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A comparison of sleep quality in Costa Rican urban and rural older adults

Comparación de la calidad del sueño en adultos mayores de Costa Rica de zona rural y urbana

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ABSTRACT

Objective Evidence regarding sleep quality in older adults residing in urban and rural areas is lacking among Latino populations living outside the United States. The purpose of the study was to compare the perceived sleep quality of older adults from Costa Rica in urban and rural areas.
Methods Volunteers were 52 urban and 30 rural older adults who completed anthropometric measures, cognitive screening, demographic information, and the Pittsburgh Sleep Quality Index questionnaire (PSQI). Non-parametric Mann-Whitney U tests determined differences on subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, sleep daily dysfunction, and global PSQI. Multiple regression analyses determined sociodemographic predictors of sleep quality.
Results Regardless of the residency zone, older adults showed similar subjective sleep quality (p=0.077), sleep latency (p=0.863), sleep duration (p=0.316), sleep efficiency (p=0.613), use of sleep medication (p=0.207), and total PSQI score (p=0.270). Sleep perturbation (p=0.009) and sleep daily dysfunction (p=0.019) were higher in rural than in urban older adults. Education predicted sleep perturbation (β=-0.266, p=0.049, R^2 =0.17). Age (β=-0.309, p=0.025) and residency region (β=0.346, p=0.024) predicted sleep daily dysfunction (R^2=0.196).
Conclusion Most sleep quality measures were similar between older adults residing in urban and rural zones. Low education predicted sleep perturbation regardless of the residency zone; and younger age and urban zone predicted higher sleep daily dysfunction.

Key Words: Urban; rural; latinos; sleep quality; Costa Rica (*source: MeSH, NLM*).

RESUMEN

Objetivo Evidencia sobre la calidad del sueño en adultos mayores que residen en áreas urbanas y rurales es escasa en las poblaciones latinas que viven fuera de los Estados Unidos. El propósito del estudio fue comparar la percepción de la calidad del sueño de adultos mayores de Costa Rica de zonas urbanas y rurales.
Métodos Los voluntarios fueron 52 adultos mayores residentes en zonas urbanas y 30 en zonas rurales, quienes completaron medidas antropométricas, evaluación cognitiva, información demográfica y el cuestionario del Índice de Calidad del Sueño de Pittsburgh (PSQI). Las pruebas no paramétricas U de Mann-Whitney determinaron diferencias en la calidad subjetiva del sueño, la latencia del sueño, la duración del sueño, la eficiencia habitual del sueño, los trastornos del sueño, el uso de medicamentos para dormir, la disfunción diaria del sueño y el PSQI global.
Resultados Independientemente de la zona de residencia, los adultos mayores mostraron similar calidad subjetiva del sueño (p=0.077), latencia del sueño (p=0.863), duración del sueño (p=0.316), eficiencia del sueño (p=0.613), uso de medicamentos para dormir (p=0.207) y puntuación total del PSQI (p=0.270). La perturbación del sueño (p=0.009) y la disfunción diaria del sueño (p=0.019) fueron mayores en los adultos mayores rurales que en los urbanos.

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Conclusión La mayoría de las medidas de calidad del sueño fueron similares entre los adultos mayores que residen en zonas urbanas y rurales. La baja educación predijo la perturbación del sueño independientemente de la zona de residencia, mientras que la edad más joven y la zona urbana predijeron una mayor disfunción diaria del sueño.

Palabras Clave: Urbano; rural; latinos; calidad del sueño; Costa Rica (*fuente: DeCS, BIREME*).

Sleep quality contributes to the overall good health in the population; people with sleep disturbances tend to show additional health problems and increased mortality risk (1). The construct of sleep has been studied unevenly due to its complexity; some of the variables characterizing this research line are onset of sleep time, sleep continuity, number of awakenings, drowsiness, and difficulty of falling asleep, among others. Epidemiological studies have measured sleep using self-report instruments, which have been validated against neurological measuring instruments, triaxial accelerometers, and polysomnography (2).

Extensive research suggests associations between various dimensions of sleep, chronic diseases, and mortality risk (3-6). Sleep duration is one of the most studied variables, and systematic reviews and meta-analytical evidence suggest that sleeping both, a few or several hours, is associated with an increased mortality risk (7-10). A prospective meta-analytic study showed that sleeping less than 6-h was associated with the onset of diabetes in Australian aged 45 years and above who did not have chronic health conditions at the beginning of the study. Participants who initially presented poor health also showed a significant association between sleeping a few hours and increased cardiovascular diseases (10). A 7-year longitudinal study conducted in China on 113,138 adults between 44 and 75 years of age, reported a significant association between sleep duration and mortality. This finding was more evident in people with comorbidities; short- and long-duration sleep were independently associated with mortality, but only long-duration sleep showed a high mortality risk in those with cardiovascular diseases or diabetes (9).

