·临床研究·

老年缺血性脑卒中后肌张力增高患者睡眠质量调查

张丽[1],孙瑾[1],刘美娟[1],王俊微[1],杜霞[1],梁立雯[2*]
(空军军医大学第一附属医院:[1]神经内科,[2]心血管内科,西安 710038)

【摘 要】 **目的** 调查老年缺血性脑卒中(IS)后肌张力增高患者睡眠质量及生活质量情况并分析睡眠质量的影响因素。**方法** 采用便利抽样法对2022年1月至2023年6月空军军医大学第一附属医院收治的365例老年IS恢复期肌张力增高患者进行问卷调查,调查内容包括人口学资料、匹兹堡睡眠质量指数(PSQI)、脑卒中专用生活质量量表(SS-QoL)等。根据PSQI得分将患者分为睡眠质量不良组(PSQI≥7分,176例)和睡眠质量良好组(PSQI<7分,182例)。采用SPSS 23.0统计软件进行数据分析。根据数据类型,分别采用t检验或χ^2检验进行组间比较。使用logistic回归分析评估老年IS恢复期肌张力增高患者睡眠质量不良的影响因素。**结果** 365例患者共回收有效问卷358份,有效回收率为98.08%。358例老年IS恢复期肌张力增高患者PSQI平均得分为(7.20±1.46)分。睡眠质量不良组精力、活动能力、自理、上肢功能维度SS-QOL评分及SS-QOL总分均显著低于睡眠质量良好组,差异有统计学意义(P<0.05)。logistic回归分析显示,肌张力3级(OR=3.357,95%CI 1.766~6.381;P<0.05)、日常活动重度依赖(OR=4.121,95%CI 2.389~7.107;P<0.05)、抑郁表现(OR=2.838,95%CI 1.425~5.652;P<0.05)及维生素D缺乏(OR=2.606,95%CI 1.347~5.043;P<0.05)均为老年IS恢复期肌张力增高患者睡眠质量不良的危险因素。**结论** 老年IS恢复期肌张力严重增强、日常活动能力低下、抑郁情绪及维生素D缺乏可能导致患者睡眠质量下降,影响患者生活质量。

【关键词】 老年人;缺血性脑卒中;肌张力;睡眠质量;生活质量;维生素D
【中图分类号】 R592;R743.3 【文献标志码】 A 【DOI】 10.11915/j.issn.1671-5403.2025.02.020

Investigation of sleep quality in elderly patients with hypermyotonia after ischemic stroke

Zhang Li[1], Sun Jin[1], Liu Meijuan[1], Wang Junwei[1], Du Xia[1], Liang Liwen[2*]
([1]Department of Neurology, [2]Department of Cardiology, First Affiliated Hospital of Air Force Medical University, Xi'an 710038, China)

【**Abstract**】 **Objective** To investigate the sleep quality and quality of life in elderly patients with hypermyotonia after ischemic stroke (IS), and to analyze the influencing factors for sleep quality. **Methods** Convenience sampling was used to screen 365 elderly patients with hypermyotonia during recovery period of IS admitted in First Affiliated Hospital of Air Force Medical University from January 2022 to June 2023. A survey was conducted on them, including demographic data, Pittsburgh sleep quality index (PSQI) and stroke specific quality of life scale (SS-QoL). The patients were divided into poor sleep quality group (PSQI ≥7 points, 176 cases) and good sleep quality group (PSQI <7 points, 182 cases) according to their PSQI score. SPSS 23.0 was used for data analysis. Based on data type, student's t test or *Chi*-square test was employed for intergroup comparison. Logistic regression analysis was utilized to identify the influencing factors for poor sleep quality in elderly patients with hypermyotonia during recovery period of IS. **Results** There were 358 valid questionnaires collected from 365 patients, with an effective recovery rate of 98.08%. The average PSQI score was (7.20±1.46) points in the 358 valid participants. The poor sleep quality group had significantly lower scores of dimensions of energy, activity ability, self-care and upper limb function and total score of SS-QoL than the good sleep quality group (P<0.05). Logistic regression analysis showed that muscular tension grade 3 (OR=3.357, 95%CI 1.766-6.381; P<0.05), severe dependence on daily activity (OR=4.121, 95%CI 2.389-7.107; P<0.05), depression performance (OR=2.838, 95%CI 1.425-5.652; P<0.05), and vitamin D deficiency (OR=2.606, 95%CI 1.347-5.043; P<0.05) were risk factors for poor sleep quality in elderly patients with hypermyotonia during recovery period of IS. **Conclusion** Severely intensified muscular tension during recovery period of elderly IS, low daily activity, depression and vitamin D deficiency may lead to a decrease in sleep quality and affect the quality of life of the patients.

