

行政院國家科學委員會專題研究計畫 期末報告

第二型糖尿病病人之睡眠問題與糖尿病控制之追蹤研究

計畫類別：個別型
計畫編號：NSC 100-2314-B-040-002-
執行期間：100年08月01日至102年07月31日
執行單位：中山醫學大學護理學系（所）

計畫主持人：廖玟君
共同主持人：黃秀梨、黃建寧、郭青萍

公開資訊：本計畫涉及專利或其他智慧財產權，2年後可公開查詢

中華民國 102年10月31日

中文摘要：睡眠困難是糖尿病患者常見的問題，糖尿病控制狀況與合併症的發生可能會影響睡眠品質。本研究使用縱貫設計去探討血糖控制影響睡眠品質的狀況。研究對象收取 276 位醫學中心內分泌門診的糖尿病共同照護網之病人。每位患者由研究護士進行訪談，使用「匹茲堡睡眠品質量表」、「嗜睡量表」和睡眠日誌，評估患者主觀睡眠；並使用日常活動日誌與「糖尿病遵從行為量表」紀錄及評估每日的服藥、飲食與運動情況；患者的血糖控制與合併症的檢測結果，乃由醫師評估後從病歷中擷取。本研究使用描述性統計與複迴歸和廣義估計方程式分析睡眠與糖尿病控制情型之關係。結果顯示 73.3% 的病人血糖控制不佳 ($HbA1c \geq 7$ 71.8%)，大多數病患 (56.6%) 至少有血糖、血壓、或血脂其中一項的異常。59.9% 的病人睡眠少於七小時，55.7% 睡眠品質不佳 (PSQI $>$)。夜尿 (53.3%) 為導致睡眠不佳的主要原因。本結果將有助於了解睡眠在糖尿病控制中的角色，亦提供糖尿病患者實證臨床照護。

中文關鍵詞：睡眠、糖尿病控制、糖尿病合併症

英文摘要：Sleep is an important indicator for quality of life. Patients with diabetes often have sleep disorders, especially symptoms of insomnia or sleep apnea. To have a better sleep quality during night time and maintain daytime function without excessive sleep, affirming related factors for sleep management is vital. Diabetes associated complications and symptoms may contribute to sleep disorders. This study used a longitudinal design to explore the role glycemic control plays in sleep quality. Patients with type 2 diabetes mellitus were recruited from a pool of the Diabetes Care Network (DCN) in endocrine outpatient clinics of a medical center. Two hundred and seventy-six patients (124 males and 151 females) aged 33-86 years (mean \pm SD = 61.8 \pm 10.4) in the DCN were sampled and their glycemic control were retrospectively followed for 1 year. Each patient was interviewed by a research nurse. Questionnaires including the 'Pittsburg Sleep Quality Index,' the 'Epworth Sleepiness Scale,' and sleep diary were used to measure subjective sleep patterns and sleep quality. Laboratory data and tests of indicators of diabetes control and complications assessed by physicians were

retrieved from medical records. Statistic software of SPSS AMOS 17.0 will be used for data analyses.

Results: 71.8% of patients had poor glycemic control (HbA1c >7) and 56.6% had at least one of diabetic complications. The majority of participants slept less than 7 hours (59.0%) and 55.7% were classified as having poor quality of sleep. In contrast, only 33.2% claimed having more than 7 hours of sleep a night, and 24.6% were classified as having excessive daytime sleep. The leading causes to disturb night time sleep perceived by current participants were nocturia (53.5%). Findings from this study provide information about the control and severity of type 2 diabetes on sleep, as well as evidence-based care for managing type 2 diabetes.

英文關鍵詞： sleep, control of diabetes, diabetes complication

行政院國家科學委員會補助專題研究計畫 成果報告
 期中進度報告

第二型糖尿病病人之睡眠問題與糖尿病控制之追蹤研究

Sleep disturbance and diabetes mellitus control in patients with type 2
diabetes- A longitudinal study

