Sleep quality in women who use different contraceptive methods

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ABSTRACT

Background: Both menstrual cycle and hormone alterations influence sleep pattern. The aim of this study was to evaluate sleep quality in women who use different contraceptive methods. **Material and Methods:** This study was a descriptive, cross-sectional survey. Pittsburgh Sleep Quality Index (PSQI) was used to evaluate sleep quality, and a questionnaire was used to obtain sociodemographic, clinical, lifestyle, and contraceptive use data. **Results:** The study population comprised 235 women in reproductive age. Regarding lifestyle, 25.5% of the women were physically active, 12.3% were tobacco-smoking, and 70.6% drank coffee daily. Sleep quality was good in 34% of the studied population and poor in 66% of the population. The population was divided into two groups: hormonal (57.1%) and non-hormonal (42.9%) contraceptive users. Sleep quality in the users of non-hormonal contraceptive methods was similar to that in the users of hormonal methods (6.1±3.2 versus 5.9±2.9; p=0.5). Sleep efficiency was statistically higher among the users of non-hormonal contraceptive methods (94.7±17.7) than among the users of hormonal methods (90.0±15.3; p=0.03). The patients who had irregular or altered menstrual cycles reported poorer sleep quality. The absence of routine physical activity negatively influenced sleep quality (p=0.05). The women who snored reported worse sleep quality (p=0.002). **Conclusions:** Nearly half of the studied population was users of hormonal contraception, and most of these women reported poor sleep quality. Sleep efficiency was higher among the users of non-hormonal contraceptives. No differences in subgroups (hormonal contraceptive users) were observed.

Keywords: Sleep; Contraception; Women; Life Style.

INTRODUCTION

Sleep is necessary for the physiological and psychological functions of the human body. Any interference in sleep quality or sleep quantity leads to important changes in the daily activity of individuals. Poor sleep quality can result in fatigue, the impairment of attention, and the disruption of regular activities[1]. A study compared sleep complaints in the same metropolitan area, using the same methodology across three consecutive decades. Clear trends of increasing sleep complaints were observed. There was a high prevalence of difficulty initiating sleep and difficulty maintaining sleep and early morning awakening mostly in women[2]. Insomnia is defined as difficulty initiating or maintaining sleep, the presence of non-restorative sleep, or the presence of sleep that is insufficient for alertness and physical and mental well-being during the day with consequent impairment of daytime activity[3]. Complaints of insomnia are more common in women than in men, and this difference between genders has been observed in patients over 40 years of age[4,5].

The incidence of insomnia in women over 30 years of age ranges from 26-45%. Epidemiological studies have demonstrated that the incidence of insomnia after menopause increases to 28-63%[4,5]. Insomnia is an important condition because sleep affects all physiological systems, including cardiovascular function, respiratory function, endocrine function, and thermoregulatory function[5]. In addition, insomnia is associated with disease, vulnerability to psychiatric disease, and decreased professional performance. Despite the high prevalence of insomnia and its negative consequences, this condition is often not properly evaluated and treated[6]. In an epidemiological study, Sarti and colleagues observed that women on oral and transdermal hormone replacement therapy reported better sleep quality than women who were not undergoing such treatment[7]. Other studies have demonstrated that hormone replacement therapy reduces the number of awakenings during the night and improves sleep quality in postmenopausal women[8].

To determine hormonal interference in sleep patterns, we conducted a study that evaluated subjective and objective sleep parameters using polysomnography in a population of pre- and postmenopausal women. Interestingly, we observed that women with an irregular menstrual cycle were twice as likely to have difficulty sleeping compared to women with a regular menstrual cycle. Additionally, we observed that women who were using hormonal contraceptives snored less and had fewer awakenings during the night than women who did not use contraception[9].

