Article

Influence of Pelvic Floor Disorders on Sleep Quality in Women

Rocío Adriana Peinado-Molina [1], Sergio Martínez-Vázquez [1], Antonio Hernández-Martínez [2]
and Juan Miguel Martínez-Galiano [1,3,*]

1   Department of Nursing, University of Jaen, 23071 Jaen, Spain; rpmolina@ujaen.es (R.A.P.-M.);
    svazquez@ujaen.es (S.M.-V.)
2   Department of Nursing, Physiotherapy and Occupational Therapy, University of Castilla-La Mancha,
    13071 Ciudad Real, Spain; antonio.hmartinez@uclm.es
3   Consortium for Biomedical Research in Epidemiology and Public Health (CIBERESP), 28029 Madrid, Spain
*   Correspondence: jgaliano@ujaen.es

Abstract: Pelvic floor disorders, the impact of their symptoms, and their association with sleep quality and sleep disorders is a little studied area. The aim of this study was to determine if an association exists between pelvic floor disorders in women and sleep disorders. An observational study was conducted among women in Spain during 2021 and 2022. A self-developed questionnaire was used to collect sociodemographic and employment data, previous medical history and health status, lifestyle and habits, obstetric history, and health problems. A validated questionnaire, the Pittsburgh Sleep Quality Index (PSQI), was used to assess the quality of sleep. The presence and impact of pelvic floor problems was assessed with the Pelvic Floor Distress Inventory (PFDI-20). Odds ratios (OR) and adjusted odds ratios (aOR) with their respective 95% confidence intervals were calculated using logistic regression. A total of 1396 women participated in the study. The total PSQI indicated that 75.36% (1052) of women have altered general sleep quality. Women with pelvic floor disorders have a higher probability of developing sleep alterations (aOR: 1.32; 95% CI: 1.22–1.42; for every 20 points). A high BMI (aOR: 1.04; 95% CI: 1.01–1.07; for each point) and the presence of musculoskeletal disorders (aOR: 3.14; 95% CI: 1.20–8.27) are also associated with sleep quality in women. Women with pelvic floor disorders are more likely to develop sleep disorders, probably due to all the discomfort they entail.

Keywords: pelvic floor dysfunction; sleep quality; women's health

1. Introduction

Sleep is an active physiological and complex process; its variability in terms of quality and duration has cultural, social, environmental, psychological, behavioral, and pathophysiological influences [1]. Moreover, sleeping is an activity inherent to human nature and has a significant effect on maintaining physical and mental health and a good quality of life [2,3].

Insomnia is a public health problem, affecting up to a third of the population in the USA [4,5] and approximately one-tenth of the Korean population [6]. Only 27–52% of people suffering from insomnia consult with a specialist [7,8]. Recent studies report that sleep disorders are more frequent among women, finding a prevalence of up to 45.5% of women with sleep problems lasting at least one year [3,9,10].

Sleep alterations and sleep disorders have a negative influence on health and weaken the immune system, with direct implications for the risk of infectious and inflammatory diseases [11], as well as causing a greater probability of chronic health conditions, such as diabetes, hypertension, increased cardiovascular risk, cancer, and emotional stress; and psychological problems such as depression and anxiety, substance abuse, and suicidal thoughts, among others [1,12–15].

Among the risk factors, being a woman has been associated with a greater probability of developing sleep disorders and having worse sleep quality. Additionally, different studies have identified other factors, such as some musculoskeletal issues, osteoporosis, fractures, back problems [16], psychiatric problems such as depression and anxiety [17], and pelvic floor disorders and the impact of their symptoms [18–23].

Pelvic floor dysfunction in women encompasses a wide range of clinical disorders: urinary incontinence, pelvic organ prolapse, fecal incontinence, and pelvic–perineal region pain syndrome [24–26]. The prevalence of these disorders ranges between 1.9% and 46.50% according to the type of dysfunction and the study population. Moreover, it is a globally relevant problem and is poorly diagnosed [24–26].

Studies that have investigated the relationship between pelvic floor disorders and sleep are scarce [18–23,27–29]. Therefore, this investigation recommends that more studies should be carried out in this area, as not all disorders are addressed. Considering the above, and due to the high prevalence of the problem and the repercussions on the women experiencing them, we aimed to study the association between the different pelvic floor disorders that women may develop and the presence of sexual dysfunctions.

2. Methods

2.1. Design and Subject Selection

An observational study was carried out among women in Spain during 2021 and 2022. Exclusion criteria included women under 18 years of age, women who had difficulty understanding Spanish, women who had given birth within the previous 12 months, women who were pregnant, and women who had mental health or cognitive disorders that could affect data collection.

Given the lack of previous studies from which the prevalence of sleep alterations could be extracted as a function of pelvic floor dysfunction, we opted to determine the power of contrasts. Thus, accepting an alpha risk of 0.05 in a two-way contrast, with 344 subjects in the group of women without sleep alteration and 1052 in the group of women with sleep alteration, the power of the hypothesis contrast was 100%. To be defined as statistically significant, the difference between the average in the group without sleep alteration must be 32.96 points, and 59.19 points in the group with sleep alteration, according to the Pelvic Floor Distress Inventory scale (PFDI-20) (Pooled Standard Deviation: 49.32).

2.2. Information Sources and Study Variables

Participants were recruited extensively by publicly disseminating the research in centers where women engaged in various activities, women's associations, and neighborhood associations. Additionally, participants from social and educational groups and workshops at healthcare centers were considered. Furthermore, information was spread among the nurse's patient roster through healthcare centers, encompassing elderly care facilities and day centers, among others. Initially, after recruitment and obtaining informed consent from the women, trained observers conducted the interviews consecutively to obtain data.