計畫類別： 個別型計畫 整合型計畫

計畫編號：NSC 100 -2314 -B - 040- 002

執行期間：101年 8月 1日至 102年 7月 31日

計畫主持人：廖玟君

共同主持人：黃秀梨、黃建寧、郭青萍

計畫參與人員：沈彥菱

成果報告類型(依經費核定清單規定繳交)： 精簡報告 完整報告

本計畫除繳交成果報告外，另須繳交以下出國心得報告：

- 赴國外出差或研習心得報告
- 赴大陸地區出差或研習心得報告
- 出席國際學術會議心得報告
- 國際合作研究計畫國外研究報告

處理方式：除列管計畫及下列情形者外，得立即公開查詢

涉及專利或其他智慧財產權， 一年 二年後可公開查詢

中 華 民 國 102 年 10 月 28 日

Title: Sleep disturbance and diabetes mellitus control in patients with type 2 diabetes

Wen-Chun Liao, RN., PhD.¹

Chien-Ning Huang, MD. PhD.²

Chin-Pyng Kuo, RN., Ph.D.¹

¹School of Nursing, Chun Shan Medical University; Department of Nursing, Chun Shan Medical University Hospital.

²Institute of Medicine, Chun Shan Medical University; Department of Internal Medicine, Chun Shan Medical University Hospital.

Abstract

Sleep is an important indicator for quality of life. Patients with diabetes often have sleep disorders, especially symptoms of insomnia or sleep apnea. To have a better sleep quality during night time and maintain daytime function without excessive sleep, affirming related factors for sleep management is vital. Diabetes associated complications and symptoms may contribute to sleep disorders. This study used a longitudinal design to explore the role glycemic control plays in sleep quality. Patients with type 2 diabetes mellitus were recruited from a pool of the Diabetes Care Network (DCN) in endocrine outpatient clinics of a medical center. Two hundred and seventy-six patients (124 males and 151 females) aged 33-86 years (mean \pm SD = 61.8 \pm 10.4) in the DCN were sampled and their glycemic control were retrospectively followed for 1 year. Each patient was interviewed by a research nurse. Questionnaires including the "Pittsburg Sleep Quality Index," the "Epworth Sleepiness Scale," and sleep diary were used to measure subjective sleep patterns and sleep quality. Laboratory data and tests of indicators of diabetes control and complications assessed by physicians were retrieved from medical records. Statistic software of SPSS AMOS 17.0 will be used for data analyses. Results: 71.8% of patients had poor glycemic control (HbA_{1c} >7) and 56.6% had at least one of diabetic complications. The majority of participants slept less than 7 hours (59.0%) and 55.7% were classified as having poor quality of sleep. In contrast, only 33.2% claimed having more than 7 hours of sleep a night, and 24.6% were classified as having excessive daytime sleep. The leading causes to disturb night time sleep perceived by current participants were nocturia (53.5%). Findings from this study provide information about the control and severity of type 2 diabetes on sleep, as well as evidence-based care for managing type 2 diabetes.

Key words: sleep, control of diabetes, diabetes complication

中文摘要

睡眠困難是糖尿病患者常見的問題，糖尿病控制狀況與合併症的發生可能會影響睡眠品質。本研究使用縱貫設計去探討血糖控制影響睡眠品質的狀況。研究對象收取 276 位醫學中心內分泌門診的糖尿病共同照護網之病人。每位患者由研究護士進行訪談，使用「匹茲堡睡眠品質量表」、「嗜睡量表」和睡眠日誌，評估患者主觀睡眠；並使用日常活動日誌與「糖尿病遵從行為量表」紀錄及評估每日的服藥、飲食與運動情況；患者的血糖控制與合併症的檢測結果，乃由醫師評估後從病歷中擷取。本研究使用描述性統計與複迴歸和廣義估計方程式分析睡眠與糖尿病控制情型之關係。

結果顯示 73.3% 的病人血糖控制不佳 ($HbA1c \geq 7$ 71.8%)，大多數病患 (56.6%) 至少有血糖、血壓、或血脂其中一項的異常。59.9% 的病人睡眠少於七小時，55.7% 睡眠品質不佳 ($PSQI >$)。夜尿 (53.3%) 為導致睡眠不佳的主要原因。本結果將有助於了解睡眠在糖尿病控制中的角色，亦提供糖尿病患者實證臨床照護。

關鍵字：睡眠、糖尿病控制、糖尿病合併症

Introduction

Diabetes mellitus is one of the most common chronic medical conditions encountered in clinical practice and is a critical public health challenge. Its prevalence (5.4%) continues to increase and it affects about 250 million people worldwide (Mahmood et al., 2009; Rodbard et al., 2007; Tasali, Mokhlesi, & Van Cauter, 2008). In Taiwan, the prevalence of type 2 diabetes is about 5~9% in young adults (aged >20 years) and 11~13% in adults aged over 40 years (Department of Health, Executive Yuan, 2006).