【**Key words**】 aged; ischemic stroke; muscular tension; sleep quality; quality of life; vitamin D
This work was supported by the National Natural Science Foundation of China (82230065) *and Natural Science Basic Research Program of Shaanxi Province* (2020JM-338).

Corresponding author: *Liang Liwen*, *E-mail*: *llwxjxn@163.com*

收稿日期:2023-12-28;**接受日期**:2024-02-04
基金项目:国家自然科学基金(82230065);陕西省自然科学基础研究计划(2020JM-338)
通信作者:梁立雯,E-mail:llwxjxn@163.com

脑卒中是全球第二大常见死因,其中缺血性脑卒中(ischemic stroke,IS)为最常见类型,不仅具有发病率高、病死率高的特点,存活者残疾遗留率也高达 75%[1]。肌张力增高是引起 IS 患者肢体功能障碍的主要原因,患者需要进行漫长的康复治疗,在此期间患者可因疼痛、肢体功能受限等,长期健康状况较差,也易出现睡眠-觉醒障碍,生活质量低下[2]。另外,老年人作为 IS 的好发人群,受衰弱、基础疾病多等因素的影响,老年 IS 患者恢复期心理压力大,更易出现入睡困难、夜间觉醒次数多等睡眠障碍[3]。除常见的肢体功能障碍等因素外,近年研究发现,维生素 D 缺乏也可能是造成脑卒中后睡眠障碍的重要因素[4]。但由于缺乏足够的临床试验证据,脑卒中后睡眠质量不良的影响因素还需进一步探索。基于此,本研究对老年 IS 恢复期肌张力增高患者行问卷调查,观察睡眠质量及生活质量情况并分析睡眠质量的影响因素。

1 对象与方法

1.1 研究对象

采用便利抽样法对 2022 年 1 月至 2023 年 6 月空军军医大学第一附属医院收治的老年 IS 恢复期肌张力增高患者进行问卷调查。共发放问卷 365 份,回收有效问卷 358 份,有效回收率为 98.08%。纳入标准:符合《中国急性缺血性脑卒中诊治指南 2018》[5] IS 诊断,首次发病且入院治疗后病情稳定;年龄≥60 岁;发病 2 周~6 个月后的恢复期进行问卷调查;问卷中改良 Ashworth 肌张力分级为 1~3 级;单侧偏瘫;意识清醒,认知能力良好。排除标准:IS 发病前存在精神、心理疾病;IS 发病前存在呼吸、循环、泌尿系统疾病或睡眠异常、使用安眠药物治疗;合并痴呆、帕金森等中枢神经系统疾病;因周围神经损伤或颅脑损伤、严重骨质疏松、关节畸形、类风湿关节炎等导致的肢体运动功能障碍;合并急性感染或肝炎等传染病;合并恶性肿瘤、自身免疫系统疾病或血液系统疾病;存在视听障碍等难以配合问卷调查。根据匹兹堡睡眠质量指数(Pittsburgh sleep quality index,PSQI)[6]将患者分为睡眠质量不良组(PSQI≥7 分,176 例)和睡眠质量良好组(PSQI<7 分,182 例)。患者及家属对研究内容知情并签署纸质版知情同意书。

1.2 方法

1.2.1 资料收集 老年 IS 恢复期肌张力增高患者的卒中部位、发病时间等疾病相关资料、25-羟维生素 D[25(OH)D]等实验室指标经查阅患者电子病历获得,其中血清 25(OH)D<20 ng/ml 为维生素 D 缺乏(化学发光法)。