Sociodemographic data, work data, personal history, health status, lifestyle and habits, obstetric history, physical activity (International Physical Activity Questionnaire, IPAQ), and health problems were collected using a tailor-made questionnaire, which had been previously piloted. In addition, to assess the quality of sleep, the validated Pittsburgh Sleep Quality Index (PSQI) [30] was used, which consists of 19 self-assessed questions. Based on these questions, seven components were elaborated on, which evaluated different aspects of sleep quality: subjective sleep quality, sleep latency, sleep time, total sleep efficiency, sleep disorders, consumption of hypnotic drugs, and daytime dysfunction. Each aspect had a score that ranged between 0 (no problem) and 3 points (severe problem). Finally, to determine the scale's total score, the scores of these components are added together, resulting in a minimum score of 0 points and a maximum of 21 points. Participants with a total score of 0 to 4 are considered to have good sleep quality, and scores equal to or greater than 5 are interpreted as poor sleep quality [31].

To assess the presence of pelvic floor problems, the Pelvic Floor Distress Inventory (PFDI-20) was used [32]. The PFDI-20 includes 20 items divided into three symptom scales: symptoms of pelvic organ prolapse (POPDI-6) (questions 1 to 6); colorectal-anal symptoms (CRADI-8) (questions 7–14); and urinary symptoms (UDI-6) (questions 15–20). The UDI-6 subscale contains six items that evaluate urinary symptoms with a maximum score of 100 points, the CRADI-8 subscale evaluates colorectal symptoms with a score of 100 points, and the POPDI-6 subscale contains six items that evaluate prolapse symptoms with a maximum score of 100 points. The PFDI-20 has a total score of 300 points, a higher score indicates a greater burden of symptoms. To establish if a woman has suffered prolapse, an affirmative response was needed for question 3 of the PFDI-20; for fecal incontinence, question 9 or 10 of the PFDI-20; for urinary incontinence, questions 16, 17, or 18 of the PFDI-20; and for pelvic pain, question 20 of the PFDI-20.

2.3. Statistical Analysis

The statistical program used for the analysis of the information was SPSS 28.0.

First, descriptive statistics were carried out using absolute and relative frequencies for categorical variables and means with standard deviation (SD) for continuous variables.

Next, a bivariate analysis was performed between the presence of pelvic floor disorders and sleep quality. For this purpose, the Pearson Chi-Square test was used, and the odds ratio (OR) and their respective 95% confidence intervals were calculated.

Finally, a bivariable and multivariable analysis was performed between the different factors and the presence of sleep disorders by means of logistic regression. Crude odds ratios (OR) and adjusted odds ratios (aOR) were estimated for the following factors: age, BMI, alcohol consumption, smoking habit, number of pregnancies, vaginal births, miscarriages, cesarean sections, menopausal status, instrumental birth, perineal trauma (episiotomy and tears), physical activity, and associated pathologies. The level of statistical significance was considered as $p < 0.05$.

2.4. Ethical Considerations

This study received a favorable opinion from the Research Ethics Committee of the province of Jaen, reference number SPCV-0220/0302-N-20. Before starting the questionnaire, the women had to read an information sheet about the study and its objectives and confirm their consent to participate.

3. Results

A total of 1396 women participated in the study, with a mean age of 44.40 years (SD = 14.70) and a mean BMI of 25.03 (SD = 4.77). In all, 57.4% (802) of the sample were married, and 35% (488) had a median income level of EUR 1000–1999. A total of 14.3% (200) of the women smoked and 54.4% (759) drank occasionally.

Regarding personal and obstetric history, 29% (405) were in post menopause, 33.4% (466) of women had a disease diagnosis, of which 6.6% (92) were musculoskeletal pathologies, 2.7% (37) were respiratory, and 1.8% (25) related to mental health. A total of 78.3% (1093) had been pregnant previously. Regarding the type of delivery, 67.2% (917) had experienced a vaginal birth, and 26.3% (397) an instrumental one. (Table 1).

Table 2 shows the distribution of responses regarding sleep quality according to the Pittsburgh Questionnaire (PSQI), as well as the variables that assess the variety of disorders that affect sleep quality. Notably, 32.2% (n = 450) evaluated their sleep quality as "quite bad". In addition, 45.2% (631) women slept between 5 and 6 h, and 32.2% (450) women used some type of hypnotic medication once or twice a week. In general, the total PSQI showed that 75.36% (1052) of the women who participated presented an alteration in the quality of sleep at a global level.

Table 1. Sociodemographic and clinical characteristics of the study sample.

Variable	n (%)	Mean (SD)
Age		44.40 (14.70)
<30 years	212 (15.4)	
30–49.9 years	768 (55.0)	
≥50 years	416 (29.8)	
BMI		25.03 (4.77)
Normal weight < 25	797 (57.1)	
Overweight 25–29.9	395 (28.3)	
Obesity ≥ 30	204 (14.6)	
Civil status		
Single	317 (22.7)	
Separated	18 (1.3)	
Divorced	72 (5.2)	
Widowed	65 (4.7)	
Common-law couple	122 (8.7)	
Married	802 (57.4)	
Education level		
Primary level, uncompleted	69 (4.9)	
Primary level, completed	90 (6.4)	
Secondary level	92 (6.6)	
Baccalaureate	177 (12.7)	
University level	968 (69.3)	
Income level		
EUR < 1000	192 (13.8)	
EUR 1000–1999	488 (35.0)	
EUR 2000–2999	415 (29.7)	
EUR > 3000	301 (21.6)	
Alcohol consumption		
Never	341 (24.4)	
Occasionally	759 (54.4)	
Only weekends	138 (9.9)	
Frequently	135 (9.7)	
Daily	23 (1.6)	
Smoking habit	200 (14.3)	
Pregnancy		
None	303 (21.7)	
One	183 (13.1)	
Two or more	910 (65.2)	
Miscarriages		
None	1012 (72.5)	
One	277 (19.8)	
Two or more	107 (7.7)	
Cesarean section		
None	1142 (81.8)	
One	183 (13.1)	
Two or more	71 (5.1)	
Vaginal birth		
None	455 (32.6)	
One	278 (19.9)	
Two or more	663 (47.5)	
Instrumental birth	397 (26.3)	
Menopausal status	405 (29.0)	
Urinary incontinence	779 (55.8)	
Fecal incontinence	149 (10.7)	
Prolapse	199 (14.3)	
Pelvic pain	266 (19.1)	
Illness	466 (33.4)	
Cardiovascular disorder	120 (8.6)	
Respiratory disorder	37 (2.7)	
Endocrine disorder	146 (10.5)	