Sleep disturbance is often observed among patients with diabetes (Resnick et al., 2003). It is probably due to diabetes itself as well as to physical complications of the disease (Taub & Redeker, 2008). 57% of patients with type 2 diabetes reported sleep problems, in those 26% had prolonged sleep latency and poor sleep maintenance and 23% had poor sleep maintenance (Lamond, Tiggemann, & Dawson, 2000). Symptoms including nocturia and neuropathic pain may be two possible causes of sleep disturbance (Lamond et al., 2000). Pain associated with diabetic neuropathy is commonly encountered in clinical practice and has impact on quality of life. Nocturia may be caused by osmotic diuresis secondary to plasma glucose levels that exceed the renal threshold. Pain and nocturia may be a part of a vicious cycle of sleep disturbance and neurohormonal changes, hence lead to worsening control of diabetes (Taub & Redeker, 2008). Controlling pain and nocturia may improve both sleep and glycemic control.

However, little literatures provide information about the role of sleep in glycemic control in people who already have type 2 diabetes. Trento et al (2008) examined sleep duration and quality in relation to glycemic control in 47 patients with type 2 diabetes and 23 middle-aged healthy control subjects. Results showed higher fragmentation and moving time in patients with diabetes; elevated HbA1c was correlated with lower sleep efficiency and more moving time (Trento et al., 2008). Diabetes is not a curable disease, but continuous control and care is needed. Without careful management, budget in dealing with complications of diabetes will be enormous. Appropriate management of diabetes is crucial for public health.

Evidences supported an association between sleep and glycemic control and complications in type 2 diabetics (Knutson, Ryden, Mander, & Van Cauter, 2006; Trento et al., 2008). Diabetics had lower sleep efficiency and maintenance than those without diabetes; higher HbA1c is correlated with lower sleep efficiency and more moving time (Trento et al., 2008). Glycemic control is associated with sleep debt (perceived hours for more sleep) in diabetics with complications, but associated with sleep quality (PSQI) in those without complications (Knutson et al., 2006). The major factors to disrupt sleep in diabetics are neuropathic pain and polyuria (Lamond et al., 2000). These existing evidences of impaired sleep and the development and severity of type 2 diabetes raise the possibility that glycemic control may affect sleep duration and quality in existing diabetic condition.

This study explored if the status of glycemic control affect sleep in patients with type 2

diabetes.

Study Design and procedure

This is a longitudinal survey study with a convenient sampling technique. Sleep including actigraphic, and self-reported sleep patterns were investigated. Status of diabetes control (glycemia, dyslipidemia, and blood pressure) and complications (neuropathy, nephropathy, and retinopathy) were retrospectively followed for 1 year.

Subjects

Patients with diabetes were recruited from outpatient clinics of endocrine department in a medical center in central Taiwan. Physicians in endocrine clinics requested the permission from diabetes patients and transferred them to this study. Participant need to meet the following criteria:

Inclusion criteria:

1. Age 18-85 years old, male or female.
2. Diagnosed with type 2 diabetes.
3. No major mental disorders such as schizophrenia, MDP.
4. No cognitive impairment (MMSE > 25 in those with middle to high educational level, >19 in those with low education or illiterate).
5. Can speak Mandarin or Taiwanese dialog.
6. No need for hospitalization. They are community dwelling individuals.

Exclusion criteria:

Subjects would be excluded from the study if they demonstrate severe depression or anxiety (HADS >15) or cognitive impairment (MMSE ≤24), or a history of alcohol or drug abuse.

The total number of patients with type 2 diabetes in the Network of Diabetes Care of Chun Shan Medical University is around 1800. We expected to sample 15% (n=270) of the total patients for this study. Two hundred and seventy-seven adults with type 2 diabetes were recruited and 272 patients completed this study with an attrition rate of 98.2%.

Measures

Sleep and sleep quality measures

Sleep measures include sleep diary, and actigraphy. Actigraphy was measured for 72 hours. Night time sleep quality was assessed by using the Pittsburg Sleep Quality Index (PSQI). Daytime excessive sleep was assessed by using the Epworth Sleepiness Scale (ESS).

