Quality of Life-5 Dimension-5 Levels, Pittsburgh Sleep Quality Index, and Cambrige-Hopkins RLS short-form 2 diagnostic questionnaires were used, respectively.

Results: Sleep quality showed significant relation with HRQOL ($p<0.01$, $r=-0.422$) in type 2 diabetic patients. 10.6% of the participants reported a definite RLS. Significant difference ($p=0.001$) was found in sleep quality and HRQOL with RLS as compared to those having no RLS.

Conclusion: The study concludes that there is a relationship of sleep quality with HRQOL in patients with type 2 diabetes. Further, patients with type 2 diabetes having RLS have poor sleep quality and HRQOL in comparison of the participants without RLS.

Keywords: Pakistan, quality of life, restless leg syndrome, sleep quality, sleep initiation and maintenance, type 2 diabetes mellitus

Öz

Amaç: Uyku kalitesinin sağlıkla ilişkili yaşam kalitesi (HRQOL) ile ilişkisini belirlemek. Diyabetik hastalarda huzursuz bacak sendromunun (HBS) sıklığını bulmak ve HBS olan ve olmayan uyku kalitesi ve sağlıkla ilişkili yaşam kalitesini karşılaştırmak.

Gereç ve Yöntem: Bu analitik kesitsel çalışma, Şubat 2023 ile Haziran 2023 arasında Pakistan'ın ikiz şehirlerinde gerçekleştirildi. Son 5 yılda tip 2 diyabet tanısı alan, 30 ila 60 yaşları arasındaki her iki cinsiyetten toplam 377 katılımcı, bir anket kullanılarak seçildi. Olasılığa dayalı olmayan kolayda örnekleme tekniği ile herhangi bir kalp hastalığı ve kontrolsüz hipertansiyonu olan katılımcılar hariç tutulmuştur. Uyku kalitesini, HRQOL ve HBS, Avrupa Yaşam Kalitesi-5 Boyut-5 Düzeylerini Pittsburgh Uyku Kalitesi indeksini ve Cambrige-Hopkins'i belirlemek için. HBS kısa form 2 tanısal anketleri sırasıyla kullanıldı.

Bulgular: Tip 2 diyabet hastalarında uyku kalitesi ile sağlıkla ilişkili yaşam kalitesi arasında anlamlı ilişki olduğu görüldü ($p<0,01$, $r=-0,422$). Katılımcıların %10,6'sı kesin bir HBS bildirdi. HBS olanlarda, HBS olmayanlara göre uyku kalitesi ve sağlıkla ilişkili yaşam kalitesi açısından anlamlı fark ($p=0,001$) bulundu.

Sonuç: Çalışma, tip 2 diyabetli hastalarda uyku kalitesi ile sağlıkla ilişkili yaşam kalitesi arasında bir ilişki olduğu sonucuna varmıştır. Ayrıca HBS olan tip 2 diyabetli hastaların uyku kalitesi ve sağlıkla ilgili yaşam kaliteleri, HBS olmayan katılımcılarla karşılaştırıldığında daha düşüktür.

Anahtar Kelimeler: Pakistan, yaşam kalitesi, huzursuz bacak sendromu, uyku kalitesi, uykunun başlatılması ve sürdürülmesi, tip 2 diyabet

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Introduction

Diabetes mellitus (DM), a chronic metabolic disorder marked by high blood sugar levels due to inadequate insulin production or resistance, affects millions globally. and is among one of the most common non-communicable diseases.[1,2] Among its types, type 2 DM (T2DM) is the most common, making up 90-95% of all cases and increasingly affecting younger populations.[3] Factors like age, family history, obesity, physical inactivity, hypertension, gestational diabetes, smoking, and unhealthy diets are well-known contributors with recent research also pointing to sleep disturbances, chemical exposure and high iron levels as emerging risks.[4,5]

The complications of T2DM are extensive, affecting multiple organ systems and including cardiovascular disease, nerve damage, kidney damage, eye damage, infections, and foot problems.[6] The International Diabetes Federation estimates that 536.6 million adults worldwide have diabetes, with this number expected to rise to 643 million by 2030 and 783 million by 2045.[6] In Pakistan, the prevalence is particularly high, with 33 million individuals- 26.7% of the population-affected, driven by sedentary lifestyles, unhealthy diets, genetic factors, and urbanization.[7]