Table 1. *Cont.*

Variable	n (%)	Mean (SD)
Gynecological disorder	40 (2.9)	
Musculoskeletal disorder	92 (6.6)	
Neurological disorder	34 (2.4)	
Neoplastic disease	11 (0.8)	
Gastrointestinal disorder	41 (2.9)	
Dermatological disorder	22 (1.6)	
Mental health disorder	25 (1.8)	
Nephro-urological disorder	10 (0.7)	
Immunological disorder	10 (0.7)	
Ophthalmology-ENT disorder	23 (1.6)	

Table 2. Response distribution for sleep quality.

Variable		Evaluation According to the Pittsburgh Questionnaire (PSQI)			
		Very Good **% (n)**	**Quite Good** **% (n)**	**Poor** **% (n)**	**Very Poor** **% (n)**
1.	**Subjective sleep quality**	10.7 (150)	53.6 (748)	32.2 (450)	3.4 (48)
		≤15 min **% (n)**	**16–30 min** **% (n)**	**31–60 min** **% (n)**	**60 min** **% (n)**
2.	**Sleep latency**	22.3 (311)	38.8 (541)	22.3 (311)	16.7 (233)
		More than 7 h % (n)	**Between 6 and 7 h** **% (n)**	**Between 5 and 6 h** **% (n)**	**Less than 5 h % (n)**
3.	**Sleep duration**	17.8 (249)	29.5 (412)	45.2 (631)	7.4 (104)
		>85% **% (n)**	**75–84%** **% (n)**	**65–74%** **% (n)**	**<65%** **% (n)**
4.	**Sleep habit efficiency**	42.4 (592)	23.8 (332)	16.0 (224)	17.8 (248)
		Never in the last month **% (n)**	**Less than once a week** **% (n)**	**One or two times a** **week % (n)**	**Three or more times a** **week % (n)**
5.	**Sleep disturbances**	6.2 (86)	75.6 (1056)	17.6 (245)	0.6 (9)
6.	**Use of sedative-hypnotics**	10.7 (150)	53.6 (748)	32.2 (450)	3.4 (48)
7.	**Daytime dysfunction**	35.1 (490)	38.9 (543)	21.6 (302)	4.4 (61)

Next, as shown in Table 3, the relationship between pelvic floor disorders and sleep disorders was studied, with a statistically significant association observed in all cases ($p < 0.05$). Specifically, women who had a urinary incontinence OR of 1.83 (95% 1.44–2.35), a fecal incontinence OR of 2.13 (95% CI: 1.32–3.44), a pelvic pain OR of 3.45 (95% CI: 2.27–5.25), or a prolapse OR of 1.77 (95% CI: 1.19–2.62) presented a higher probability of sleep disturbances than those who did not have these dysfunctions. In addition, the relationship between the impact of symptoms and the presence of sleep disturbances was analyzed, with statistical associations observed with the four scales ($p < 0.05$). Overall, women with sleep disorders presented an average of 26.33 points (95% CI: 21.65–31.01) more in the impact of pelvic floor symptoms (PFDI-20) than those who did not have sleep disorders.

Finally, a multivariable analysis was carried out, as shown in Table 4. An elevated BMI was identified as a risk factor for having sleep disorders, with an aOR of 1.04 (95% CI: 1.01–1.07). Furthermore, the results indicated that women with musculoskeletal conditions, relative to other conditions, were more likely to have sleep disturbances with an aOR of 3.14 (95% CI: 1.20–8.27). In addition, a greater impact of the symptoms of pelvic floor problems, as assessed by the PFDI-20 scale, increased the probability of having worse sleep quality with an aOR of 1.32 (95% CI: 1.22–1.42; for every 20 points).

Table 3. Bivariate analysis of pelvic floor problems and sleep quality.

	Dichotomy of Sleep Quality		Bivariate Analysis	
	No Alteration **% (n)** **n = 344**	**With Alteration** **% (n)** **n = 1052**	**OR (95% CI)**	**_p_ Value**
Urinary incontinence				**<0.001**
No	31 (191)	69 (426)	1	
Yes	19.6 (153)	80.4 (626)	**1.83 (1.44–2.35)**	
Fecal incontinence				**0.002**
No	25.9 (323)	74.1 (924)	1	
Yes	14.1 (21)	85.9 (128)	**2.13 (1.32–3.44)**	
Pelvic pain				**<0.001**
No	28.1 (317)	71.9 (813)	1	
Yes	10.2 (27)	89.8 (239)	**3.45 (2.27–5.25)**	
Prolapse				**0.004**
No	26 (311)	74 (886)	1	
Yes	16.6 (33)	83.4 (166)	**1.77 (1.19–2.62)**	
Score impact of pelvic floor problems	**No** **Mean (SD)**	**Yes** **Mean (SD)**	**Mean difference** **(95% CI)**	**_p_**
Prolapse symptoms	8.82 (11.56)	16.40 (17.73)	**7.59 (5.57–9.58)**	**<0.001**
Colorectal-Anal symptoms	10.27 (12.45)	17.73 (17.88)	**7.47 (5.75–9.17)**	**<0.001**
Urinary symptoms	13.77 (15.59)	25.06 (24.30)	**11.29 (9.08–13.49)**	**<0.001**
Pelvic function disorders Total (PFDI-20)	32.86 (32.73)	59.19 (52.04)	**26.33 (21.65–31.01)**	**<0.001**

Table 4. Bivariate and multivariate analysis sleep quality and associated factors.

