Original Article

DISEASES ASSOCIATED WITH SLEEP QUALITY IN PHYSICALLY ACTIVE ELDERLY WOMEN

DOENÇAS ASSOCIADAS À QUALIDADE DO SONO EM IDOSAS PRATICANTES DE EXERCÍCIO FÍSICO

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RESUMO

O presente estudo tem como objetivo associar a presença de doenças com a qualidade do sono em idosas praticantes de exercícios físicos. Foram investigadas 146 idosas (69,58±6,22 anos) praticantes de exercícios físicos. A pesquisa foi desenvolvida por meio da aplicação de um questionário de questões sociodemográficas e de percepção de saúde, além do Índice de Qualidade de Sono de Pittsburgh – PSQI. Os dados foram analisados por meio do *t-test* independente, comparando a qualidade do sono entre os grupos, e o teste qui-quadrado, exato de Fisher e regressão logística binária para identificar as doenças associadas a má qualidade do sono e suas respectivas razão de *Odds* e intervalo de confiança. Os resultados apresentaram alta prevalência de baixa qualidade do sono nesta população (n=79, fr=56,4%). Identificou-se que idosas com artrose, depressão, diabetes, doença cardíaca, fibromialgia, gastrite e incontinência urinária apresentam qualidade de sono significativamente piores que as demais. Além disso, a qualidade do sono está associada à presença de artrose, diabetes e doença cardíaca, d. a qual o portador apresenta 3,4 vezes mais chance de apresentar qualidade do sono ruim

Palavras chaves: Sono. Doenças. Saúde. Idosa.

ABSTRACT

The present study aimed to associate presence of diseases with sleep quality in elderly women who engage in physical exercises. A total of 146 senior women (69.58±6.22 years old) with this profile were investigated. The research was developed through the application of questionnaires covering sociodemographic data and health perception, in addition to the Pittsburgh Sleep Quality Index (PSQI). Data were analyzed by means of the independent t-test, comparing sleep quality between groups, as well as the chi-squared test, Fisher's exact test, and binary logistic regression to identify diseases associated with poor sleep quality and their respective odds ratio and confidence interval. Results showed high prevalence of low sleep quality in this population (n=79, rf=56.4%). Elderly women with arthrosis, depression, diabetes, heart disease, fibromyalgia, gastritis and urinary incontinence had a significantly worse sleep quality compared to the other ones. Moreover, sleep quality has proven to be associated with arthrosis, diabetes and heart disease, and those who have them are 3.4 times more likely to present poor sleep quality.

Keywords: Sleep. Diseases. Health. Elderly Women.

Introduction

The aging process is part of a human being nature's, starting from birth through the moment when life comes to an end[1]. Thus, the durability of an elderly individual may be related to several factors, such as physical and emotional wellbeing[2].

Important aspects in this aging process and in life durability include sleep quality, because aging brings changes to both sleep quality and number of sleeping hours[3].

Sleep has been defined as a condition in which a person restores and rests their body and mind[1], a moment characterized by changes in physiological and behavioral processes[4]. According to the second edition of the International Classification of Sleep Disorders (ICSD-2), published by the American Academy of Sleep Medicine in 2005, there are more than 90 types of different sleep disorders, such as: insomnia, sleep-related respiratory disorders, hypersomnia, circadian rhythm sleep disorders, parasomnia, sleep-related movement disorders, and other factors[5-7].

The main consequences of sleep disorders are biological and physiological changes such as tiredness, fatigue, memory fail, attention and concentration deficit, tachycardia and mood changes[5], and the onset or aggravation of diseases can be mentioned as well[8]. Diseases generally associated with poor sleep are: cardiopathies, arthritis, chronic lung disease, diabetes *mellitus*, Alzheimer's, Parkinson's, obstructive lung disease, acid reflux, sleep apnea, peptic ulcer, circadian rhythm disorder, and others[1,9]. Thus, in the elderly population, sleep quality is highlighted as the main complaint, which occurs as a consequence of changes during the aging process[1].

However, it has been observed that physical exercise causes physiological, biochemical and psychological changes, improving the overall sleep quality and reducing nocturnal fluctuations in older women[10], thus proving to be an essential strategy for many outcomes, such as: depression[11], quality of life[12], cardiovascular risk factors[13], mortality[14] and obesity[15], presented by individuals with cardiovascular disease[16].