An epidemiological sleep study in São Paulo evaluated hormonal interference in the sleep patterns of premenopausal women and demonstrated that the women who used hormonal contraception had a lower apnea/hypopnea index based on polysomnography and better sleep efficiency. The results of that study corroborated previous findings and suggested that hormonal contraceptive use may improve sleep quality. However, neither of these studies assessed the women according to the type of contraceptive method, the dosage of the method, or the route of administration[10].

Because sleep quality significantly impacts daily life and contraceptives are widely used in the female population, this study aimed to further evaluate sleep quality in women who use different contraceptive methods, specially comparing non-hormonal to hormonal ones and different composition of them (subgroups of hormonal contraceptives).

MATERIAL AND METHODS
Population

This study was a cross-sectional survey conducted at the Family Planning Outpatient Clinic of the Universidade Federal de Sao Paulo (UNIFESP). The population comprised women of reproductive age who were enrolled at the UNIFESP Family Planning Outpatient Clinic. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Inclusion criteria

The following inclusion criteria were considered essential for participation in the study: enrollment in the UNIFESP Family Planning Outpatient Clinic; 19-45 years of age; Contraceptive use for a minimum period of 3 months.

Exclusion criteria

Women with uncontrolled clinical diseases, such as systemic arterial hypertension, diabetes, and cancer; women who were using psychotropic drugs, alcohol consumption, or drugs of abuse; and women with psychiatric and neurological diseases were excluded by questionnaries (clinical interview).

Sample

The inclusion and exclusion criteria were strictly adhered to and resulted in a population sample that comprised 235 women who attended a medical consultation at the clinic.

Data collection

The data were collected from July 2011 to April 2012. Data collection was initiated after approval from the UNIFESP Research Ethics Committee (#0734/11). The enrolled women were invited to participate in the study by voluntarily signing informed consent forms.

Two research instruments were used to collect the data: a Portuguese version of the Pittsburgh Sleep Quality Index (PSQI), validated for use in Brazil[11], was used to evaluate sleep quality, and a questionnaire was used to obtain sociodemographic, clinical, lifestyle, and contraceptive use data.

The PSQI was used to evaluate the subjective sleep parameters. The PSQI consists of 19 questions regarding habits and problems related to sleep, such as insomnia, excessive sleepiness, and parasomnias[12]. The PSQI has an overall score of 21 points: a score of 0-5 indicates good sleep quality, and scores of 5-21 indicate poor sleep quality.

Sociodemographic, clinical, lifestyle, and contraceptive use data were obtained using an instrument that was specifically developed for this study. In addition to sociodemographic items (age, educational level, household income, and occupation), this instrument included obstetric items (the number of pregnancies and miscarriages), gynecological items (regular or irregular menstruation), and clinical and lifestyle items, such as exercise, tobacco-smoking, alcohol consumption, coffee consumption, drugs, the presence of diseases, and medication use. The data on contraceptive use were collected, including the type of method and the usage time in months.

The patients were divided into three groups according to the type of contraceptive used: 1) Hormonal 1, which was classified as users of combined oral contraceptives with breaks, continuous combined oral contraceptives and monthly injectable contraceptives; 2) Hormonal 2, which was classified as users of quarterly injectable contraceptives; and 3) Hormonal 3, which was classified as users of progestin-only oral contraceptives and hormonal intrauterine devices (IUDs).

Body mass index (BMI) was determined during the clinical evaluation and was calculated as follows: weight in kilograms divided by height in meters squared. The BMI results were categorized as underweight, normal weight, overweight, or obese.

Data analysis

Descriptive statistical analyses were performed to determine the mean and standard deviation of the numeric variables. The Chi-squared test was used to compare the categorical variables. Student's *t*-test was used to compare the means of the two groups. To compare the means of two or more groups, analysis of variance (ANOVA) with the Bonferroni post-hoc test was used. The significance level was set at $p<0.05$.