1. Sleep diary:

Each participant was given a sleep diary and its instruction to record their daily sleep and waking behaviors for 72 hrs. Researchers provided a 10-minute educational session to the participants about sleep diary recording. The sleep diary contains two parts: bedtime and wake time questions. The bedtime questions include: a) consumption of caffeine, alcohol, and tobacco products; b) medication use; c) habitual activity before getting into sleep; d) light during sleep; e) sleep partners, if any; f) environmental noise during bedtime; and g) the timing and duration of exercise and nap periods. The wake time questions gather information about: a) bedtime; b) sleep latency; c) final wake time;

d) frequency of nocturnal awakenings; d) minutes of wake after sleep onset; e) reasons for nocturnal awakenings; f) mood on final awakening; and g) alertness on final awakening. The data collected from the sleep diary help to calculate sleep parameters including:

- a · Sleep latency (SL), minutes: time takes from wake to stage 1 sleep;
- b · Frequency of nightly awakening (FNA);
- c · Wake after sleep onset time (WASO), minutes;
- d · Total sleep time (TST), minutes = [TIB-(SL+WASO)];
- e · Sleep efficiency (SE), percentage= TST/TIB;
- f · Total nap time.

Sleep diary are helpful to record participants' habitual sleep behavior which aids the interpretation of objective sleep data collected by actigraphy.

2. Pittsburgh Sleep Quality Index (PSQI):

The PSQI assessed habitual sleep of adults over a 1-month time interval with consists of nineteen self-rated questions that generates seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. A global PSQI score is summed from each component to have a range of 0-21. Higher score indicates worse sleep quality. A post hoc cutoff score of 5 is the cut point to discriminate "good" or "poor" sleeper. The overall Cronbach's alpha values of the global PSQI for examining internal consistency reliability ranged from 0.77-0.83 (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; Carpenter & Andrykowski, 1998; Doi et al., 2000). Sensitivity and specificity of the PSQI ranged from 80%-89.6% and 86.5%-86.6%, respectively (Buysse et al., 1989; Doi et al., 2000; Tsai et al., 2005). The Cronbach's alpha in our study was 0.74.

3. Epworth Sleepiness Scale (ESS)

The ESS assessed daytime excessive sleep in recent times (Johns, 1991). Sleepiness at 8 daytime situations is assessed from 0=no chance of dozing to 3=high chance of dozing with a total score ranged from 0 to 24. The higher score indicates sleepier during daytime. A cutoff score of 9 and over indicate a risk of sleep apnea. The overall Cronbach's alpha of the internal consistency reliability for this questionnaire is 0.88 (Johns, 1992). The receiver operator characteristic curves clearly showed that the ESS is the most discriminating test of daytime sleepiness (Johns, 2000). The ESS is a simple and reliable method for measuring persistent daytime sleepiness in adults. The Cronbach's alpha in our study was 0.75.

Control of diabetes

1. Glycemic control: HbA1c
2. Blood pressure control: systolic blood pressure and diastolic pressure
3. Lipid control: LDL-cholesterol, HDL-cholesterol, and triglyceride.

The above parameters will be retrieved from laboratory data for each patient at baseline, 6 month, and 1 year follow up. Table 1 shows the classification level of these parameters.

Table 1. Classification of laboratory parameters based on the AACE guideline.

| | Normal | Abnormal |
|-----------------|--------------|--|
| HbA1c | <7% (<=6.5%) | >=7% (>6.5%) |
| Systolic BP | <130 mmHg | >=130 mmHg |
| Diastolic BP | <80 mmHg | >=80 mmHg |
| LDL-cholesterol | <100 mg/ml | |
| HDL-cholesterol | >60 mg/ml | <40 mg/ml (male) <50 mg/ml (female) |
| Triglyceride | <150 mg/ml | >150 mg/ml |

Complications of diabetes:

1. Neuropathy: Foot examination was performed by sensory and deep tendon reflex. Autonomic function was assessed by using the tests of ankle-brachial Index and heart rate variability.
2. Nephropathy: was assessed by laboratory parameters of urine albumin-to-creatinine ratio ≥ 30 mg albumin/g creatinine, microalbuminuria ≥ 30 mg albumin/g creatinine, and macroalbuminuria ≥ 300 mg albumin/g creatinine.
3. Retinopathy: Non-mydriatic retina camera was used to perform retinal examination and diagnosed by an ophthalmologist.