	Dichotomy of Sleep Quality		Bivariate Analysis		Multivariate Analysis	
Pelvic Floor Problems	**No Alteration** **n = 344**	**With Alteration** **n = 1052**	**Odds Ratio (95% CI)**	**_p_ Value**	**Odds Ratio *** **(95% CI)**	**_p_ Value**
Age n (%)				0.120		0.131
<30 years	52 (24.5)	160 (75.5)	1		1	
30–49.9 years	204 (26.6)	564 (73.4)	0.90 (0.63–1.28)	0.551	0.60 (0.36–1.01)	0.057
≥50 years	88 (21.2)	328 (78.8)	1.21 (0.82, 1.79)	0.337	0.74 (0.35–1.60)	0.448
BMI (mean; SD)	24.11 (4.47)	25.34 (4.82)	**1.06 (1.03–1.09)**	**<0.001**	**1.04 (1.01–1.07)**	**0.028**
Alcohol consumption n (%)				0.450		0.917
Never	21.1 (72)	78.9 (269)	1		1	
Occasionally	25.8 (196)	74.2 (563)	0.77 (0.57–1.04)	0.093	0.94 (0.67–1.31)	0.703
Only weekends	26.8 (37)	73.2 (101)	0.73 (0.46–1.16)	0.179	0.97 (0.59–1.58)	0.890
Frequently	23.7 (32)	76.3 (103)	0.86 (0.54–1.38)	0.538	1.06 (0.64–1.76)	0.812
Daily	30.4 (7)	69.6 (16)	0.61 (0.24–1.54)	0.298	0.66 (0.24–1.82)	0.427
Smoking habit n (%)				0.510		0.698
No	24.3 (291)	75.7 (905)	1		1	
Yes	26.5 (53)	73.5 (147)	0.89 (0.63–1.25)		0.93 (0.65–1.34)	
Pregnancy n (%)				0.260		0.847
None	27.7 (84)	72.3 (219)	1		1	
One	39 (21.3)	78.7 (144)	1.42 (0.92–2.19)		1.12 (0.53–2.34)	0.765
Two or more	24.3 (221)	75.7 (689)	1.20 (0.90–1.61)		0.96 (0.38–2.41)	0.924
Miscarriages n (%)				0.648		0.937
None	25.3 (256)	74.7 (756)	1		1	
One	23.1 (64)	76.9 (213)	1.13 (0.82–1.54)	0.455	1.04 (0.72–1.49)	0.841
Two or more	22.4 (24)	77.6 (83)	1.17 (0.73–1.89)	0.515	1.10 (0.64–1.89)	0.734
Cesarean section n (%)				**0.043**		0.163
None	26 (297)	74 (845)	**1**		1	
One	18.6 (34)	81.4 (149)	**1.54 (1.04–2.29)**		1.70 (0.98–2.92)	0.059
Two or more	18.3 (13)	81.7 (58)	1.57 (0.85–2.90)		1.78 (0.67–4.74)	0.247
Vaginal birth n (%)				0.200		0.629
None	25.5 (116)	74.5 (339)	1		1	
One	20.5 (57)	79.5 (221)	1.33 (0.93–1.90)		1.36 (0.67–2.73)	0.395
Two or more	25.8 (171)	74.2 (492)	0.99 (0.75–1.30)		1.21 (0.51–2.89)	0.668
Instrumental birth n (%)				**0.014**		0.053
No	26.3 (271)	73.7 (758)	1		1	
Yes	19.9 (73)	80.1 (294)	**1.44 (1.08–1.93)**		1.42 (0.00–2.02)	

Table 4. *Cont.*

Pelvic Floor Problems	Dichotomy of Sleep Quality		Bivariate Analysis		Multivariate Analysis	
	No Alteration n = 344	With Alteration n = 1052	Odds Ratio (95% CI)	*p* Value	Odds Ratio * (95% CI)	*p* Value
Menopausal status n (%)				0.139		0.449
No	25.7 (255)	74.3 (736)	1		1	
Yes	22 (89)	78 (316)	1.23 (0.93–1.62)		0.80 (0.45–1.42)	
Episiotomy n (%)				0.914		0.122
No	24.8 (181)	75.2 (550)	1		1	
Yes	24.5 (163)	75.5 (502)	1.01 (0.79–1.29)		0.74 (0.50–1.09)	
Tear n (%)				0.330		0.892
No	25.5 (222)	74.5 (648)	1		1	
Yes	23.2 (122)	76.8 (404)	1.13 (0.88–1.46)		1.02 (0.74–1.42)	
Physical activity (IPAQ) n (%)				**0.054**		0.519
Low	71 (19.9)	285 (80.1)	1		1	
Medium	197 (26.6)	543 (73.4)	**0.69 (0.51–0.93)**	**0.016**	0.83 (0.60–1.15)	0.256
High	76 (25.3)	224 (74.7)	0.74 (0.51–1.06)	0.100	0.90 (0.61–1.33)	0.581
Cardiovascular disorder n (%)				**0.001**		0.565
No	25.8 (329)	74.2 (947)	1		1	
Yes	12.5 (15)	87.5 (105)	**2.43 (1.40–4.24)**		1.21 (0.64–2.28)	
Pulmonary disorder n (%)				0.230		0.701
No	24.9 (338)	75.1 (1021)	1		1	
Yes	16.2 (6)	83.8 (31)	1.71 (0.71–4.14)		1.20 (0.46–3.02)	
Endocrine disorder n (%)				0.225		0.937
No	25.1 (314)	74.9 (936)	1		1	
Yes	20.5 (30)	79.5 (116)	1.30 (0.85–1.98)		0.94 (0.59–1.48)	
Gynecological disorder n (%)				0.151		0.380
No	24.9 (338)	75.1 (1018)	1		1	
Yes	15 (6)	85 (34)	1.88 (0.78–4.52)		1.52 (0.60–3.86)	
Musculoskeletal Disorder n (%)				**<0.001**		**0.019**
No	26.0 (339)	74.0 (965)	**1**		**1**	
Yes	5.4 (5)	94.6 (87)	**6.11 (2.46–15.18)**		**3.14 (1.20–8.27)**	
Neurological disorder n (%)				0.078		0.543
No	25.0 (340)	75.0 (1022)	1		1	
Yes	11.8 (4)	88.2 (30)	2.50 (0.87–7.13)		1.44 (0.45–4.60)	
Mental health disease n (%)				0.839		0.343
No	341 (24.6)	75.4 (1044)	1		1	
Yes	3 (27.3)	72.7 (8)	0.87 (0.23–3.30)		0548 (0.10–2.17)	
Gastrointestinal disorder n (%)				**0.009**		0.152
No	25.2 (341)	74.8 (1014)	**1**		1	
Yes	7.3 (3)	92.7 (38)	**4.30 (1.31–13.89)**		2.46 (0.72–8.39)	
Dermatological disorder n (%)				0.478		0.474
No	24.7 (340)	75.3 (1034)	1		1	
Yes	18.2 (4)	81.8 (18)	1.48 (0.50–4.40)		1.5 (0.44–4.41)	
Mental health Disorder n (%)				**0.016**		0.225
No	25 (343)	75 (1028)	**1**		1	
Yes	4 (1)	96 (24)	**8.01 (1.08–59.41)**		3.59 (0.46–28.29)	
Nephro-urological Disorder n (%)				0.281		0.837
No	24.7 (343)	75.3 (1043)	1		1	
Yes	10.0 (1)	90.0 (9)	2.96 (0.37–23.45)		0.79 (0.09–7.35)	
Immunological disorder n (%)				0.732		0.902
No	24.7 (342)	75.3 (1044)	1		1	
Yes	20.0 (2)	80 (8)	1.31 (0.28–6.20)		1.11 (0.22–5.67)	
PFDI-20 questionnaire (for every 20 points) (Mean; SD)	32.86 (32.73)	59.19 (52.04)	**1.35 (1.26–1.45)**	**<0.001**	**1.32 (1.22–1.42)**	**<0.001**