Thus, despite studies investigating poor sleep quality related to diseases, little is known about these variables associated with elderly women who exercise[11,13-16].

In this sense, the results of this study may contribute to deepening knowledge about poor sleep quality in elderly women who exercise and have any disease, and thus subsidize health services in care planning for health promotion. Understanding the importance of this theme, the present study aims to identify presence of diseases and their associations with poor sleep quality in physically active elderly women.

Methods

Cross-sectional and descriptive study approved by the Ethics Committee on Research Involving Humans, Santa Catarina State University [*Universidade do Estado de Santa Catarina*] (UDESC), under legal opinion CAAE 45881815.1.0000.0118.

Participants

The study involved senior citizens participating in physical activity projects developed by the Third Age Study Group [*Grupo de Estudos da Terceira Idade*] (GETI), an extension program of Santa Catarina State University (UDESC). The program counts with approximately 200 elderly participants and provides the community with extension projects that promote active aging by means of physical exercise[17,18].

Inclusion criteria were: being female, due to the relationship between being female and sleep quality, and aged 60 years old or over. Thus, 146 elderly women aged between 60 and 90 years old ($\bar{x}$ =69.58 years old, SD=6.22) were selected for the research. It is worth stressing that all researched elderly women had been engaging in a physical exercise modality (water aerobics, swimming, gymnastics, Pilates, dance, body building, walking, body building for elderly women with urinary incontinence) for at least six months in the program, which takes place two to three times a week, with duration of 50 minutes per session. The women's assiduity was controlled by attendance lists.

Instruments

Data collection instruments were composed of a diagnosis sheet with information covering sociodemographic characteristics (age, marital status, education and current occupation), health conditions (subjective perception of current health status, self-reported

and medically diagnosed diseases, use of medication, and difficulties with exercising) – designed by the group of researchers from the Gerontology Laboratory [*Laboratório de Gerontologia*] (LAGER) of the Center for Health Sciences and Sports [*Centro de Ciências da Saúde e do Esporte*] (CEFID), UDESC – and the Pittsburgh Sleep Quality Index (PSQI), designed by Buysse et al.[19], and validated and translated for Brazil by Bertolazi[20], with a high coefficient of reliability (α=0.82), to assess sleep quality.

The PSQI is made up of sleep-related questions according to the following components: 1) subjective sleep quality; 2) sleep latency; 3) sleep length; 4) habitual sleep efficiency; 5) sleep disorders; 6) use of sleep-inducing medication; 7) daytime somnolence, and disorders during the day. Each component has specific scores, with a maximum of 21 points. To categorize groups, the model proposed by Bleyer et al.[21] was employed, considering scores above five as indicative of poor sleep quality.

Data Collection

Data were collected in November 2016 by researchers with prior training. Initially, the elderly from the GETI/UDESC were contacted in person, given explanations about the research objectives and confidentiality, and invited to participate. Then, the date, time and place for application were set. The diagnosis sheet was applied first, followed by the Pittsburgh Sleep Quality Index – PSQI, both by means of individual interview.

Statistical Analysis

Data were analyzed on IBM SPSS Statistics, version 20.0 (Armonk, USA). Descriptive statistics, mean ($\overline{x}$), standard deviation (SD), relative frequency (*rf*) and absolute frequency (*af*) were used for expressing results concerning sleep quality and self-reported diseases.

Data normal distribution in the PSQI score was verified by means of the Kolmogorov-Smirnov test, after which the independent t-test was applied to assess differences in sleep quality among the elderly women as to presence or absence of certain diseases. The PSQI score was categorized according to what Tiede et al.[22] proposed, so values above 5 points on the scale classify sleep as being of poor quality. The chi-squared test (x^2) and Fisher's exact test (F) were applied to determine the independence of the categories of variables, and the Goodman-Kruskal lambda test (λ) was employed to measure the strength of this association through proportional reduction in error. The significance level for the analyses was 5%.

Binary logistic regression adjusted to all independent variables was used for estimating odds ratio (OR) and confidence intervals (95%CI), with sleep dysfunction as outcome (n=79), by means of the increasing step-by-step method, using as criterion the lowest signification level presented by the variables in the gross analysis. Adjustment quality was verified by the Hosmer-Lemeshow test. Collinearity between proposed models was controlled by variance inflation factor (VIF<10), by the model tolerance (VIF/1>0.20), observing high variation in the last dimensions of the condition index, and by the high proportion of variance between variables during the analysis on the dimensions of the collinearity diagnosis.