1.2.2 问卷调查 在安静、无旁人的病室或诊疗室内,由研究者对患者进行一对一问卷调查,协助患者理解问卷内容。(1)人口学资料:包括性别、年龄、婚姻状况等。(2)PSQI:量表包含 19 个自评条目及 5 个睡眠同伴条目,其中计分的有 18 个条目,包括主观睡眠质量、入睡时长、睡眠时间、睡眠效率、睡眠障碍、睡眠药物、日间功能障碍共 7 个维度,总分 0~21 分,PSQI≥7 分被认为存在睡眠障碍,PSQI<7 分被认为睡眠质量良好。(3)脑卒中专用生活质量量表(stroke specific quality of life scale,SS-QoL)[7]:量表包含精力、家庭角色、语言、活动能力、情绪、个性、自理、社会角色、思维、上肢功能、视力、工作能力共 12 个维度,49 个条目,各条目采用 1~5 分计分,总分 49~245 分,得分越高,生活质量越好。(4)日常活动能力:使用改良 Barthel 指数(modified Barthel index,MBI)[8]评估。最高得分为 100 分,为日常活动无依赖;61~99 分为轻度依赖;41~60 分为中度依赖;21~40 分为重度依赖;≤20 分为完全依赖。(5)情绪障碍:采用焦虑自评量表(self-rating anxiety scale,SAS)及抑郁自评量表(self-rating depression scale,SDS)[9]评估,两个量表各包含 20 个条目,以 1~4 分计分,以 20 个条目总得分×1.25 转换标准得分,SAS 标准得分≥50 分为有焦虑表现,SDS 标准得分≥53 分为有抑郁表现。

1.3 统计学处理

采用 SPSS 23.0 统计软件进行数据分析。计量资料以均数±标准差($\bar{x}\pm s$)表示,组间比较采用 t 检验。计数资料以例数(百分率)表示,组间比较采用 χ^2 检验。采用 logistic 回归分析评估患者睡眠质量不良的影响因素。$P<0.05$ 为差异有统计学意义。

2 结 果

2.1 老年 IS 恢复期肌张力增高患者睡眠质量调查

老年 IS 恢复期肌张力增高患者 PSQI 平均得分为(6.91±1.56)分,最低得分为 3 分,最高得分为 11 分。患者 PSQI 得分情况详见表 1。

表 1 老年 IS 恢复期肌张力增高患者 PSQI 得分情况

Table 1 PSQI scores of elderly patients with hypermyotonia during recovery period of IS (points)

PSQI	Lowest score	Highest score	Average score ($\bar{x}\pm s$)
Subjective sleep quality	0	3	1.02±0.20
Time to fall asleep	0	3	1.09±0.29
Sleep time	0	3	1.25±0.32
Sleep efficiency	0	3	1.69±0.31
Sleep disorder	0	3	1.01±0.20
Sleep medication	0	2	0.29±0.11
Daytime dysfunction	0	2	0.85±0.14
Total score	3	10	7.20±1.46

PSQI: Pittsburgh sleep quality index; IS: ischemic stroke.