RESULTS

The studied population comprised 235 women who were enrolled at the UNIFESP Family Planning Outpatient Clinic. The mean age of the patients was 31.3 years, and the ages ranged from 19-45 years. A mean of 1.5 pregnancies, 0.2 miscarriages, and 1.5 live births was observed per woman. The mean household income was 2.6 times the minimum wage. The mean PSQI score for the studied population was 6. The women slept an average of 6.6 hours per night, and the mean sleep efficiency was 92%. Sleep quality was good in 34% of the studied population and poor in 66% of the population. Additionally, 69.4% of the women did not experience daytime sleepiness.

Regarding the categorical variables, 60.9% of the study participants had completed secondary school, and approximately 70% of the participants worked outside of the home. Regarding lifestyle, 25.5% of the women were physically active, 12.3% were tobacco-smoking, 56.2% drank alcohol socially, and 70.6% drank coffee daily.

A comparison of the lifestyle and sleep characteristics between users of non-hormonal and hormonal contraceptive methods is shown in Table 1.

Table 2 shows the comparison of the four types of hormonal contraceptives with the non-hormonal contraceptives. Significant differences were observed among the variables studied in these four groups. The women who used non-hormonal methods had a higher number of children and pregnancies when compared to women using hormonal 1. The women who used non-hormonal methods had higher BMI when compared to women using hormonal 1 and 3. In addition, coffee consumption was higher in the non-hormonal group, when compared to hormonal 2 and 3. A trend toward significance was detected in the alcohol consumption scores, which indicated higher scores in the Hormonal 1 group.

Of the 235 women studied, 80 of them had good sleep quality, whereas 155 (66%) reported poor sleep quality. The comparison of the groups indicated that the women who did not exercise had worse sleep quality (76.6%), and this finding was statistically significant ($p=0.05$). In addition, the women who did not snore (82.5%) had better sleep quality, and this finding was statistically significant ($p=0.002$) (Table 3).

The comparison of sleep quality in the women who used non-hormonal methods indicated that household income and the presence of snoring were significantly associated with sleep quality. The women who had a higher household income(3.0 times the minimum wage) had better sleep quality than the women with lower incomes (2.2 times the minimum wage). Furthermore, the women who did not report snoring experienced better sleep quality (87.1%).

Table 1. A comparison of the lifestyle and sleep characteristics between users of non-hormonal and hormonal contraceptive methods.

	Non Hormonal N=101	**Hormonal N=134**	***p* value**
Age	34.2±6.8	29.0±7.5	< 0.001
Body mass index	27.9±6.3	25.6±4.6	0.001
Number of miscarriages	0.3±0.6	0.2±0.4	0.2
Number of pregnancies	1.8±1.2	1.3±1.2	0.002
Hours of sleep/day	6.6±1.4	6.6±1.5	0.9
Sleep efficiency	94.7±17.7	90.0±15.3	0.03
Pittsburgh score	6.1±3.2	5.9±2.9	0.5
Alcohol consumption (yes)	47 (46.5%)	85 (63.4%)	0.01
Coffee consumption (yes)	83 (82.1%)	82 (62.4%)	0.01
Tobacco-smoking (yes)	12 (11.8%)	17 (12.6%)	0.5

Note: the values were presented as mean±standard deviation or N (%).

Table 2. A comparison of the anthropometric characteristics, lifestyle habits, and sleep characteristics between users of non-hormonal and hormonal contraceptive methods.