Other variables related to sleep quality have been reported in older adults (11). A significant association was found between poor sleep quality and suicide risk in 10-years of follow-up. Falling asleep difficulty and non-restorative sleep were individually associated with higher suicide risk (Odds Ratio [OR]=2.17 and 2.24, respectively). The authors analyzed this association controlling for the influence of depressive symptoms and confirmed that the self-reported basal sleep quality was still associated with an increased risk of death by suicide (OR=1.30, 95 % confidence interval [CI_{95}%]=1.04-1.63, $p<0.05$). These findings confirm previous evidence showing that mortality is not only related to the aging process, but also to independent factors associated with an increased risk for all-cause mortality (12).

Sleep disturbance during aging increase morbidity and mortality risk (13). There are studies focusing in demographic and social components associated with sleep quality impairment. For example, men sleep more hours than women, and older adults tend to report equal or less sleep time compared to younger adults. Hispanics report short sleep and African Americans report short and long sleep; low socioeconomic status groups also reported short sleep and those who have long working hours (1). Objective sleep measurements also show that participants who sleep alone show better quality sleep than those who sleep with someone else.

Residence zone (i.e., urban vs. rural) is another important aspect to analyze on sleep research. A study on urban participants in China, showed that poor sleep quality is associated with age, number of chronic diseases, anxiety, and low educational level (14). Another study conducted with rural population found associations between poor sleep quality and age, chronic diseases, poor diet and a low level of activities of daily living (15). There is also evidence on sleep quality in African urban and rural adolescents and adults (6,16). In Uganda, 148 rural and urban children aged 11 to 16 responded a comprehensive questionnaire that included sleep pattern questions. The self-reported sleep duration and subjective sleep quality was similar between urban and rural participants (16). In 263 adults from Ghana, total sleep time was associated to 10-year cardiovascular disease risk even after controlling for residency zone (i.e., urban vs. rural) and previous sleep disturbance, among others (6).

A study on low-income Latin American adults living in New York, reported that sleep quality is affected by living in environments characterized by neighborhood problems (e.g., violence) and construction problems. These findings agree with those reported by Kurina, McClintock (1), who found that downtown life and perceived neighborhood problems are related to health outcomes, including mortality risk. In spite of this evidence, there is still little information on comparisons between sleep quality on urban and rural Latino older populations not living in the United States. Therefore, the purpose of this study was to compare the perceived sleep quality of older Costa Rican adults residing in urban and rural areas.

METHODS

Participants

Participants were 82 Costa Rican older adults between the ages of 60 and 84. From the total sample, 52 were

from the Greater Metropolitan Area (i.e., Urban) and 30 resided in the rural areas of the Guanacaste State (i.e., Rural). The Greater Metropolitan Area is located in Costa Rica's Central Valley, and State of Guanacaste is located about 200 km Northeast of San José (the capital) towards the Pacific Coast.

Procedures

Participants were recruited from the University of Costa Rica's Institutional Program for the Older Adult, the Costa Rican Gerontological Association, the Program for Golden Citizens of the Costa Rican Social Security Bureau, retired teachers, community folk and cultural groups. The recruiting process was carried out directly through the groups and institutions by visiting and personally inviting any person interested in participating that signed up for the research project. The inclusion criteria to participate in the study were being able to read, understand and sign an informed consent, have between 65 to 85 yr. of age, being from a community dwelling living condition, have adequate visual and auditory abilities to fill-out the measurement instrument, and have stable doses of medications for at least 30 days prior to screening. Volunteers were not allowed to participate in the study if they had moderate cognitive impairment as determined by the Mini-Mental State Examination (MMSE) (17), had current clinically significant major psychiatric disorder, and had a history of drug or alcohol abuse or dependence. The study protocol followed the Helsinki Declaration of ethical principles for medical research involving human participants and was approved by the Scientific Ethics Committee of the University of Costa Rica.

An *ad hoc* questionnaire was filled that included socio-demographic information (e.g., sex, age, place of residence, ethnic group, education level). The quality of sleep was measured with the Pittsburgh Sleep Quality Index, PSQI (18). The PSQI has proved internal consistency (Cronbach's α=0.83) and is an effective instrument to measure the quality and patterns of sleep in adults. It differentiates "poor" from "good" sleep quality by measuring seven areas (components): subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction over the last month (18). According to Buysse, Reynolds (18), a score ≤5 on PSQI indicates a good sleeper, and scores >5 bad quality sleep.