Results

Table 1 displays sociodemographic characteristics and health conditions related to sleep quality, showing that all variables classify poor sleep quality. It is possible to observe that negative perception on health status (*p*=0.04) and the hindrance that said status brings to exercising (*p*=0.02) also correlate with worse sleep quality.

Table 1. Comparison of the study participants' sociodemographic characteristics and health conditions with their sleep quality

Variables		n(%)	PSQI score $\overline{x}$(SD)	p-value
Age	Elderly women/Younger (≤75 years old)	114(81.4)	6.53(2.93)	0.75
	Elderly women/Older (>75 years old)	26(18.6)	6.73(2.88)	
Marital status	With partner	84(62.7)	6.54(2.95)	0.95
	Without partner	50(37.3)	6.50(2.97)	
Education	Up to 9 years	53(39.6)	6.83(3.28)	0.33
	Over 9 years	81(60.4)	6.32(2.71)	
Current occupation	Active	27(20.1)	6.19(2.35)	0.51
	Not active	107(79.9)	6.61(3.09)	
Health perception	Positive	87(64.9)	6.08(2.42)	0.04*
	Negative	47(35.1)	7.34(3.62)	
Difficulties with PE	Yes	33(24.6)	7.85(3.74)	0.02*
	No	101(75.4)	6.09(2.51)	
Use of medication	Regularly	111(82.8)	6.56(2.94)	0.76
	Not regularly	23(17.2)	6.35(3.04)	

Source: The authors

The study participants self-reported 21 types of diseases. This research excluded diseases with $n<10$ for the poor sleep quality outcome to conduct the comparative analysis (Table 2). Results show a statistically significant difference for self-reported diseases such as arthrosis, depression, diabetes, heart disease, fibromyalgia, gastritis and urinary incontinence compared to worse sleep quality.

Table 2. Comparison between diseases and sleep quality among study participants

Diseases		N (%)	PSQI score/ $\overline{x}$ (SD)	p-value
Arthrosis	Yes	48(39)	7.25(0.40)	0.020*
	No	75(61)	6.00(0.34)	
Depression	Yes	14(11.4)	7.20(0.61)	0.038*
	No	109(88.6)	6.40(0.29)	
Diabetes	Yes	22(17.9)	7.20(0.61)	0.040*
	No	101(82.1)	6.40(0.29)	
Heart disease	Yes	21(17.1)	8.15(0.63)	0.003*
	No	102(82.9)	6.20(0.28)	
Fibromyalgia	Yes	12(9.8)	9.10(0.90)	0.001*
	No	111(90.2)	6.30(0.27)	
Gastritis	Yes	99(80.5)	7.10(0.54)	0.034*
	No	101(75.4)	6.42(0.30)	
Hypertension	Yes	67(54.5)	6.52(0.34)	0.76
	No	56(45.5)	6.56(0.42)	
Hypothyroidism	Yes	25(20.3)	6.27(0.57)	0.92
	No	98(79.7)	6.60(0.30)	
Urinary incontinence	Yes	24(19.5)	7.86(0.73)	0.014*
	No	99(80.5)	6.24(0.27)	
Labyrinthitis	Yes	25(20.3)	7.13(0.67)	0.46
	No	98(79.7)	6.38(0.28)	
Osteoporosis	Yes	69(56.1)	7.10(0.48)	0.26
	No	54(43.9)	6.44(0.37)	

Legend: *$p<0.05$ (Independent t-test)
Source: The authors

Table 3 displays the association between diseases and sleep quality classification (poor and good) for elderly women who exercise. Results show significant differences for arthrosis (p=0.031), diabetes (p=0.031) and heart disease (p=0.01) as to sleep quality classification, revealing a higher frequency of individuals with poor sleep quality.