	Non Hormonal (N=101) Mean+SD or N/%	Hormonal 1 (N=24) Mean+SD or N/%	Hormonal 2 (N=7) Mean+SD or N/%	Hormonal 3 (N=103) Mean+SD or N/%	*p* value	Post hoc*
Age	34.2±6.8	27.6±7.9	32.7±7.4	29.1±7.4	0.7	
Body mass index	27.9±6.3	24.4±4.4	26.5±4.7	25.8±4.6	**0.008**	1<0;3<0
Number of birth lives	1.5±0.8	0.8±1.0	1.1±0.3	1.1±1.0	**0.002**	1<0
Number of miscarriages	0.3±0.6	0.3±0.6	0.2±0.4	0.2±0.4	0.5	
Number of pregnancies	1.8±1.2	1.0±1.3	1.4±0.5	1.3±1.2	**0.01**	1<0
Hours of sleep/night	6.6±1.3	6.1±1.8	6.1±1.3	6.7±1.4	0.3	
Sleep efficiency	94.7±17.8	84.5±21.5	86.0±13.7	91.6±13.3	**0.03**	1<0
Pittsburgh score	6.1±3.2	6.4±3.7	6.7±1.7	5.7±2.8	0.2	
Alcohol consumption (yes)	47 (46.5%)	17 (70.8%)	4 (57.1%)	64 (62.1%)	0.06	
Coffee consumption (yes)	83 (82.1%)	17 (70.8%)	3 (42.8%)	63 (61.7%)	**0.005**	2<0;3<0;
Physically active	28 (27.7%)	7 (29.1%)	1 (14.2%)	28 (27.18%)	0.8	
Snoring	35 (34.6%)	5 (20.8%)	4 (57.1%)	28 (27.1%)	0.1	
Tobacco-smoking (yes)	12 (11.8%)	4 (16.6%)	0 (0%)	13 (12.3%)	0.6	

*Bonferroni pairwise comparison or Chi square residuals; where: 0=non hormonal; 1= hormonal 1; 2= hormonal 2; 3= hormonal 3.
Hormonal 1: classified as users of combined oral contraceptives with breaks, continuous combined oral contraceptives and monthly injectable contraceptives
Hormonal 2: classified as users of quarterly injectable contraceptives
Hormonal 3: classified as users of progestin-only oral contraceptives and hormonal intrauterine devices (IUDs).

Table 3. A comparison of the anthropometric characteristics, lifestyle habits, and types of contraceptive methods between women with good and poor sleep quality.

	Good sleep quality (N=80)	Bad sleep quality (N=155)	*p* value
Age	31.5±7.5	31.2±7.9	0.8
Body mass index	26.1±5.1	26.8±5.7	0.3
Number of birth lives	1.2±0.9	1.2±0.9	0.9
Number of miscarriages	0.2±0.5	0.3±0.6	0.2
Number of pregnancies	1.5±1.1	1.5±1.2	0.8
Alcohol consumption (yes)	45 (56.2%)	87 (56.1%)	0.9
Coffee consumption (yes)	58 (72.7%)	108 (70.1%)	0.7
Physically active (yes)	28 (35.0%)	36 (23.2%)	**0.05**
Snoring (yes)	14 (17.5%)	58 (37.4%)	**0.002**
Tobacco-smoking (yes)	9 (11.2%)	20 (12.9%)	0.7
Contraceptive methods			0.4
Hormonal	49 (61.2%)	85 (54.8%)	
Non hormonal	31 (38.7%)	70 (45.1%)	

The differences in age, the number of pregnancies, the number of miscarriages, the number of living children, body mass index, physical activity, tobacco-smoking, coffee consumption, and alcohol consumption were not statistically significant (Table 4).

The comparison of sleep quality (good or bad) in the women who used hormonal contraceptive methods revealed that there were no significant differences between the women according to age, the number of pregnancies, the number of miscarriages, the number of live births, body mass index, household income, physical activity, tobacco-smoking, coffee consumption, alcohol consumption, and the presence of snoring (Table 5).

DISCUSSION

Sleep quality is closely associated with the activities of daily living. Furthermore, sleep is correlated with all physiological systems[1]. Insomnia problems affect the Brazilian population. A study revealed that insomnia is increasing through decades[2]. Sleep quality in healthy women who use different contraceptive methods has been rarely investigated because most studies have been aimed at women who are in the climacteric period or menopause.