Results

Table 2 to Table 4 demonstrates results in this study. Two hundred and seventy-six patients (124 males and 151 females) with type 2 diabetes aged 33-86 years (mean \pm SD = 61.8 \pm 10.4) voluntarily participated in this study (Table 2). The average duration of diabetes since diagnosed was 12.3 \pm 7.7 years (range 1-52 years).

Table 2. Personal characteristics

Table 2. Personal characteristics

| Variable | n | (%) | |
|------------|------------------------------|-----|------|
| Age | 31-49 | 34 | 12.4 |
| | 50-64 | 126 | 45.8 |
| | 65-74 | 77 | 28.0 |
| | 75+ | 38 | 13.8 |
| Gender | Female | 151 | 54.9 |
| | Male | 124 | 45.1 |
| Occupation | No | 106 | 39.1 |
| | retired | 69 | 25.5 |
| | yes | 96 | 35.4 |
| Education | Illiterate | 30 | 11.1 |
| | Elementary and middle school | 135 | 49.8 |
| | High school and higher | 106 | 39.1 |
| Marriage | Single/widower/widow | 212 | 76.0 |
| | married | 67 | 24.0 |

Diabetes control includes the control of glycemia, blood pressure, and dyslipidemia. In current study subjects (Table 3), 73.3% of patients had poor glycemic control ($HbA_{1c} \geq 7$). 55.7% had elevated blood pressure, and 91.6% had dyslipidemia. All of them had at least one of abnormalities in glycemia, blood pressure or dyslipidemia. This is a group of poor diabetes control.

Table 3. Status of diabetes control (haven't renewed)

| Variable | | n (%) | Min | Max | Mean (SD) |
|-------------------------------|--------------------|-----------|-----|------|-------------|
| Glycemia | | | | | |
| AC mg/dl | 80-130 | 39(29.8) | 68 | 364 | 157.7(51.2) |
| | >130 | 92(70.2) | | | |
| PC mg/dl | ≤ 180 | 16(38.1) | 88 | 461 | 224.2(93.4) |
| | >180 | 26(62.0) | | | |
| HbA1C(mg/dl) | <6.5 | 17(13.0) | 5.3 | 15.1 | 8.1(1.8) |
| | 6.5-6.9 | 18(13.7) | | | |
| | 7-9 | 64(48.9) | | | |
| | >9 | 30(22.9) | | | |
| Glycemic control | $HbA_{1c} < 7$ | 35(26.7) | | | |
| | $HbA_{1c} \geq 7$ | 94(73.3) | | | |
| Blood pressure (BP) | | | | | |
| SBP(mmHg) | ≤ 130 | 60(45.8) | 100 | 180 | 132.1(15.3) |
| | >130 | 71(54.2) | | | |
| DBP(mmHg) | ≤ 80 | 123(93.9) | 50 | 104 | 77.9(9.3) |
| | >80 | 8(6.1) | | | |
| BP control | $BP \leq 130/80$ | 58(44.3) | | | |
| | $BP > 130/80$ | 73(55.7) | | | |
| Dyslipidemia | | | | | |
| TG(mg/dl) | <150 | 59(45.0) | 45 | 567 | 167.3(96.3) |
| | ≥ 150 | 59(45.0) | | | |
| HDL(mg/dl) ¹ | Normal | 35(26.7) | 25 | 121 | 43.4(13.0) |
| | Abnormal | 62(47.3) | | | |
| CHOL(mg/dl) | <160 | 37(28.2) | 98 | 333 | 184.4(41.7) |
| | ≥ 160 | 81(61.8) | | | |
| LDL(mg/dl) | <100 | 40(30.5) | 58 | 217 | 114.3(32.7) |
| | ≥ 100 | 70(53.4) | | | |
| Lipid control ² | Normal | 11(8.4) | | | |
| | Abnormal | 120(91.6) | | | |
| Diabetes control ³ | 0 (normal) | 0(0) | | | |
| | 1 (one abnormal) | 24(18.3) | | | |
| | 2 (two abnormal) | 60(45.8) | | | |
| | 3 (three abnormal) | 47(35.9) | | | |

¹ HDL normal: female ≥ 50 mg/dl, male ≥ 40 mg/dl

² Lipid control normal: TG <150, HDL >50 (female), >40 (male), and LDL <100.

³ Diabetes control: glycemia, hypertension, and dyslipidemia.