* Adjusted odds ratios (aOR) for the following factors: age, BMI, alcohol consumption, smoking habit, number of pregnancies, vaginal births, miscarriages, cesarean sections, menopausal status, instrumental birth, perineal trauma (episiotomy and tears), physical activity, and associated pathologies.

4. Discussion

Pelvic floor disorders and the impact of their symptoms influence the quality of women's sleep. Other factors associated with sleep disturbances include BMI and musculoskeletal pathologies.

For the strengths of this study, it should be noted that the study's sample size is large and, as a novel aspect, included all pelvic floor disorders, which had not previously been included jointly by other authors. On the other hand, for its limitations, the influence of

possible selection and memory biases was controlled a priori by using a previously piloted questionnaire that had been prepared in a level of language that was easy to read and understand. To avoid confounding bias, all the variables that could influence the obtained results, such as menopausal status, BMI, age, medical history, among others, were included in the multivariate analysis. Finally, although a clinical evaluation of the women was not carried out through clinical diagnostic means, the instruments used to detect pelvic floor disorders and sleep disorders were questionnaires [30,32], validated in a population similar to ours, and are internationally accepted as instruments to detect possible pelvic floor problems [33–37].

Regarding sleep quality, the results obtained in our study show a high prevalence of sleep alterations, with 75.36% of the participants reporting poor sleep quality. The high prevalence of sleep alterations may be due to the low existing cut-off point. In fact, our results are higher than those identified in other studies [6,38–40]. In a cross-sectional descriptive study carried out in Spain [39] with 2144 participants (1173 women and 971 men) with ages ranging from 43 to 71 years, 44.6% of women had poor sleep quality vs. 75.36% in our study, a difference of 30 percentage points. In a cross-sectional descriptive study also carried out in a region of Spain (Community of Madrid), with a sample of 240 participants (165 women and 75 men), the prevalence (40%) was also lower than that obtained in our results [38]. In a cross-sectional descriptive study carried out in 11 Latin American countries [40] in which 6079 women participated, using the same sleep quality identification method and instrument, 46.2% of the participants were detected to have poor sleep quality, a prevalence lower than ours. In another cross-sectional study conducted on a Korean population [6] with 2695 participants between the ages of 19 and 69, including 1350 women, the global prevalence of insomnia symptoms was 10.7%, well below that found in our study.

Our results did not detect an association between age and sleep disturbances, as found in other studies [41–44] However, it is important to highlight that the distribution of sleep disorders between age groups varies. Thus, in line with the literature, it was mainly found that the older the age, the higher the probability of having worse sleep quality. For example, in a multicenter cohort study [45] conducted in Chicago surveying 814 men and women, age was associated with poor sleep quality. On the other hand, Uhlig et al. [46], opposite to our results, found sleep alterations in those over 50 years of age in their cross-sectional descriptive study carried out in Norway with 93,860 participants older than 20 years (22,728 women).

BMI, in line with our results, has been related to sleep quality in a recent cross-sectional study conducted in South Korea in 2016 [47] with 1165 participants (737 men and 428 women) aged between 19 and 64 years; the study identified that a high BMI was associated with poor sleep quality. Other authors also found this association [21,46].

On the other hand, different authors [20,48] have established an association between menopausal state and insomnia and poorer sleep quality, which could not be documented in our results.

Mental health is a factor that influences the sleep of women [49], an association not observed in our results. However, an association between musculoskeletal pathologies and sleep disturbances was observed in our study, in agreement with that observed in other studies [46,50].