Participants completed the questionnaires in one session. An additional session was required in the rural zones since most of the participants showed a low educational level, requiring more clarification related to the questionnaire content. Some participants in rural zones could not fill out the questionnaires in writing, and instead, they answered verbally (research assistants read aloud the questionnaires and wrote down their answers).

Statistical analysis

Statistical analyses were performed with the IBM-SPSS Statistics, version 22 (IBM Corporation, Armonk, New York). Descriptive statistics are presented as mean and standard deviation (M ± SD). Independent samples t- tests determined significant mean differences between urban and rural older adults on age, MMSE, body height, weight, body mass index (BMI = body weight in kg/Body height in m^2), number of family members and sons living at home. Non-parametric Mann-Whitney U tests were computed to determine differences on sleep variables (i.e., subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, sleep daily dysfunction, and global PSQI). In addition, the CI_{95}% around the mean differences are presented. Finally, a multiple linear regression analysis determined whether sociodemographic variables predicted sleep quality. The criterion variable were sleep perturbation (model 1) and sleep daily dysfunction (model 2), and predictor variables were MMSE, age, education, number of family members, sons living at home, and residence zone (dummy-coded) (19). For all analyses, significance level was set *a priori* at $p \leq 0.05$.

RESULTS

Participants were 82 older adults from urban and rural Costa Rican regions. Descriptive statistics for sample appear in Table 1. The 50 % of urban older adults were married, 13.5 % were single (never been married), and 36.6 % were either widowed, separated or divorced. The 53.3 % of rural older adults were married, 6.7 % were single, and 40 % were either widowed, separated or divorced. A higher proportion of urban older adults were retired (82.7 %) compared to rural older adults (73.3 %).

Urban were younger than rural older adults (p=0.013, CI_{95}%=-6.1, -0.7, yr.). The cognitive screening (i.e., MMSE) showed higher scores in urban than in rural older adults ($p \leq 0.001$, CI_{95}%=1.5, 3.4 pts.); however, scores were within considered normal values (no cognitive impairment =24-30 pts.) (17). Urban had similar body height (p=0.261, CI_{95}% =-1.7, 6.2 cm), weight (p=0.787, CI_{95}%=-8.2, 6.2 kg), and BMI (p=0.358, CI_{95}%=-4.2, 1.5 kg/m^2), than rural older adults. In addition, the number of family members was similar between urban and rural older adults (p=0.685, CI_{95}%=-0.9, 0.6 members), as well as the number of sons living with them (p=0.644, CI_{95}%=-0.3, 0.5 sons).

Similar mean scores between urban and rural older adults were found on subjective sleep quality (p=0.077), sleep latency (p=0.863), sleep duration (p=0.316), sleep efficiency (p=0.613), sleep medication (p=0.207), and PSQI total score (p=0.270). Sleep perturbation (p=0.009) and sleep daily dysfunction (p=0.019) were higher in rural than in urban older adults.

Table 1. Descriptive statistics of the urban and rural older adults (n=82)