Table 3. Association of diseases and sleep quality in physically active elderly women

Disease		Sleep quality		p-value	λ-value
		Good *n(%)*	Poor *n(%)*		
Arthrosis	*yes*	24(35.8)	43(64.2)	0.031*	0.06
	no	27(52.9)	24(47.1)		
Depression	*yes*	5(35.7)	9(64.3)	0.58	0.00
	no	46(44.2)	58(55.8)		
Diabetes	*yes*	5(22.7)	17(77.3)	0.031*	0.00
	no	46(47.9)	50(52.1)		
Heart disease	*yes*	4(19)	17(81)	0.015*	0.00
	no	47(48.5)	50(51.5)		
Fibromyalgia	*yes*	2(18.2)	9(81.8)	0.11	
	no	49(45.8)	58(54.2)		0.00
Gastritis	*yes*	44(46.3)	51(53.7)	0.17	
	no	7(30.4)	16(69.6)		0.00
Incontinence	*yes*	6(26.1)	17(73.9)	0.06	
	no	45(47.4)	50(52.6)		0.00

Legend: *p<0.05 (Chi-squared test) **p<0.05 (Fisher's exact test)
Source: The authors

Table 4 displays results for logistic regression gross and adjusted analyses on the association between diseases and poor sleep quality. In the gross analysis, the heart disease variable associated positively and significantly with poor sleep quality. In the adjusted analysis, the same disease associated with poor sleep quality (OR: 3.40; 95%CI; 1.04-11.15), thus showing that elderly women with heart disease are 3.4 times more likely to have poor sleep quality.

Table 4. Logistic regression gross and adjusted analysis for association between diseases and poor sleep quality in physically active women (n=79)

Diseases		n(%)	OR (95%CI)	OR (95%CI)*
Arthrosis	*yes*	48(39)	2.02(0.96-4.24)	1.67(0.77-3.63)
	no	75(61)	1	1
Heart disease	*yes*	21(17.1)	4.00(1.25-12.74)	3.40(1.04-11.15)
	no	102(82.9)	1	1
Fibromyalgia	*yes*	12(9.8)	3.80(0.78-18.43)	2.41(0.42-13.78)
	no	111(90.2)	1	1
Urinary incontinence	*yes*	14(19.5)	2.55(0.93-7.03)	1.63(0.52-5.10)
	no	99(80.5)	1	1

Legend: *Analysis adjusted for all variables. Adjustment quality verified by the Hosmer-Lemeshow test with p=0.81. The model explains 62.7% of the sample
Source: The authors

As for the sleep characteristics (PSQI domains) of the elderly women who engage in physical exercises and have heart diseases, 30.8% of them do not breath comfortably, 28.6% snore or cough loudly or heavily, 28% have bad dreams, 21.2% take medication to sleep, and 25.9% do not sleep within the first 30 minutes after going to bed.

Discussion

In the present study, most elderly women who engaged in physical activity showed poor sleep quality, which is associated with heart diseases, diabetes, depression, fibromyalgia, gastritis, urinary incontinence and arthrosis. In this research, senior women with heart diseases were 3.4 times more likely to have poor sleep quality.

Mechanisms related to sleep disorders and heart diseases in elderly women are not well established; however, it is known that interrupted sleep may increase the activity of the sympathetic nervous system and catecholamine secretion, which then increases risks for arterial hypertension and coronary artery disease[23].

International studies report that personal, behavioral and socio-environmental factors associate significantly with insomnia and poor sleep quality, and multi-factor approaches need to be considered when developing interventions aimed at sleep and at reducing cardiovascular risk[14,16,22,24].

Major strategies to improve sleep and lower the gravity of cardiovascular diseases include physical exercise as a nonpharmacological means to raise quality of life[2]. Although several studies argue that physical exercise is a beneficial factor to improve sleep quality in elderly women[10,23,25], the present research has not found the same; thus, further studies need to be conducted with longitudinal monitoring of sleep quality[26], which is also a recommendation for the investigated program. Observing the sleep characteristics (PSQI domains) of physically active elderly women with heart diseases, it was possible to find that they do not breath comfortably, they snore, or cough loudly or heavily, sleep poorly, take medication to sleep and do not sleep within the first 30 minutes after going to bed. According to studies[10,27], sleep disorders, especially in this age group, is most likely due to physical, psychological and environmental factors; thus, identifying its causes is important to improve the elderly's sleep quality and health.

Another disease associated with the participants' poor sleep quality was diabetes *mellitus*. This aspect may be explained by production of melatonin, hormone responsible for regulating sleep, and by secretion of leptin, hormone responsible for regulating satiety, balancing food consumption; sleep deprivation causes leptin hypersecretion, inhibiting secretion of insulin with the rise in cortisol levels, thus increasing risks for developing diabetes *mellitus*[28].