Sleep quality, essential for physical and mental health, is significantly impacted in individuals with T2DM. Poor sleep is linked to a host of adverse outcomes, including depression, anxiety, obesity, and cardiovascular disease.[8] Restless legs syndrome (RLS), a major sleep disorder, affected 11% of the global population in 2017 and it has drastically increased to 17% in last 3 years.[9,10] Whereas, prevalence was notably higher (23.6%) in 2017 and now it has raised to 28% in Pakistan highlighting the need for focused attention on sleep disorders in this group.[10,11]

Health-related quality of life (HRQOL) is a critical measure that looks at how diseases affect an individual's physical, social, and mental well-being. T2DM greatly impacts HRQOL, showing up as physical symptoms, emotional distress, social isolation, and financial strain.[12] Previous studies have consistently shown that T2DM patients have lower HRQOL scores, particularly in areas related to physical performance, functional impairments, and overall well-being.[13] Additionally, poor sleep quality makes these effects worse, leading to higher levels of depression and anxiety, insulin resistance, and inflammation.[14,15]

Pakistan has a high prevalence of T2DM, with substantial literature on T2DM and HRQOL. However, there is limited research on the relationship between sleep quality and HRQOL in individuals with T2DM. This study focuses on participants with diabetes for up to 5 years, minimizing the impact of diabetes-related complications on sleep and HRQOL. While various sleep disorder affect sleep, RLS is a significant concern. Though some studies have examined RLS prevalence in different disease populations, there is limited research on its prevalence in the T2DM population. Moreover, the literature lacks studies comparing sleep quality and HRQOL between diabetic patients with and without RLS, highlighting a significant gap in existing research globally.

This study aimed to fill the gap in existing research by exploring the relationship between sleep quality and HRQOL in T2DM patients in Pakistan, with a special focus on those with and without RLS. Secondly, the study findings can enhance the existing knowledge on the impact of sleep quality on HRQOL, particularly in context of T2DM in Pakistan.

Materials and Methods

This analytical cross-sectional study was conducted from February to July 2023, from hospitals of Rawalpindi and Islamabad (Pakistan Institute of Medical Sciences, Smile Dental Hospitals Care Clinic, Abid Hospital Islamabad and Friends Hospital. Sample size was 377 for our primary objective, which was calculated using the Rao software with a 95% confidence interval, 5% margin of error, response rate of 50%, and a population of 20,000. In our study, 40 participants were diagnosed with RLS. So to achieve our secondary objective, 40 participants without RLS were selected by using random sampling method (every 6th interval) to equalize the groups for the comparison of sleep quality and HRQOL in participants with and without RLS. Participants of both gender with age range of 30 to 60 years and had been diagnosed with T2DM within the last 1 to 5 years were included in the study. Whereas, participants who had any heart disease, chronic kidney disease, liver disease, active thyroid disorder, uncontrolled hypertension, diagnosed depression, obstructive sleep apnea, recent trauma, hospital admission within the past 3 months, were also excluded from the study.

A self-structured questionnaire was used to gather basic demographic data of each participant that included age, gender, marital status, occupation, body mass index (BMI), past medical history, comorbidity and the duration of diabetes.

The EuroQol (European Quality of Life)-5 Dimension-5 Levels (EQ-5D-5L) questionnaire was used and has shown strong validity and reliability with a Cronbachs's alpha coefficient of 0.87 in assessing HRQOL across a range of demographics and different health conditions.[16] It is a tool that enabled a quantitative expression of a person's values and preferences in terms of their general state of health. The EQ-5D-5L uses a five-digit code to score an individual's chosen severity level for each of the five dimensions. It provided a descriptive profile of health status and converted into an index score ranging from- 0.594 to 1. The index score represented the individual's health state, with 1 indicating full health and 0 representing a state worse than death.[17] Another tool used was Pittsburgh Sleep Quality Index (PSQI) to determine sleep quality created by Buysse. It is a standardized self-administered questionnaire for evaluating overall sleep quality over one month. PSQI is a very reliable tool with Cronbachs's alpha coefficient value of 0.72 and demonstrated to have good validity.[18] PSQI scores of 7 components range from 0 to 3. The global score, obtained by summing component scores, ranges from 0 to 21, with higher scores indicating poorer sleep quality and lower global scores indicating better sleep quality.[18]

Cambridge Hopkins RLS short-form 2 diagnostic (CH-RLSQ13) is a diagnostic questionnaire which has been proved to be

a valid and reliable tool for diagnosing RLS. The CH-RLSQ13 divides subjects into four categories, definite RLS, probable, uncertain and no RLS. According to a study, this tool has a sensitivity and specificity of 87.2% and 94.4%, respectively.[19]
After screening 500 participants, we took data from 377 participants falling in our inclusion criteria, prior to data collection participants signed an informed consent. The Institutional Review Board and Ethical Committee IRB & EC (approval number: #0356-22, date: 24.12.2022) of Shifa International Hospital, Islamabad Pakistan have authorized this study.