2.2 两组患者临床资料比较

睡眠质量不良组与睡眠质量良好组在肌张力分级、日常活动能力、抑郁表现及维生素 D 缺乏方面比较,差异有统计学意义($P<0.05$;表 2)。

表2 两组患者临床资料比较

Table 2 Comparison of clinical data between two groups

Item	Poor sleep quality group(n=176)	Good sleep quality group(n=182)	χ^2/t	P value
Gender[n(%)]			0.526	0.468
Male	89(50.57)	99(54.40)		
Female	87(49.43)	83(45.60)		
Age[n(%)]			0.842	0.359
60-70 years	129(73.30)	141(77.47)		
>70 years	47(26.70)	41(22.53)		
Body mass index(kg/m^2, $\bar{x}\pm s$)	22.65±2.19	22.26±2.30	1.642	0.102
Marital status[n(%)]			0.624	0.430
Married	108(61.36)	119(65.38)		
Unmarried/divorced/widowed	68(38.64)	63(34.62)		
Primary caregiver[n(%)]			0.894	0.640
Family member	105(59.66)	113(62.09)		
Nursing worker	48(27.27)	51(28.02)		
Other	23(13.07)	18(9.89)		
Education level[n(%)]			0.621	0.733
Junior high school or below	52(29.55)	48(26.37)		
Technical secondary school and senior high school	89(50.57)	93(51.10)		
Junior college or above	35(19.89)	41(22.53)		
Payment method of medical expense[n(%)]			4.720	0.094
Self-paying	62(35.23)	45(24.73)		
Rural cooperative medical service	49(27.84)	58(31.87)		
Medical insurance/free medical service	65(36.93)	79(43.41)		
Hypertension[n(%)]	72(40.91)	66(36.26)	0.815	0.367
Coronary heart disease[n(%)]	87(49.43)	93(51.10)	0.100	0.752
Diabetes mellitus[n(%)]	27(15.34)	20(10.99)	1.486	0.223
Hyperlipidemia[n(%)]	32(18.18)	26(14.29)	1.000	0.317
Lesion site[n(%)]			0.104	0.747
Anterior circulation	122(69.32)	129(70.88)		
Posterior circulation	54(30.68)	53(29.12)		
National Institute of Health stroke scale(points, $\bar{x}\pm s$)	3.65±0.78	3.51±0.81	1.665	0.097
TOAST typing[n(%)]			0.494	0.781
Large-artery atherosclerosis	84(47.73)	87(47.80)		
Cardiogenic embolism	86(48.86)	91(50.00)		
Other	6(3.41)	4(2.20)		
Disease course[n(%)]			0.306	0.580
2 weeks-3 months	79(44.89)	87(47.80)		
3-≤6 months	97(55.11)	95(52.20)		
Hemiplegia side[n(%)]			0.106	0.744
Left	84(47.73)	90(49.45)		
Right	92(52.27)	92(50.55)		
Muscular tension grading[n(%)]			6.964	0.031
Grade 1-1$^+$	40(22.73)	53(29.12)		
Grade 2	70(39.77)	84(46.15)		
Grade 3	66(37.50)	45(24.73)		
Daily activity ability[n(%)]			10.199	0.006
Mild dependence	42(23.86)	57(31.32)		
Moderate dependence	73(41.48)	89(48.90)		
Severe dependence	61(34.66)	36(19.78)		
Anxiety performance[n(%)]			1.020	0.313
Yes	62(35.23)	55(30.22)		
No	114(64.77)	127(69.78)		
Depression performance[n(%)]			8.054	0.005
Yes	89(50.57)	65(35.71)		
No	87(49.43)	117(64.29)		
Vitamin D deficiency[n(%)]			5.747	0.017
Yes	112(63.64)	93(51.10)		
No	64(36.36)	89(48.90)		

TOAST: trial of Org 10172 in acute stroke treatment.

2.3 患者睡眠质量不良的影响因素

logistic 回归分析显示,肌张力 3 级、日常活动重度依赖、抑郁表现及维生素 D 缺乏均为患者睡眠质量不良的危险因素($P<0.05$;表 3)。

表 3 老年 IS 恢复期肌张力增高患者睡眠质量不良的 logistic 回归分析

Table 3 Logistic regression analysis of poor sleep quality in elderly patients with hypermyotonia during recovery period of IS

Factor	β	SE	$Wald\ \chi^2$	OR	95%CI	P value
Muscular tension grade 3	1.211	0.398	9.258	3.357	1.766-6.381	0.002
Severe dependence on daily activity	1.416	0.405	12.224	4.121	2.389-7.107	<0.001
Depression performance	1.043	0.367	8.077	2.838	1.425-5.652	0.004
Vitamin D deficiency	0.958	0.321	8.907	2.606	1.347-5.043	0.003

IS: ischemic stroke.

2.4 两组患者生活质量情况比较

睡眠质量不良组精力、活动能力、自理、上肢功能维度 SS-QoL 评分及 SS-QoL 总分均显著低于睡眠质量良好组,差异有统计学意义($P<0.05$;表 4)。

表 4 两组患者各维度 SS-QoL 评分比较

Table 4 Comparison of dimensions of SS-QoL between two groups (points, $\bar{x}\pm s$)

Item	Poor sleep quality group ($n=176$)	Good sleep quality group ($n=182$)	t	P value
Energy	6.20±1.13	7.05±1.33	6.506	<0.001
Family role	7.78±1.65	8.04±1.89	1.385	0.167
Language	17.06±3.05	17.55±2.78	1.590	0.113
Activity ability	16.45±2.81	18.89±3.04	7.879	<0.001
Emotion	16.36±3.19	17.02±3.68	1.811	0.071
Personality	9.12±1.22	9.30±1.54	1.223	0.222
Self-care	11.06±2.35	13.40±2.89	8.389	<0.001
Social role	10.69±1.97	11.05±2.16	1.646	0.101
Thinking	10.03±2.06	10.42±2.15	1.751	0.081
Upper limb function	16.44±2.98	18.06±2.53	5.551	<0.001
Visual acuity	11.44±1.75	11.59±1.86	0.785	0.433
Work ability	6.11±1.02	6.31±1.21	1.688	0.092
Total score	138.74±5.06	148.68±7.22	15.039	<0.001

SS-QoL: stroke specific quality of life scale.