Arthrosis was another disease reported in this study, which affects more than half of all individuals older than 65 and is responsible for high rates of sleep disturbances due as a consequence of pain and joint function deficiency, worsening one's quality of life and mental health29,30.

Poor sleep quality also associated with gastritis diagnosis in active seniors (*p*=0.034), who had on average less than seven daily hours of sleep[31], had difficulties to fall asleep and reported asthenic and neurotic complaints[32]. Mody et al.[33] state that nocturnal gastric symptoms are prevalent and have negative effects on the elderly population's quality of life.

It also has been evidenced that cases of urinary incontinence associated with poor sleep quality (*p*=0.014), since the elderly women needed to get up at night to urinate, thus losing their sleep[34], or having it interrupted as a result of that. According to Winkelman et al.[35], among women with urinary incontinence, poor sleep quality is common, and incontinence frequency is associated with a higher degree of sleep dysfunction; thus, women who seek treatment for urinary incontinence must be asked about their sleep habits so that they can receive proper interventions.

Moreover, it is worth highlighting that sleep deficiency in physically active seniors is associated with chronic diseases, which means risks to their health, decreasing their quality of life, as they are more prone to develop cardiovascular and metabolic diseases[16,36].

The present study presents some limitations, namely: diagnosis self-reported by the participants, which does not efficiently allow knowing the degree and certainty of the identified diseases; small sample, which prevents better statistical analyses; and study size, since longitudinal designs could better track changes in sleep quality in the health and disease process.

Conclusions

This study has identified that elderly women who engaged in physical exercises had high prevalence of poor sleep quality, which is associated with depression, fibromyalgia, gastritis, urinary incontinence, arthrosis, diabetes and heart disease. However, those with heart disease were more likely to have poor sleep quality.

Nevertheless, data indicative of poor sleep reinforces the need to assess the elderly population's sleep in detail, with special attention to factors and diseases that cause its fragmentation, and to associations with the type of exercise performed.

Therefore, this study contributes to fostering new researches and encouraging the creation of projects for physical exercise with the elderly in order to improve their sleep.

References

1. Silva KKM, Gleyce AF, Gonçalves RG, Menezes RMP, Martino MF. Alterações do sono e a interferência na qualidade de vida no envelhecimento. J Nurs UFPE online 2017;11(1):422-428. DOI: 10.5205/reuol.7995-69931-4-SM.1101sup201722.
2. Vieira AAU, Galindo AG, Silva AD, Santos EF, Júnior FMV, Sampaio RG, et al. Análise de qualidade de vida e bem estar em praticantes de atividades físicas na terceira idade. Col Pesq em Educ Fís 2014;13(1):41-8.
3. Quinhones MS, Gomes MM. Sono no envelhecimento normal e patológico: aspectos clínicos e fisiopatológicos. Rev Bras de Neur 2011; 47(1): 31-42.
4. Geib LTC, Alfredo CN, Ricardo W, Magda LN. Sleep and aging. Rev psiquiatr Rio Gd Sul 2013; 25(3):453-465.
5. Neves GSM, Giorelli SA, Florido P, Gomes MM. Transtornos do sono: visão geral. Rev Bras Neur 2013; 49(2):57-71.
6. Chokroverty S. Overview of sleep & sleep disorders. Indian J Med Res 2010; 131:126-40.
7. Thorpy, MJ. Classification of sleep disorders. Neurotherapeutics 2012; 9:687–701. 2012; 9:687–701.doi: 10.1007/s13311-012-0145-6.
8. Muller MR, Guimarães SS. Sleep disorders impact on daily functioning and life quality. Estud psicol (Campinas) 2007; 24(4): 519-528. http://dx.doi.org/10.1590/1982-0275201936e180011.
9. Heitkotter KH, Katya M, Laura CA, Patrícia M . Avaliação da qualidade do sono em um grupo de pacientes com doença de Parkinson. Rev Bras Neur Psiq 2015; 19(1):10-17.
10. Lambiase MJ, Gabriel KP, Kuller LH, Matthews KA. Temporal Relationships between Physical Activity and Sleep in Older Women. Med Sci Sports Exerc 2013; 45(12): 2362 -2368.doi: 10.1249/MSS.0b013e31829e4cea.
11. Piette J.D. Striplin D, Marinec N, Chen J, Trivedi RB, Aron DC, Fisher L, Aikens JE. A Mobile Health Intervention Supporting Heart Failure Patients and Their Informal Caregivers: A Randomized Comparative Effectiveness Trial. J Med Internet Res 2015; 10(17):142-196.doi: 10.2196/jmir.4550.
12. Whittaker F, Wade V. The costs and benefits of technology-enabled, home-based cardiac rehabilitation measured in a randomised controlled trial. J Telemed Telecare 2014; 20(7): 419-422.doi: 10.1177/1357633X14552376.
13. Leemrijse CJ, Dijk VL, Harald TJ, Ron JGP, Cindy V.The effects of Hartcoach, a life style intervention provided by telephone on the reduction of coronary risk factors: a randomised trial. BMC Cardiovasc Disord 2012;12(1) 12-47.doi: 10.1186/1471-2261-12-47.
14. Kureshi F, Kennedy KF, Jones PG, Thomas RJ, Arnold SV, Sharma P, Fendler T, Buchanan DM, Qintar M, Ho PM, Nallamothu BK, Oldridge NB, Spertus JA . Association Between Cardiac Rehabilitation Participation and Health Status Outcomes After Acute Myocardial Infarction. JAMA Cardiol 2016; 1(9): 980-988. doi: 10.1001/jamacardio.2016.3458.