Statistical Analysis

The statistical package of social sciences version 23 was used to analyze the data of 377 participants. For descriptive analysis, the Mean and standard deviation of Age, BMI, and duration of diabetes, whereas frequency of gender, BMI categories, marital status, occupation, and RLS were calculated and shown in the form of tables, pie, and bar charts. The relationship of sleep quality with HRQOL was determined using Pearson correlation. The Independent-T test was used to determine the HRQOL and sleep in T2DM with and without RLS

Results

The study sample consisted of total 377 participants, out of which males were 224 (59%) and females were 153 (40%). The mean and standard deviation of age of the participants was 48.77±7.175 (years). The majority of participants were in the healthy category of BMI, 219 (58.1%) followed by overweight 146 (38.7%). The mean and standard deviation of BMI and duration of diabetes were 24.67±2.59 (Kg/m^2) and 3.73±1.07 (years) respectively. In the total sample, laborers were 32 (9%), businessman 66 (17%), housewives 124 (32%) whereas majority of the participants had other occupations 139 (36.9%). A total of 40 participants, accounting for 10.6% of the sample, reported a definite RLS, details of which is given in (Figure 1). Total males and females in Group A (RLS) and Group B (no RLS) were 16 (40%), 24 (60%) and 26 (65%), 14 (35%) respectively. Demographic details of Group A and Group B is given in (Table 1).

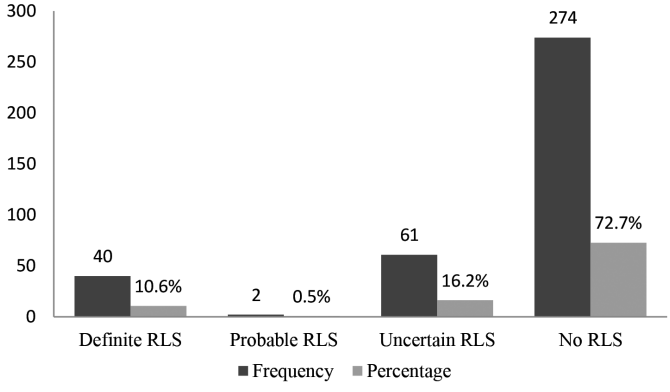

Figure 1. Frequency (%) of RLS of the participants

RLS: Restless leg syndrome

Sleep quality showed a negative moderate and significant relation (r=-0.422, p<0.01) with HRQOL in T2DM patients (Table 2). A sample of 80 participants with 40 in each group RLS (Group A) and no RLS (Group B) was assessed further for group comparison of sleep quality and HRQL of diabetes patients with and without RLS. There was a significant difference (p=0.001) in sleep quality and HRQOL of T2DM patients with RLS as compared to those having no RLS (Table 3).

Discussion

The present study showed an inverse and significant relationship of sleep quality with HRQOL in T2DM patients.
Our findings were supported by the study conducted in China by Peian Lou et al.[20] in 2015 and North India by MD Azharuddin[21], both studies concluded that poor sleep is common in T2DM population which was linked to reduced HRQL.[20] Furthermore, poor sleep quality has adverse effect on various aspects of HRQOL, specifically the functional abilities in daily activities.[21,22] In addition, the results are also consistent with the cross-sectional study by Chasens and Luyster[22] luyster conducted in 2016 focusing on sleep disturbances and their effect on QOL in diabetic patients. RLS was one of the major sleep-disturbance causing factors discussed in this study. They reported that sleep problems such as insomnia, RLS and poor sleep quality, are all associated with lower QOL in those with diabetes.[22]
People with diabetes experience poor sleep quality in response to lifelong and comprehensive self-management. Poor sleep leads to tiredness, decrease energy, poor diet and glycemic