3 讨 论

睡眠质量与精神障碍、疼痛等多种健康问题有关,有报道指出,睡眠障碍能加重卒中诱发因素,增加复发风险,影响患者预后[10]。因此,调查患者睡眠质量并对睡眠障碍的高危因素予以干预,对改善患者预后有利。本研究中,老年 IS 恢复期肌张力增高患者 PSQI≥7 分者有 176 例(49.16%),表明有近一半的患者存在睡眠质量不良,值得临床关注。

据文献报道,存在抑郁情绪者睡前可因悲观、沮丧等难以入睡,长期可致日间嗜睡[11]。本研究结果显示,抑郁表现是老年 IS 恢复期肌张力增高患者睡眠质量不良的危险因素,与上述报道一致。另外,肢体运动功能受限患者如厕、穿衣等日常活动难以自主完成,需要家庭成员等其他人协助完成,可能觉得自身给家庭造成沉重负担,增加负性情绪,也影响患者睡眠质量[12]。本研究中,肌张力 3 级、日常活动重度依赖均为睡眠质量不良的危险因素。考虑与重度肌张力增高患者肢体活动严重受限,对他人依赖性强,更易产生负性情绪,影响睡眠质量有关。此外,维生素 D 缺乏近年被发现与情绪障碍、睡眠障碍等存在密切关联,维生素 D 可诱导多巴胺能神经元生长、发育,增加 5-羟色胺等神经递质表达,而影响抑郁、睡眠障碍等健康问题的发生[13]。本研究中,维生素 D 缺乏也是患者睡眠质量不良的危险因素,两组患者维生素 D 缺乏发生率分别为 63.64%、51.10%,两组患者均有半数以上的患者存在维生素 D 缺乏。有研究指出,中重度失能老人的离床活动需求常未得到满足[14],对于日常活动受限的老年患者,离床活动需要更多的帮助,日光下活动存在不足可能是本研究维生素 D 缺乏发生率较高的原因。因此,增加日光下户外活动、适当补充维生素 D 可能对改善老年缺血性脑卒中恢复期肌张力增强患者睡眠质量有利。

长期睡眠不足也可造成记忆力减退,严重影响患者日常生活[15],且睡眠障碍也易引起疲乏、焦虑等表现,增加患者生理与心理负担,对身心健康均产生不利影响[16,17]。本研究中,睡眠质量不良组 SS-QoL 总分显著低于睡眠质量良好组,且精力、活动能力、自理、上肢功能维度 SS-QoL 评分也低于睡眠质量良好组。分析原因为睡眠质量不良导致患者得不到足够的休息,疲劳感增加,精力下降,造成患者生活质量降低[18,19]。

综上所述,睡眠质量不良可导致老年 IS 恢复期肌张力增高患者生活质量下降,肌张力分级高、日常生活重度依赖、抑郁及维生素 D 缺乏是患者睡眠质量不良的危险因素,临床可予以针对性的干预措施。

【参考文献】

[1] 陈瑜, 顾素莲, 王俏俏. 老年急性缺血性脑卒中偏瘫患者出院后生活质量现状及其影响因素[J]. 中华老年多器官疾病杂志, 2024, 23(3): 194-197. DOI: 10.11915/j.issn.1671-5403.2024.03.041.

[2] Zhang Z, Wang M, Gill D, *et al*. Genetically predicted sleep traits and functional outcome after ischemic stroke: a Mendelian randomization study[J]. Neurology, 2023, 100(11): 1159-1165. DOI: 10.1212/WNL.0000000000206745.

[3] Su X, Gao Y, Xu W, *et al*. Association cystatin C and risk of stroke in elderly patients with obstructive sleep apnea: a prospective cohort study[J]. Front Neurosci, 2021, 15(12): e762552. DOI: 10.3389/fnins.2021.762552.

[4] 武煦峰, 苏洪宝, 夏青. 维生素D营养状况与卒中相关失眠的相关性研究[J]. 中国食物与营养, 2023, 29(6): 55-57,66. DOI:10.3969/j.issn.1006-9577.2023.06.011.