Variable	Urban	All urban (n = 52)		Rural		All rural (n = 30)
		Male (n = 11)	Female (n = 41)	Male (n = 3)	Female (n= 27)	
Age (yr.)	64.9 ± 1.8	67.4 ± 0.9	66.9 ± 5.7	71.0 ± 3.4	70.2 ± 1.1	70.3 ± 6.2
Height (cm)	169.8 ± 2.0	154.2 ± 1.0	157.2 ± 9.2	166.0 ± 3.7	153.6 ± 1.3	155.0 ± 6.6
Weight (kg)	72.5 ± 4.5	67.4 ± 2.3	68.5 ± 13.7	79.5 ± 8.5	68.1 ± 3.2	69.5 ± 16.9
BMI (kg/m^2)	25.1 ± 1.9	28.5 ± 0.9	27.8 ± 5.3	28.6 ± 3.4	29.2 ± 1.3	29.2 ± 2.4
MMSE (0-30 pts)	28.3 ± 1.3	29.3 ± 1.3	29.1 ± 1.4	27.3 ± 1.3	26.5 ± 2.4	26.6 ± 2.4
Education (yrs.)	13.9 ± 3.3	12.0 ± 4.6	12.4 ± 4.4	12.0 ± 5.6	8.2 ± 5.4	8.5 ± 5.4
Family members	3.4 ± 1.8	2.7 ± 1.5	2.9 ± 1.6	1.7 ± 0.6	3.2 ± 1.8	3.0 ± 1.7
Sons living at home	1.0 ± 1.4	0.7 ± 0.9	0.7 ± 1.0	0.0 ± 0.0	0.7 ± 0.8	0.6 ± 0.8
Subjective quality of sleep (0-3)	0.6 ± 0.4	0.9 ± 0.2	0.8 ± 1.1	1.3 ± 0.7	1.3 ± 0.2	1.3 ± 1.7
Sleep latency (0-3)	1.1 ± 0.3	1.3 ± 0.2	1.2 ± 0.9	1.3 ± 0.5	1.3 ± 0.2	1.3 ± 0.9
Sleep duration (0-3)	0.6 ± 0.3	0.8 ± 0.2	0.8 ± 0.9	2.0 ± 0.6	0.6 ± 0.2	0.7 ± 1.2
Sleep efficiency (0-3)	0.6 ± 1.0	1.0 ± 1.2	0.9 ± 1.2	1.3 ± 1.5	0.7 ± 1.2	0.8 ± 1.2
Sleep perturbation (0-3)	0.3 ± 0.5	0.4 ± 0.6	0.4 ± 0.5	± 0.0	0.7 ± 0.5	0.7 ± 0.5
Sleep medication (0-3)	0.1 ± 0.3	0.4 ± 1.0	0.3 ± 0.9	1.0 ± 1.7	0.6 ± 1.1	0.6 ± 1.1
Sleep daily dysfunction (0-3)	0.5 ± 0.7	0.2 ± 0.5	0.3 ± 0.6	1.0 ± 0.0	0.6 ± 0.8	0.6 ± 0.7
Global PSQI (0-21)	3.6 ± 3.1	5.0 ± 3.9	4.7 ± 3.8	9.0 ± 5.2	5.6 ± 4.4	6.0 ± 4.5

Regression analyses showed that for model 1, education was a significant predictor of sleep perturbation (Table 2). Participants with less total years of education showed higher sleep perturbation (β=-0.266, p=0.049, R^2=0.170). For regression model 2, age (β=-0.309, p=0.025) and residency region (β=0.346, p = 0.024) were significant predictors of sleep daily dysfunction (Table 2). For this model, being older and living in an urban region accounted for 19.6 % of the variance in sleep daily dysfunction (R^2=0.196).

DISCUSSION

The purpose of the study was to compare Costa Rican urban and rural older adults on the perceived sleep quality, a construct composed of seven factors. The main finding of the study was that the perceived quality of sleep as measured by the PSQI was similar between urban and rural older adults. From the seven factors comprised in the PSQI, rural older adults showed impaired scores in sleep perturbation and sleep daily dysfunction. Age, education and residency zone were significant predictors of impaired sleep quality.

To describe family dynamics more clearly in the sample analyzed, we found that about half of the older adults from urban and rural zones interviewed were married; with the other half being widowed or single. In addition, in both zones the number of family members was similar, as well as the number of sons living with them. Li, Yao (15), reported similar results in rural areas, as 67.4 % were married and 74 % lived with a relative. However, in a study with Chinese population residing in an urban area, only 9.8 % of the older adults lived alone (14).

The cognitive screening on the sample in the present study showed normal scores for both groups of older adults; however, Faubel, López-GarcÍa (20), reported that people older than 60 years sleeping more than 11-h had lower cognitive scores than those sleeping ~7-h. Older adults scoring low in mental and physical tests reported poor subjective sleep quality (15). Other evidence suggests that older adults with a relatively poor mental health show 8 % higher risk of experiencing disturbed sleep (21).

In this study, the body height, weight and BMI measures in older adults from rural and urban zones were similar. Li, Yao (15) found in rural zones in China that more than half of the older adults had normal weight, and 32 % were overweight and obese. In addition, 66 % suffered from chronic diseases, and those with low weight showed higher scores in the PSQI, indicating lower sleep quality, lower sleep efficiency and shorter duration, greater use of sleep medications and greater diurnal dysfunction. However, Luo, Zhu (14), did not find a significant difference in sleep quality among urban Chinese older adults with low and high BMI.

The quality of sleep, sleep latency, duration and efficiency of the elderly of this study was similar between those residing in urban and rural zones. In urban and rural Chinese older adults, more than 40 % showed an increased prevalence of poor subjective sleep quality, especially among women from urban zones (14,15). The high prevalence of sleep disturbances was associated to increasing age (14).