Finally, in line with some researchers [18–23,27–29], pelvic floor disorders were found to influence sleep quality. Specifically, regarding urinary incontinence, the authors Yilmaz Bulut and Altay and Winkelman et al. found an association in cross-sectional studies with 140 women carried out in Turkey and with 640 women carried out in San Francisco, respectively [22,23]. Concerning uterine prolapse, Humalajärvi et al., in their prospective study [19] in Finland involving 322 women, found that the women who had prolapse scored significantly worse in the sleep dimensions. Regarding pelvic pain, and in line with our results, in a case-control study conducted in Turkey [29] with 157 women using the same sleep quality scale as used in the present study, it was observed that women

with chronic pelvic pain had poorer sleep quality, an association also shown by other authors [28]. Luo Y et al. [27] in a multicenter cross-sectional study carried out in China with 1250 participants, observed that sleep disorders were related to double incontinence, that is, urinary and fecal; however, this association was not found when the woman only suffered from fecal incontinence, contrary to the results found in our investigation.

Each stage in a woman's life increases the risk of suffering from sleep disorders and requires different management strategies that must be implemented considering the circumstances of each moment and state in which the woman finds herself. The results show that women at any age are one of the most vulnerable groups to suffer from the public health problem of sleep disorders. Efforts are currently being made to mitigate many of the risk factors associated with sleep disturbances. For this reason, strategies must be applied that pay attention to new factors that influence sleep quality and disorders, such as pelvic floor disorders, both in preventing their appearance and in addressing them once they are already present. There is growing concern in public health regarding the importance of sleep. This phenomenon has increased due to social demand for strategies aimed at improving sleep quality in the population. However, there is no standardized consensus on how to apply these strategies.

5. Conclusions

In conclusion, women with pelvic floor disorders have a higher probability of developing sleep alterations. A high BMI and musculoskeletal disorders also negatively influence the quality of sleep.

Author Contributions: Conceptualization, J.M.M.-G., R.A.P.-M., S.M.-V. and A.H.-M.; Data curation, J.M.M.-G., R.A.P.-M. and S.M.-V.; Formal analysis, A.H.-M.; Investigation, J.M.M.-G., R.A.P.-M., S.M.-V. and A.H.-M.; Methodology, A.H.-M. and J.M.M.-G.; Project administration, J.M.M.-G.; Supervision, J.M.M.-G.; Writing—review and editing, R.A.P.-M., S.M.-V., J.M.M.-G. and A.H.-M. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: We followed the protocols established to carry out this type of research with the purpose of publication/disclosure to the scientific community. The study was conducted according set in the Declaration of Helsinki. The study received a favorable opinion from the Research Ethics Committee of the province of Jaen, reference number SPCV-0220/0302-N-20.

Informed Consent Statement: Before starting the questionnaire, the women had to read an information sheet about the study and its objectives and confirm their consent to participate.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare that they have no conflicts of interests.

References

1. Kwok, C.S.; Kontopantelis, E.; Kuligowski, G.; Gray, M.; Muhyaldeen, A.; Gale, C.P.; Peat, G.M.; Cleator, J.; Chew-Graham, C.; Loke, Y.K.; et al. Self-Reported Sleep Duration and Quality and Cardiovascular Disease and Mortality: A Dose-Response Meta-Analysis. *J. Am. Heart Assoc.* **2018**, *7*, e008552. [CrossRef]
2. Ghetti, C.; Lee, M.; Oliphant, S.; Okun, M.; Lowder, J.L. Sleep quality in women seeking care for pelvic organ prolapse. *Maturitas* **2015**, *80*, 155–161. [CrossRef]
3. Merino-Andreu, M.; Alvarez-Ruiz de Larrinaga, A.; Madrid-Perez, J.A.; Martinez-Martinez, M.A.; Puertas-Cuesta, F.J.; Asencio-Guerra, A.J.; Romero Santo-Tomas, O.; Jurado-Luque, M.J.; Segarra-Isern, F.J.; Canet-Sanz, T.; et al. Healthy sleep: Evidence and guidelines for action. Official document of the Spanish Sleep Society. *Rev. Neurol.* **2016**, *63*, 1. [PubMed]
4. Bollu, P.C.; Kaur, H. Sleep Medicine: Insomnia and Sleep. *Mo. Med.* **2019**, *116*, 68–75.

5. Olfson, M.; Wall, M.; Liu, S.-M.; Morin, C.M.; Blanco, C. Insomnia and Impaired Quality of Life in the United States. *J. Clin. Psychiatry* **2018**, *79*, 17m12020. [CrossRef] [PubMed]

6. La, Y.K.; Choi, Y.H.; Chu, M.K.; Nam, J.M.; Choi, Y.-C.; Kim, W.-J. Gender differences influence over insomnia in Korean population: A cross-sectional study. *PLoS ONE* **2020**, *15*, e0227190. [CrossRef]

7. Aikens, J.E.; Rouse, M.E. Help-Seeking for Insomnia among Adult Patients in Primary Care. *J. Am. Board Fam. Med.* **2005**, *18*, 257–261. [CrossRef]

8. Ohayon, M.M. Epidemiology of insomnia: What we know and what we still need to learn. *Sleep. Med. Rev.* **2002**, *6*, 97–111. [CrossRef]

9. Pedraza-Flechas, A.M.; Lope, V.; Moreo, P.; Ascunce, N.; Miranda-García, J.; Vidal, C.; Sánchez-Contador, C.; Santamariña, C.; Pedraz-Pingarrón, C.; Llobet, R.; et al. Sleep patterns, sleep disorders and mammographic density in spanish women: The DDM-Spain/Var-DDM study. *Maturitas* **2017**, *99*, 105–108. [CrossRef] [PubMed]

10. Zeng, L.-N.; Zong, Q.-Q.; Yang, Y.; Zhang, L.; Xiang, Y.-F.; Ng, C.H.; Chen, L.-G.; Xiang, Y.-T. Gender Difference in the Prevalence of Insomnia: A Meta-Analysis of Observational Studies. *Front. Psychiatry* **2020**, *11*, 577429. [CrossRef] [PubMed]