In the comparison of the types of contraceptive methods, more than half of the population used hormonal methods (56.6%) rather than non-hormonal methods. A study conducted in 2011 of Brazilian women[13] revealed that over 80% of the

Table 4. The characteristics of the women who used non-hormonal contraceptive methods and their correlation with sleep quality.

	Good Quality	Bad Quality	*p* value
Age	34.7±6.7	34.2±7.1	0.7
Body mass index	27.8±5.6	27.9±6.6	0.9
Number of birth lives	1.6±0.9	1.4±0.8	0.3
Number of miscarriages	0.2±0.6	0.3±0.7	0.5
Number of pregnancies	1.9±1.1	1.7±1.2	0.4
Alcohol consumption (yes)	25 (80.6%)	58 (82.8%)	0.8
Coffee consumption (yes)	25 (80.6%)	58 (82.8%)	0.7
Physically active (yes)	11 (35.4%)	17 (24.2%)	0.2
Snoring (yes)	4 (12.9%)	31 (44.2%)	0.002
Tobacco-smoking (yes)	3 (9.6%)	9 (12.8%)	0.6

Note: the values were presented as mean±standard deviation or N (%).

Table 5. The characteristics of the women who used hormonal contraceptive methods and their correlation with sleep quality.

	Good quality	Bad quality	*p* value
Age	29.4±7.4	28.8±7.7	0.6
Body mass index	25.1±4.4	25.8±4.7	0.3
Number of birth lives	1.0±0.8	1.1±1.0	0.7
Number of miscarriages	0.2±0.4	0.2±0.5	0.3
Number of pregnancies	1.3±1.1	1.3±1.2	0.8
Alcohol consumption (yes)	31 (63.2%)	54 (63.5%)	0.9
Coffee consumption (yes)	33 (67.3%)	50 (59.5%)	0.3
Physically active (yes)	17 (34.6%)	19 (22.3%)	0.1
Snoring (yes)	10 (20.4%)	27 (31.7%)	0.1
Tobacco-smoking (yes)	6 (12.2%)	11 (12.9%)	0.9

Note: the values were presented as mean±standard deviation or N (%).

women used hormonal contraceptive methods. This difference may be explained by the different locations where the studies were performed because the 2011 study was conducted in private practices and health plan-affiliated offices, whereas this study was conducted at a family planning clinic of a public university. The women in this study were allowed to choose a contraceptive method from a variety of methods after educational guidance and a clinical evaluation by multi-professional staff.

The number of pregnancies was significantly lower (*p*=0.002) in the users of hormonal contraceptive methods. This finding may be due to the high efficacy of hormonal contraceptives[13].

This study revealed that alcohol consumption was higher in the women who used hormonal contraceptive methods, whereas coffee consumption was higher in the women who used non-hormonal methods. No data are available in the literature for a comparison.

The BMI values of the women who used hormonal contraceptive methods were lower than those of non-hormonal contraceptive users. Interestingly, one of the reasons for the discontinuation of hormonal contraceptive methods, especially combined oral methods, is weight gain[13].

No significant differences were observed in the sleep quality between the two groups; however, sleep efficiency was higher in the users of non-hormonal contraceptive methods. This finding is in contrast to the finding of a previous study[9]

that women who used hormonal methods experienced better sleep quality. This divergence may be due to the different study populations. In that study, the women had already been diagnosed with sleep disorders and were seeking medical care for the disorder.

Additionally, in this study, sleep was subjectively assessed using an individual questionnaire; an objective method, such as polysomnography, was not used to evaluate sleep, which may be a limitation of this study. Another divergence is that the women with irregular menstrual cycles in this study were twice as likely to have difficulty sleeping. In this study, the women who reported having altered or irregular menstrual cycles experienced worse sleep quality than the women with normal menstrual cycles. However, this finding was not statistically significant, which suggests that menstrual irregularity may be an important factor in women who have sleep disorders. In a healthy population, this hormonal factor may not influence sleep quality.