The sleep latency of the elderly in the urban area was 24.1-min and 12.6 % could not fall asleep before 30-min. Women showed worse sleep latency and subjective sleep quality than men (14). Meta-analytical evidence (22), shows that sleep latency is different between 20 yr. and over 80 yr. adults; however, the difference is only of 10-min; therefore, investigators have questioned the purported association between sleep latency and age, which warrants more research. Another confounding variable that might explain some of the findings is the number of diseases reported or under reported by participants. For instance, Nakazaki, Noda (23) reported an association between poor sleep

and chronic diseases, and Potvin, Lorrain (24) reported an association between poor sleep quality with cognitive status deterioration in older adults. Luo, Zhu (14), studied urban older adults and found that 41.2 % of participants reported sleeping less than 7-h, 53.9 % reported having a high sleep efficiency (above 85 %), and only 17 % reported using sleep medications.

In this study, we found that lower education predicted sleep disturbance (regression model 1, negative β, Table 2). A recent study in rural Chinese showed that poor sleep quality was predicted by marital status (poorer sleep in unmarried), low income and chronic diseases (25). Another recent report in older adults form rural Thailand showed that being female, having high education level, mild depression and poor family relationships were significant predictors of poor sleep quality (26). A previous study on urban Chinese older adults also showed and association between lower education and lower sleep quality (14). However, the association was lost in older adults residing in rural zone (15).

Table 2. Multiple linear regression coefficients on sociodemographic predictors sleep perturbation and sleep daily dysfunction in older adults

Predictors	Unstandardized coefficients		Standardized coefficients	t	p=	95% confidence interval for β	
	B	Standard Error	β			Lower Bound	Upper Bound
Model 1							
(Constant)	0.980	1.533		0.639	0.525	-2.086	4.046
MMSE	0.010	0.036	0.040	0.266	0.791	-0.063	0.082
Age	-0.016	0.011	-0.196	-1.437	0.156	-0.039	0.006
BMI	0.014	0.011	0.162	1.330	0.188	-0.007	0.036
Education	-0.028	0.014	-0.266	-2.012	0.049	-0.055	0.000
Region	0.228	0.167	0.208	1.364	0.178	-0.106	0.563
Family members	-0.007	0.055	-0.022	-0.132	0.896	-0.118	0.103
Sons living at home	-0.031	0.095	-0.051	-0.323	0.748	-0.221	0.160
Model 2							
(Constant)	0.617	1.846		0.334	0.739	-3.074	4.308
MMSE	0.045	0.044	0.155	1.044	0.301	-0.042	0.133
Age	-0.031	0.014	-0.309	-2.298	0.025	-0.059	-0.004
BMI	0.002	0.013	0.016	0.136	0.893	-0.024	0.027
Education	-0.017	0.017	-0.131	-1.004	0.319	-0.050	0.016
Region	0.465	0.202	0.346	2.309	0.024	0.062	0.869
Family members	0.034	0.066	0.082	0.507	0.614	-0.099	0.167
Sons living at home	0.102	0.115	0.140	0.893	0.375	-0.127	0.332

Note: Model 1: dependent variable is sleep perturbation; Model 2: dependent variable is sleep daily dysfunction; MMSE: Mini-Mental State Examination; BMI: Body Mass Index.

In the present study, age (negative β) and the residence zone (positive β) predicted daily sleep dysfunction (regression model 2, Table 2). For this model, being younger and living in an urban region accounted for 19.6 % of the variation in daily sleep dysfunction. According to Li, Yao (15), in a sample of rural older adults, a regression analysis associated poor quality of sleep with chronic disease, age, impaired diet (increased rice intake), dysfunction in activities of daily life, and low scores in physical and mental tests. In a study on urban older adults (14), a regression analysis showed that age, lower educational level, anxiety, and the number of chronic diseases were risk factors of poor sleep quality.

In conclusion, it is unreasonable to determine a single linear change in variables related to subjective sleep quality and the aging process. In this study, low education levels were related to sleep perturbation regardless of the residency zone; however, younger age and living in urban zones predicted higher sleep daily dysfunction. The culture, residence zone, different socio-demographic factors, eating habits, and diseases are some factors that partially mediate different forms and magnitudes of poor quality of sleep associated with aging. It is necessary to determine factors affecting different populations to reduce conditions influencing poor sleep quality and provide older adults with a greater sense of well-being. It might be plausible to recommend activities related to positive benefits in sleep quality in the older adult population, such as Tai-chi practice and other types of physical training (27-32) ♣

Conflict of interest: None.

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