11. Irwin, M.R. Why Sleep Is Important for Health: A Psychoneuroimmunology Perspective. *Annu. Rev. Psychol.* **2015**, *66*, 143–172. [CrossRef] [PubMed]

12. Kabat, G.C.; Xue, X.; Kamensky, V.; Zaslavsky, O.; Stone, K.L.; Johnson, K.C.; Wassertheil-Smoller, S.; Shadyab, A.H.; Luo, J.; Hale, L.; et al. The association of sleep duration and quality with all-cause and cause-specific mortality in the Women's Health Initiative. *Sleep Med.* **2018**, *50*, 48–54. [CrossRef]

13. Copinschi, G. Metabolic and endocrine effects of sleep deprivation. *Essent. Psychopharmacol.* **2005**, *6*, 341–347. [PubMed]

14. van Oort, S.; Beulens, J.W.J.; van Ballegooijen, A.J.; Grobbee, D.E.; Larsson, S.C. Association of Cardiovascular Risk Factors and Lifestyle Behaviors with Hypertension. *Hypertension* **2020**, *76*, 1971–1979. [CrossRef] [PubMed]

15. Liu, R.T.; Steele, S.J.; Hamilton, J.L.; Do, Q.B.; Furbish, K.; Burke, T.A.; Martinez, A.P.; Gerlus, N. Sleep and suicide: A systematic review and meta-analysis of longitudinal studies. *Clin. Psychol. Rev.* **2020**, *81*, 101895. [CrossRef] [PubMed]

16. Murtagh, K.N.; Hubert, H.B. Gender Differences in Physical Disability Among an Elderly Cohort. *Am. J. Public Health* **2004**, *94*, 1406–1411. [CrossRef]

17. Asher, M.; Aderka, I.M. Gender differences in social anxiety disorder. *J. Clin. Psychol.* **2018**, *74*, 1730–1741. [CrossRef]

18. Bochenska, K.; Hall, E.; Griffith, J.W.; Kenton, K.; Alverdy, A.; Lewicky-Gaupp, C.; Mueller, M. The Promise of PROMIS in Pelvic Organ Prolapse. *Female Pelvic Med. Reconstr. Surg.* **2019**, *25*, 426–429. [CrossRef]

19. Humalajärvi, N.; Aukee, P.; Kairaluoma, M.V.; Stach-Lempinen, B.; Sintonen, H.; Valpas, A.; Heinonen, P.K. Quality of life and pelvic floor dysfunction symptoms after hysterectomy with or without pelvic organ prolapse. *Eur. J. Obstet. Gynecol. Reprod. Biol.* **2014**, *182*, 16–21. [CrossRef]

20. Stuenkel, C.A. Managing menopausal vasomotor symptoms in older women. *Maturitas* **2021**, *143*, 36–40. [CrossRef]

21. Tyagi, S.; Perera, S.; Clarkson, B.D.; Tadic, S.D.; Resnick, N.M. Nocturnal Polyuria in Older Women with Urge Urinary Incontinence: Role of Sleep Quality, Time in Bed and Medications Used. *J. Urol.* **2017**, *197*, 753–758. [CrossRef] [PubMed]

22. Winkelman, W.D.; Warsi, A.; Huang, A.J.; Schembri, M.; Rogers, R.G.; Richter, H.E.; Myers, D.L.; Kraus, S.R.; Johnson, K.C.; Hess, R.; et al. Sleep Quality and Daytime Sleepiness Among Women with Urgency Predominant Urinary Incontinence. *Female Pelvic Med. Reconstr. Surg.* **2018**, *24*, 76–81. [CrossRef]

23. Yılmaz Bulut, T.; Altay, B. Sleep Quality and Quality of Life in Older Women with Urinary Incontinence Residing in Turkey. *J. Wound Ostomy Cont. Nurs.* **2020**, *47*, 166–171. [CrossRef]

24. Al-Badr, A.; Saleem, Z.; Kaddour, O.; Almosaieed, B.; Dawood, A.; Al-Tannir, M.; AlTurki, F.; Alharbi, R.; Alsanea, N. Prevalence of pelvic floor dysfunction: A Saudi national survey. *BMC Women's Health* **2022**, *22*, 27. [CrossRef] [PubMed]

25. Hong, M.-K.; Ding, D.-C. Current treatments for female pelvic floor dysfunctions. *Gynecol. Minim. Invasive Ther.* **2019**, *8*, 143. [PubMed]

26. Pérez Rodriguez, N.M.; Martínez Torres, J.C.; García Delgado, J.Á.; Rodríguez Adams, E.M.; Rodríguez Lara, H. Dysfunction of pelvic and sexual floor in women. *InvestIG Medicoquir.* **2019**, *11*, 1–25.

27. Luo, Y.; Wang, K.; Zou, P.; Li, X.; He, J.; Wang, J. Prevalence and Associated Factors of Fecal Incontinence and Double Incontinence among Rural Elderly in North China. *Int. J. Environ. Res. Public Health* **2020**, *17*, 9105. [CrossRef]

28. Arion, K.; Orr, N.L.; Noga, H.; Allaire, C.; Williams, C.; Bedaiwy, M.A.; Yong, P.J. A Quantitative Analysis of Sleep Quality in Women with Endometriosis. *J. Women's Health* **2020**, *29*, 1209–1215. [CrossRef]

29. Cosar, E.; Güngör, A.; Gencer, M.; Uysal, A.; Hacivelioğlu, S.O.; Özkan, A.; Şen, H.M. Sleep disturbance among women with chronic pelvic pain. *Int. J. Gynecol. Obstet.* **2014**, *126*, 232–234. [CrossRef]

30. Hita-Contreras, F.; Martínez-López, E.; Latorre-Román, P.A.; Garrido, F.; Santos, M.A.; Martínez-Amat, A. Reliability and validity of the Spanish version of the Pittsburgh Sleep Quality Index (PSQI) in patients with fibromyalgia. *Rheumatol. Int.* **2014**, *34*, 929–936. [CrossRef]