Table 1. Demographic details of the participants

Variables	Group A (RLS)	Group B (no RLS)
	Mean ± SD	
Age (years)	53.82±5.21	48.62±6.65
BMI (Kg/m^2)	24.11±2.98	24.92±2.84
Duration of diabetes (years)	2.98±1.35	3.7±1.07

BMI: Body mass index, RLS: Restless leg syndrome, SD: Standard deviation

Table 2. Correlation of sleep quality with HRQOL in diabetic patients

Variables	Coefficient of correlation (R value)	p
Sleep quality HRQOL	-0.422	<0.01**

**Indicates significant correlation (p-value <0.01).
HRQOL: Quality with health-related quality of life

Table 3. Comparison of sleep quality and HRQOL with or without RLS in diabetic patients

Variables	Group A (RLS)	Group B (No RLS)	p
	Mean ± SD		
Sleep quality	9.35±3.23	6.9±2.83	0.001***
HRQOL	0.5±0.16	0.67±0.26	0.001***

***Indicates significant difference (p- value <0.001).
RLS: Restless leg syndrome, HRQOL: Quality with health-related quality of life

control, weakened immune system and insufficient diabetes self-care. All these factors taken together produce a viscous cycle that might be the reason of decrease quality of life with poor sleep quality in diabetes patient.[23]

The current study reported that RLS had a prevalence of 10.6% among participants diagnosed with T2DM which is supported by Shin-Ichi Harashima cross sectional study on Japanese diabetic population which reported 8% prevalence of RLS.[24]

RLS may affect anyone, it has been found to be more common in those who have certain underlying health issues, such as diabetes. The link between diabetes and RLS is not entirely understood, however various studies have found a greater frequency of RLS among diabetics than in the general population.[25] The exact mechanisms relating the two disorders are unknown, however some studies suggest that diabetes-related nerve injury, poor circulation, or changes in neurotransmitter levels may contribute to the development or worsening of RLS symptoms.[25]

A Turkish cross-sectional study in 2019 reported higher prevalence (28.3%) of RLS in patients with T2DM in comparison to our findings. The possible explanation of contradictory findings between the studies might be attributed to various factors such as geographical location, genetic predisposition and environmental variables. Further sample inclusion criteria of wide age group (18-80 years) in the previous study may have contributed to the variations. Additionally, the longer duration of diabetes in the Turkish study may have impacted the progression and severity of RLS symptoms, potentially leading to a higher prevalence.[25]

Furthermore, contradictory to our study results, higher prevalence of 55.8% was reported in a study conducted in Pakistan in 2015. The smaller sample size (n=120) and different questionnaire for RLS diagnosis International RLS Study Group criteria, in the previous study might be the reason for conflicting results.[26]

Our study further concluded that T2DM patients with RLS experienced significantly poorer sleep quality and HRQOL as compared to participants without RLS. Our results are is in line with cross sectional study conducted on 210 Irani[21] an diabetic participant.[27] Furthermore, the current study results are also consistent with a study conducted in India in 2020 by Thara Pinheiro et al.[11] that reported that diabetic patients who also had RLS had considerably poorer sleep quality and HRQOL in comparison to those who did not have RLS.[11]

The sleep quality of participants in our study was subjectively assessed, in future studies polysomnography could be used for more accurate results. Further Physical level of T2DM patients were not assessed in this study. Seminars should be conducted on increasing awareness about the significance of better sleep quality in individuals with T2DM.

Conclusion

The current study concludes a negative and moderate relationship of sleep quality with HRQOL in T2DM patients. 10.6% prevalence of RLS was found in patients with diabetes. Further, diabetic patients with RLS experienced poor sleep quality and decrease HRQOL as compared to participants without RLS.

Ethics

Ethics Committee Approval: The Institutional Review Board and Ethical Committee IRB & EC (approval number: #0356-22, date: 24.12.2022) of Shifa International Hospital, Islamabad Pakistan have authorized this study.

Informed Consent: An informed consent form was signed by each participant prior to the enrollment in the study. Each participant received a comprehensive explanation of the entire procedure and participation in the study was entirely voluntary.

Footnotes

Authorship Contributions

Concept: H.F., Design: N.B., Data Collection or Processing: N.B., J.S., Z.M., Analysis or Interpretation: H.F., N.B., T.A., Literature Search: J.S., Z.M., Writing: H.F., T.A., I.I.

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