Night time sleep disturbance was assessed by the global score of the Pittsburg Sleep Quality

Index (PSQI >5). Daytime excessive sleep was assessed by the Epworth Sleepiness Scale (ESS \geq 10). Table 4 shows the distribution of sleep status in current diabetics. The majority of participants slept less than 7 hours (66.8%) and 55.7% were classified as having poor quality of sleep (PSQI \geq 5). In contrast, only 33.2% claimed having more than 7 hours of sleep a night, and 24.6% were classified as having excessive daytime sleep (ESS \geq 10). The leading causes to disturb night time sleep perceived by current participants were nocturia (53.5%). In the current data shows that poor night time sleep is more dominate than excessive daytime sleep in type 2 diabetics.

Table 4. Sleep in patients with diabetes

| Variable | | n | (%) | Mean (SD) |
|---|---|-----|------|-------------|
| Excessive daytime sleepiness | Normal (ESS ¹ =0-9) | 205 | 75.4 | 6.5(4.4) |
| | Abnormal (ESS=10-24) | 67 | 24.6 | |
| Night time sleep quality | Good (PSQI ² <5) | 120 | 44.3 | 6.8(4.0) |
| | Poor (PSQI \geq 5) | 151 | 55.7 | |
| Night time sleep hours | >7 hrs | 90 | 33.2 | 7.7(1.4) |
| | 6-7 hrs | 97 | 35.8 | |
| | 5-5.9hrs | 63 | 23.2 | |
| | <5 hrs | 21 | 7.7 | |
| Night time sleep latency | \leq 15 min | 117 | 43.2 | |
| | 16-30 min | 76 | 28.0 | |
| | 31-60 min | 40 | 14.8 | |
| | \geq 60 min | 38 | 14.0 | |
| Sleep efficiency (%) | \geq 85 | 148 | 54.6 | 84.0 (15.2) |
| | 75~84 | 61 | 22.5 | |
| | 65~74 | 35 | 12.9 | |
| | <65 | 27 | 10.0 | |
| Sleep disturbances for three or more times a week | | | | |
| | Have to get up to use the bathroom (Nocturia) | 145 | 145 | 53.5 |
| | Cough or snore loudly | 46 | 46 | 17.0 |
| | Cannot get to sleep within 30 minutes | 77 | 77 | 28.4 |
| | Night mare | 33 | 33 | 12.2 |
| | Wake up in the middle of night or early morning | 58 | 58 | 21.4 |
| | Pain | 14 | 14 | 5.2 |
| | Cannot breath comfortably | 5 | 5 | 1.8 |
| | Feel hot | 4 | 4 | 1.5 |
| | Feel cold | 3 | 3 | 1.1 |

¹ Epworth Sleepiness Scale; ² Pittsburg Sleep Quality Index

Management of diabetes includes avoidance of smoking and alcohol drinking, compliance of medication, diet control, and performing physical activities. Table 5 shows the current distributions of diabetes management in our study subjects. Majority of them did not smoke or drink alcohol and complied with medications. However, only 28.8% of them did diet control and 30.0% of them performed physical activity usually. Diet control and exercise are the activities not easy to comply for them.

Table 5. Management of Diabetes

| Variable | | n | (%) | Mean (SD) |
|------------------------------------|--------------|-----|------|-----------|
| Smoking | no | 209 | 74.6 | |
| | Yes | 39 | 13.9 | |
| | quit | 21 | 7.5 | |
| Alcohol drinking | no | 216 | 79.7 | |
| | Yes | 46 | 17.0 | |
| | quit | 9 | 3.3 | |
| Exercise | No | 87 | 32.1 | |
| | Yes | 184 | 67.9 | |
| Medication compliance ¹ | Not complied | 96 | 37.1 | 3.7(0.5) |
| | Complied | 163 | 62.9 | |
| Diet control ¹ | Not Complied | 185 | 71.2 | 3.3(0.6) |
| | Complied | 75 | 28.8 | |
| Physical activity ¹ | Not complied | 182 | 69.7 | 2.7(1.3) |
| | Complied | 79 | 30.3 | |

¹ Based on the Compliance Index for Diabetes Care, an average score of greater than 3.5 (sometimes to usually performed) is considered as complied.