To determine the relationship between sleep quality and contraception, the patients were distributed into users of non-hormonal contraceptive methods and hormonal methods, such as oral combined contraceptives, monthly injectable contraceptives, continuous oral hormonal contraceptives, quarterly injectable contraceptives, progestin hormones, and IUDs. The BMI values were similar between the users of the different types of hormonal methods. Regarding sleep efficiency, a worse index was found among the women who used combined oral

contraceptives, monthly injectable contraceptives, and continuous oral contraceptives than among the women who used other hormonal and non-hormonal methods.

Although hormonal contraceptives are largely used among the modern society women little is known about the effects of these drugs on sleep. Previously we hypothesized that the use of hormonal contraceptives, mainly those based on progestagens could be a new therapeutic element for the treatment of insomnia[14]. However, no clinical trials were done to test it. In our present study we did not observe difference in sleep when different types of contraceptives were used. In a recent cross sectional pilot study sleep was evaluated in users of different types of contraceptives and controls. They observed that users of progestogen-only oral contraception present the longest sleep time compared to controls. They also concluded that global subjective sleep was influenced by vaginal route (administration of etonorgestrel/ethinylestradiol[15].

The analysis of the significant differences between good and poor sleep quality indicated that the women who did not exercise had poorer sleep quality. Physical activity is a non-pharmacological therapy that has been suggested to improve sleep quality[16]. Another study suggested that sleep influences next day exercise rather than exercise influencing sleep[17]. Furthermore, this study demonstrated that snoring was a factor that impacted sleep quality, and 82.5% of the patients who did not snore experienced better sleep quality. Snoring may be a sign of sleep apnea or may depend on the sleeping position[18]. One possible repercussion of apnea is poor sleep quality. A study that compared snorers with and without sleep apnea revealed that the apnea patients had worse quality of life, and this finding may be attributed to excessive daytime sleepiness[19].

To understand the factors that interfere with sleep quality, the women who used hormonal and non-hormonal contraceptive methods were studied separately. Regarding the women who used non-hormonal methods, household income significantly interfered with sleep quality, and the women of a higher socioeconomic level reported better sleep quality. Another influential factor was the presence of snoring, which impairs sleep quality. The differences in the variables were not statistically significant for the women who used hormonal methods.

This study on contraception and sleep quality demonstrated that the women worked outside the home and that the majority of women had completed a secondary education. The women slept an average of 6.6 hours per night and considered their sleep efficient.

The women who used non-hormonal methods were older, had more children, drank more coffee, had a higher BMI, and had higher sleep efficiency. However, the women with irregular menstrual cycles reported worse sleep quality. The women who used hormonal methods were younger and consumed more alcohol. The absence of routine physical activity negatively influenced sleep quality. The women who snored had worse sleep quality. Approximately half of the studied population were users of hormonal contraception, and most of the population had poor sleep quality. There were no differences in sleep quality based on the contraceptive method used; however, sleep efficiency was better among the users of non-hormonal contraceptives.

A limitation of the present investigation is that it was based on a transverse section of the population and the women were not previously selected according to sleep complaints. Another limitation was that we did not do polysomnography of the participants. That is to say that we only have subjective data of the sleep pattern in this study. New prospective studies should be performed with standardized dosing of contraceptives so that more reliable conclusions may be drawn regarding the effects of contraceptives on sleep patterns specially randomized controlled trials.

CONCLUSION

The use of hormonal contraceptives has increased significantly in recent years; moreover, the prevalence of sleep disturbances has increased exponentially, especially in women. So the effects of hormonal contraceptive use on sleep patterns warrant further investigation. The results of the present study are different from previous findings that showed an improvement in several parameters of sleep quality among women using hormonal contraceptives. We found no differences in subgroups (hormonal contraceptive users). Future studies evaluating sleep quality and duration with PSG using controlled placebo protocols among women with and without sleep complaints may provide additional evidence of the positive effects of hormonal contraceptives on sleep patterns.

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