15. Yu E, Rimm E, Qi L, Rexrode K Albert CM, Sun Q, Willett WC, Hu FB, Manson JE. Diet, Lifestyle, Biomarkers, Genetic Factors, and Risk of Cardiovascular Disease in the Nurses' Health Studies. Am J Public Health 2016;10(9):1616-1623.doi: 10.2105/AJPH.2016.303316. Epub 2016 Jul 26.

16. Goodwin L, Ostuzzi G, Khan N, Hotopf MH, Moss-Morris R. Can we identify the active ingredients of behaviour change interventions for coronary heart disease patients? A systematic review and meta-analysis. PloS one 2016; 11(4)153-271.doi: 10.1371/journal.pone.0153271. eCollection 2016.

17. Mazo GZ. Grupo de estudos da terceira idade-geti: 25 anos de atuação na extensão universitária. UDESC em Ação 2014; 8(1): 85-100. Acesso em 12/02/2017. Disponível em: http://www.revistas.udesc.br/index.php/cidadaniaemacao/article/view/4613.

18. Sandreschi PF, Petreça DR, Mazo GZ. Avaliação de um programa universitário de atividade física para idosos pelo modelo RE-AIM. Rev Bras Ativ Fís Saúde 2015; 20(3): 270-283.doi: https://doi.org/10.12820/rbafs.v.20n3p270.

19. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28(2): 193-213.

20. Bertolazi AN. Tradução, adaptação cultural e validação de dois instrumentos de avaliação do sono: Escala de Sonolência de Epworth e Índice de Qualidade de Sono de Pittsburgh. 2008. 93p. Dissertação (mestrado em medicina) Faculdade de Medicina. Programa de Pós-graduação em medicina. Universidade Federal do RS (UFGRS). Porto Alegre, 2008. Acesso em 02/02/2017. Disponível em: http://www.lume.ufrgs.br/bitstream/handle/10183/14041/000653543.pdf.

21. Bleyer FTS, Andrade RB, Teixeira CS, Felden EPG. Sono e treinamento em atletas de elite do Estado de Santa Catarina, Brasil. Rev. bras. educ. fís. esporte 2015; 29(2):207-216.http://dx.doi.org/10.1590/1807-55092015000200207.

22. Tiede H. Rorzyczka J, Dumitrascu R, Belly M, Reichnberger F, Ghofrani HA, Seeger W, Heitmann J, Schulz R. Poor sleep quality is associated with exercise limitation in precapillary pulmonary hypertension. BMC Pulm Med 2015; 15(11): 1186-1289.doi: 10.1186/s12890-015-0005-3.

23. Thuruston R, Chang Y, Von KR, Barinas ME, Jennings JR, Hall MH, Santoro N, Buysse DJ, Matthews KA. Sleep Characteristics and Carotid Atherosclerosis Among Midlife Women. Sleep 2017; 40(2): zsw052.doi: 10.1093/sleep/zsw052.