References:

- Buysse, D. J., Reynolds, C. F., 3rd, 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.
- Carpenter, J. S., & Andrykowski, M. A. (1998). Psychometric evaluation of the Pittsburgh Sleep Quality Index. *J Psychosom Res*, 45(1 Spec No), 5-13.
- Doi, Y., Minowa, M., Uchiyama, M., Okawa, M., Kim, K., Shibui, K., & Kamei, Y. (2000). Psychometric assessment of subjective sleep quality using the Japanese version of the Pittsburgh Sleep Quality Index (PSQI-J) in psychiatric disordered and control subjects. *Psychiatry Research*, 97(2-3), 165-172.
- Johns, M. W. (1991). A new method for measuring daytime sleepiness: the Epworth sleepiness scale. *Sleep*, 14(6), 540-545.
- Johns, M. W. (1992). Reliability and factor analysis of the Epworth Sleepiness Scale. *Sleep*, 15(4), 376-381.
- Johns, M. W. (2000). Sensitivity and specificity of the multiple sleep latency test (MSLT), the

- maintenance of wakefulness test and the epworth sleepiness scale: failure of the MSLT as a gold standard. *J Sleep Res*, 9(1), 5-11.
- Knutson, K. L., Ryden, A. M., Mander, B. A., & Van Cauter, E. (2006). Role of sleep duration and quality in the risk and severity of type 2 diabetes mellitus. *Arch Intern Med*, 166(16), 1768-1774. doi: 166/16/1768 [pii]
10.1001/archinte.166.16.1768
- Kushida, C., Chang, A., Gadkary, C., Guilleminault, C., Carrillo, O., & Dement, W. (2001). Comparison of actigraphic, polysomnographic, and subjective assessment of sleep parameters in sleep-disordered patients. *Sleep Medicine*, 2(5), 389-396.
- Lamond, N., Tiggemann, M., & Dawson, D. (2000). Factors predicting sleep disruption in Type II diabetes. *Sleep*, 23(3), 415-416.
- Mahmood, K., Akhter, N., Eldeirawi, K., Onal, E., Christman, J. W., Carley, D. W., & Herdegen, J. J. (2009). Prevalence of type 2 diabetes in patients with obstructive sleep apnea in a multi-ethnic sample. *J Clin Sleep Med*, 5(3), 215-221.
- Resnick, H. E., Redline, S., Shahar, E., Gilpin, A., Newman, A., Walter, R., . . . Punjabi, N. M. (2003). Diabetes and sleep disturbances: findings from the Sleep Heart Health Study. *Diabetes Care*, 26(3), 702-709.
- Rodbard, H. W., Blonde, L., Braithwaite, S. S., Brett, E. M., Cobin, R. H., Handelsman, Y., . . . Zangeneh, F. (2007). American Association of Clinical Endocrinologists medical guidelines for clinical practice for the management of diabetes mellitus. *Endocr Pract*, 13 Suppl 1, 1-68. doi: A205210114R6L833 [pii]
- Tasali, E., Mokhlesi, B., & Van Cauter, E. (2008). Obstructive sleep apnea and type 2 diabetes: interacting epidemics. *Chest*, 133(2), 496-506. doi: 133/2/496 [pii]
10.1378/chest.07-0828
- Taub, L. F., & Redeker, N. S. (2008). Sleep disorders, glucose regulation, and type 2 diabetes. *Biol Res Nurs*, 9(3), 231-243. doi: 9/3/231 [pii]
10.1177/1099800407311016
- Trento, M., Broglio, F., Riganti, F., Basile, M., Borgo, E., Kucich, C., . . . Porta, M. (2008). Sleep abnormalities in type 2 diabetes may be associated with glycemic control. *Acta Diabetol*, 45(4), 225-229. doi: 10.1007/s00592-008-0047-6
- Tsai, P. S., Wang, S. Y., Wang, M. Y., Su, C. T., Yang, T. T., Huang, C. J., & Fang, S. C. (2005). Psychometric evaluation of the Chinese version of the Pittsburgh Sleep Quality Index (CPSQI) in primary insomnia and control subjects. *Quality of Life Research*, 14(8), 1943-1952.