[5] 中华医学会神经病学分会, 中华医学会神经病学分会脑血管病学组. 中国急性缺血性脑卒中诊治指南2018[J]. 中华神经科杂志, 2018, 51(9): 666-682. DOI:10.3760/cma.j.issn.1006-7876.2018.09.004.

[6] Denison HJ, Jameson KA, Sayer AA, *et al*. Poor sleep quality and physical performance in older adults[J]. Sleep Health, 2021, 7(2): 205-211. DOI: 10.1016/j.sleh.2020.10.002.

[7] Rocha LSO, Gama GCB, Rocha RSB, *et al*. Constraint induced movement therapy increases functionality and quality of life after stroke[J]. J Stroke Cerebrovasc Dis, 2021, 30(6): e105774. DOI: 10.1016/j.jstrokecerebrovasdis.2021.105774.

[8] Taghizadeh G, Martinez-Martin P, Meimandi M, *et al*. Barthel index and modified Rankin scale: psychometric properties during medication phases in idiopathic Parkinson disease[J]. Ann Phys Rehabil Med, 2020, 63(6): 500-504. DOI: 10.1016/j.rehab.2019.08.006.

[9] Guo C, Huang X. Hospital anxiety and depression scale exhibits good consistency but shorter assessment time than Zung self-rating anxiety/depression scale for evaluating anxiety/depression in non-small cell lung cancer[J]. Medicine (Baltimore), 2021, 100(8): e24428. DOI: 10.1097/MD.0000000000024428.

[10] Korostovtseva L. Ischemic stroke and sleep: the linking genetic factors[J]. Cardiol Ther, 2021, 10(2): 349-375. DOI: 10.1007/s40119-021-00231-9.

[11] Crouse JJ, Carpenter JS, Song YJC, *et al*. Circadian rhythm sleep-wake disturbances and depression in young people: implications for prevention and early intervention[J]. Lancet Psychiatry, 2021, 8(9): 813-823. DOI: 10.1016/S2215-0366(21)00034-1.

[12] Baillieul S, Dekkers M, Brill AK, *et al*. Sleep apnoea and ischaemic stroke: current knowledge and future directions[J]. Lancet Neurol, 2022, 21(1): 78-88. DOI: 10.1016/S1474-4422(21)00321-5.

[13] Borges-Vieira JG, Cardoso CKS. Efficacy of B-vitamins and vitamin D therapy in improving depressive and anxiety disorders: a systematic review of randomized controlled trials[J]. Nutr Neurosci, 2023, 26(3): 187-207. DOI: 10.1080/1028415X.2022.2031494.

[14] Gao L, Yang J, Liu J, *et al*. Activities of daily living and depression in Chinese elderly of nursing homes: a mediation analysis[J]. Psychol Res Behav Manag, 2023, 16(1): 29-38. DOI: 10.2147/PRBM.S394787.

[15] Lapow JM, Dicpinigaitis AJ, Pammal RS, *et al*. Obstructive sleep apnea confers lower mortality risk in acute ischemic stroke patients treated with endovascular thrombectomy: national inpatient sample analysis 2010-2018[J]. J Neurointerv Surg, 2022, 14(12): 1195-1199. DOI: 10.1136/neurintsurg-2021-018161.

[16] Alamowitch S, Turc G, Palaiodimou L, *et al*. European Stroke Organisation (ESO) expedited recommendation on tenecteplase for acute ischaemic stroke[J]. Eur Stroke J, 2023, 8(1): 8-54. DOI: 10.1177/23969873221150022.

[17] Mc Carthy CE, Yusuf S, Judge C, *et al*. Sleep patterns and the risk of acute stroke: results from the INTERSTROKE international case-control study[J]. Neurology, 2023, 100(21): 2191-2203. DOI: 10.1212/WNL.0000000000207249.

[18] Simonsen SA, Andersen AV, West AS, *et al*. Sleep-disordered breathing and cerebral small vessel disease — acute and 6 months after ischemic stroke[J]. Sleep Breath, 2022, 26(3): 1107-1113. DOI: 10.1007/s11325-021-02482-1.

[19] Geng D, Wu B, Lin Y, *et al*. High total bilirubin-to-uric acid ratio predicts poor sleep quality after acute ischemic stroke: a prospective nested case-control study[J]. Psychogeriatrics, 2023, 23(6): 897-907. DOI: 10.1111/psyg.12992.

(编辑: 郑真真)