24. Ham O. K, Kim N, Bo GL, Eunju C. Behavioral Characteristics and Cardiovascular Disease Risks Associated With Insomnia and Sleep Quality Among Middle-Aged Women in South Korea. Res Nurs Health 2017; 40(3):206-217.doi: 10.1002/nur.21792. Epub 2017 May 4.

25. Banno M, Harada Y, Taniguchi M, Tobita R, Tsujimoto H, Tsujimoto Y, Kataoka Y, Noda A. Exercise can improve sleep quality: a systematic review and meta-analysis. PeerJ 2018; 6:e5172.doi: 10.7717/peerj.5172.

26. Paula AFM, Ribeiro LHM, D'Elboux MJ, Guariento ME. Avaliação da capacidade funcional, cognição e sintomatologia depressiva em idosos atendidos em ambulatório de Geriatria. Rev Bras Clin Med 2013; 11(3):212-8.

27. Zdanys KF, Steffens DC. Sleep Disturbances in the Elderly. Psychiatr Clin North Am 2015; 38(4):723-41.doi: 10.1016/j.psc.2015.07.010. Epub 2015 Aug 28.

28. Nilsson PM, Rööst M, Engström G, Hedblad B, Berglund G. Incidence of diabetes in middle-aged men is related to sleep disturbances. Diab care 2004; 27(10): 2464-2469. https://doi.org/10.2337/diacare.27.10.2464.

29. Lu , J, Huang L, Wu X, Fu W, Liu Y. Effect of Tai Ji Quan training on self-reported sleep quality in elderly Chinese women with knee osteoarthritis: a randomized controlled trail. Sleep Med 2017;12(24):70-75.doi: 10.1016/j.sleep.2016.12.024. Epub 2017 Feb 6.

30. Parmele PA, Cox BS, DeCaro JA, Keefe FJ, Smith DM. Racial/ethnic differences in sleep quality among older adults with osteoarthritis, Sleep Healt 3(3):163-169. doi: 10.1016/j.sleh.2017.03.010. Epub 2017 Apr 22.

31. Torre-Bouscoulet L, Garcia SC, Vázquez GJC, Salazar-Peña CM, Lopez VMV, De oca MM, Muiño A, Tálamo C, Valdivia G, Menezes AM, Perez-Padilla R. Perceptions of short and long sleep duration and comorbid conditions: the Platino study. Sleep Med 2013;.14(9): 850-857.doi: 10.1016/j.sleep.2013.04.014. Epub 2013 Jul 12.

32. Dzhulai GS, Chernin VV, Iakovlev NA. Chronic gastritis: keys to understanding the internal picture of the disease. Eksp Klin Gastroenterol 2002;1(191): 28-30.

33. Mody R, Bolge SC, Kannan H, Fass R. Effects of gastroesophageal reflux disease on sleep and outcomes. Clin Gastroenterol Hepatol 2009;7:953–9.doi: 10.1016/j.cgh.2009.04.005. Epub 2009 Apr 16.

34. Tuncer M, Yazici O, Kafkali A, Sabuncu K, Salepci B, Narter F, Gungor GA, Yucetas U. Critical evaluation of the overactive bladder and urgency urinary incontinence association with obstructive sleep apnea syndrome in a relatively young adult male population. Neurourol Urodyn 2016; 36(7): 1804–1808.doi: 10.1002/nau.23184. Epub 2016 Dec 6.

35. Winkelman WD, Warsi A, Huang AJ, Schembri M, Rogers RG, Richter HE, Myers DL, Kraus SR, Johnson KC, Hess R, Gregory T, Bradley CS, Arya LA, Brown JS, Stone KL, Subak LL. Sleep Quality and Daytime Sleepiness Among Women With Urgency Predominant Urinary Incontinence. Female Pelvic Med Reconstr Surg 2018; Mar/Apr; 24(2):76-81.doi: 10.1097/SPV.0000000000000547.
36. Faith MS, Van HL, Appel LJ, Burke LE, Carson JA, Franch HA, Jakicic JM, Kral TV, Odoms-Young A, Wansink B, Wylie-Rosett J. Evaluating parents and adult caregivers as "agents of change" for treating obese children: evidence for parent behavior change strategies and research gaps: a scientific statement from the American Heart Association. Aha scien stat 2012;125(9):1186-207. doi: 10.1161/CIR.0b013e31824607.

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