國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

達成目標

未達成目標（請說明，以 100 字為限）

實驗失敗

因故實驗中斷

其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文： 已發表 未發表之文稿 撰寫中 無

專利： 已獲得 申請中 無

技轉： 已技轉 洽談中 無

其他：（以 100 字為限）

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以 500 字為限）

本研究追蹤糖尿病人睡眠、飲食、糖尿病控制與合併症狀況，追蹤時間從長達二年，收取之資料協助了解糖尿病人實際生活中的睡眠飲食活動與藥物狀況，可分析行為況狀與糖尿病控制的關係，分析結果提供糖尿病照護之參考。

國科會補助計畫衍生研發成果推廣資料表

日期:2013/11/01

| | |
|-----------|------------------------------------|
| 國科會補助計畫 | 計畫名稱: 第二型糖尿病病人之睡眠問題與糖尿病控制之追蹤研究 |
| | 計畫主持人: 廖玫君 |
| | 計畫編號: 100-2314-B-040-002- 學門領域: 護理 |
| 無研發成果推廣資料 | |

100 年度專題研究計畫研究成果彙整表

| 計畫主持人：廖玟君 | | 計畫編號：100-2314-B-040-002- | | | | 計畫名稱：第二型糖尿病病人之睡眠問題與糖尿病控制之追蹤研究 | |
|-----------|-------------|--------------------------|-----------------|------------|------|-------------------------------------|--|
| 成果項目 | | 量化 | | | 單位 | 備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等） | |
| | | 實際已達成數（被接受或已發表） | 預期總達成數（含實際已達成數） | 本計畫實際貢獻百分比 | | | |
| 國內 | 論文著作 | 期刊論文 | 0 | 1 | 100% | 篇 | |
| | | 研究報告/技術報告 | 0 | 0 | 100% | | |
| | | 研討會論文 | 0 | 0 | 100% | | |
| | | 專書 | 0 | 0 | 100% | | |
| | 專利 | 申請中件數 | 0 | 0 | 100% | 件 | |
| | | 已獲得件數 | 0 | 0 | 100% | | |
| | 技術移轉 | 件數 | 0 | 0 | 100% | 件 | |
| | | 權利金 | 0 | 0 | 100% | 千元 | |
| | 參與計畫人力（本國籍） | 碩士生 | 0 | 1 | 100% | 人次 | |
| | | 博士生 | 0 | 0 | 100% | | |
| | | 博士後研究員 | 0 | 0 | 100% | | |
| | | 專任助理 | 0 | 0 | 100% | | |
| 國外 | 論文著作 | 期刊論文 | 0 | 3 | 100% | 篇 | |
| | | 研究報告/技術報告 | 0 | 0 | 100% | | |
| | | 研討會論文 | 2 | 3 | 100% | | |
| | | 專書 | 0 | 0 | 100% | 章/本 | |
| | 專利 | 申請中件數 | 0 | 0 | 100% | 件 | |
| | | 已獲得件數 | 0 | 0 | 100% | | |
| | 技術移轉 | 件數 | 0 | 0 | 100% | 件 | |
| | | 權利金 | 0 | 0 | 100% | 千元 | |
| | 參與計畫人力（外國籍） | 碩士生 | 0 | 0 | 100% | 人次 | |
| | | 博士生 | 0 | 0 | 100% | | |
| | | 博士後研究員 | 0 | 0 | 100% | | |
| | | 專任助理 | 0 | 0 | 100% | | |

| | |
|--|----------|
| <p>其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)</p> | <p>無</p> |
|--|----------|

| | 成果項目 | 量化 | 名稱或內容性質簡述 |
|---|-----------------|----|-----------|
| 科 教 處 計 畫 加 填 項 目 | 測驗工具(含質性與量性) | 0 | |
| | 課程/模組 | 0 | |
| | 電腦及網路系統或工具 | 0 | |
| | 教材 | 0 | |
| | 舉辦之活動/競賽 | 0 | |
| | 研討會/工作坊 | 0 | |
| | 電子報、網站 | 0 | |
| | 計畫成果推廣之參與(閱聽)人數 | 0 | |

國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

達成目標

未達成目標（請說明，以 100 字為限）

實驗失敗

因故實驗中斷

其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文： 已發表 未發表之文稿 撰寫中 無

專利： 已獲得 申請中 無

技轉： 已技轉 洽談中 無

其他：（以 100 字為限）

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以 500 字為限）

本研究追蹤糖尿病人睡眠、飲食、糖尿病控制與合併症狀況，追蹤時間從長達二年，收取之資料協助了解糖尿病人實際生活中的睡眠飲食活動與藥物狀況，可分析行為況狀與糖尿病控制的關係，分析結果提供糖尿病照護之參考。