31. Buysse, D.J.; Ancoli-Israel, S.; Edinger, J.D.; Lichstein, K.L.; Morin, C.M. Recommendations for a Standard Research Assessment of Insomnia. *Sleep* **2006**, *29*, 1155–1173. [CrossRef]

32. Sánchez-Sánchez, B.; Torres-Lacomba, M.; Yuste-Sánchez, M.J.; Navarro-Brazález, B.; Pacheco-Da-Costa, S.; Gutiérrez-Ortega, C.; Zapico-Goñi, Á. Cultural adaptation and validation of the Pelvic Floor Distress Inventory Short Form (PFDI-20) and Pelvic Floor Impact Questionnaire Short Form (PFIQ-7) Spanish versions. *Eur. J. Obstet. Gynecol. Reprod. Biol.* **2013**, *170*, 281–285. [CrossRef]

33. Bertolazi, A.N.; Fagondes, S.C.; Hoff, L.S.; Dartora, E.G.; Miozzo, I.C.d.S.; de Barba, M.E.F.; Barreto, S.S.M. Validation of the Brazilian Portuguese version of the Pittsburgh Sleep Quality Index. *Sleep Med.* **2011**, *12*, 70–75. [CrossRef]

34. Bunyavejchevin, S.; Ruanphoo, P. Thai translation and validation of the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire, IUGA-Revised (PISQ-IR) and Pelvic Floor Distress Inventory (PFDI-20). *Int. Urogynecol. J.* **2022**, *33*, 3137–3142. [CrossRef]

35. de Arruda, G.T.; dos Santos Henrique, T.; Virtuoso, J.F. Pelvic floor distress inventory (PFDI)—Systematic review of measurement properties. *Int. Urogynecol. J.* **2021**, *32*, 2657–2669. [CrossRef]

36. Sohn, S.; Kim, D.H.; Lee, M.Y.; Cho, Y.W. The reliability and validity of the Korean version of the Pittsburgh Sleep Quality Index. *Sleep Breath.* **2012**, *16*, 803–812. [CrossRef] [PubMed]

37. Curcio, G.; Tempesta, D.; Scarlata, S.; Marzano, C.; Moroni, F.; Rossini, P.M.; Ferrara, M.; De Gennaro, L. Validity of the Italian Version of the Pittsburgh Sleep Quality Index (PSQI). *Neurol. Sci.* **2013**, *34*, 511–519. [CrossRef]

38. Rodríguez-Muñoz, A.; Moreno-Jiménez, B.; Fernández-Mendoza, J.J.; Olavarrieta-Bernardino, S.; De La Cruz-Troca, J.J.; Vela-Bueno, A. Insomnia and quality of sleep among primary care physicians: A gender perspective. *Rev. Neurol.* **2008**, *47*, 119–123.

39. Madrid-Valero, J.J.; Martínez-Selva, J.M.; Ribeiro do Couto, B.; Sánchez-Romera, J.F.; Ordoñana, J.R. Age and gender effects on the prevalence of poor sleep quality in the adult population. *Gac. Sanit.* **2017**, *31*, 18–22. [CrossRef]

40. Blümel, J.E.; Cano, A.; Mezones-Holguín, E.; Barón, G.; Bencosme, A.; Benítez, Z.; Bravo, L.M.; Calle, A.; Flores, D.; Espinoza, M.T.; et al. A multinational study of sleep disorders during female mid-life. *Maturitas* **2012**, *72*, 359–366. [CrossRef] [PubMed]

41. Cho, Y.W.; Shin, W.C.; Yun, C.H.; Hong, S.B.; Kim, J.; Earley, C.J. Epidemiology of Insomnia in Korean Adults: Prevalence and Associated Factors. *J. Clin. Neurol.* **2009**, *5*, 20. [CrossRef] [PubMed]

42. Hajak, G. Epidemiology of severe insomnia and its consequences in Germany. *Eur. Arch. Psychiatry Clin. Neurosci.* **2001**, *251*, 49–56. [CrossRef]

43. Morin, C.M.; LeBlanc, M.; Bélanger, L.; Ivers, H.; Mérette, C.; Savard, J. Prevalence of Insomnia and its Treatment in Canada. *Can. J. Psychiatry* **2011**, *56*, 540–548. [CrossRef] [PubMed]

44. Pallesen, S.; Nordhus, I.H.; Nielsen, G.H.; Havik, O.E.; Kvale, G.; Johnsen, B.H.; Skjøtskift, S. Prevalence of Insomnia in the Adult Norwegian Population. *Sleep* **2001**, *24*, 771–779. [CrossRef]

45. Knutson, K.L.; Rathouz, P.J.; Yan, L.L.; Liu, K.; Lauderdale, D.S. Stability of the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Questionnaires Over 1 Year in Early Middle-Aged Adults: The CARDIA Study. *Sleep* **2006**, *29*, 1503–1506. [CrossRef]

46. Uhlig, B.L.; Sand, T.; Ødegård, S.S.; Hagen, K. Prevalence and associated factors of DSM-V insomnia in Norway: The Nord-Trøndelag Health Study (HUNT 3). *Sleep Med.* **2014**, *15*, 708–713. [CrossRef]

47. Hur, S.; Oh, B.; Kim, H.; Kwon, O. Associations of Diet Quality and Sleep Quality with Obesity. *Nutrients* **2021**, *13*, 3181. [CrossRef]

48. Xu, M.; Bélanger, L.; Ivers, H.; Guay, B.; Zhang, J.; Morin, C.M. Comparison of subjective and objective sleep quality in menopausal and non-menopausal women with insomnia. *Sleep Med.* **2011**, *12*, 65–69. [CrossRef]

49. Merrill, R.M. Mental Health Conditions According to Stress and Sleep Disorders. *Int. J. Environ. Res. Public Health* **2022**, *19*, 7957. [CrossRef] [PubMed]

50. Ødegård, S.S.; Sand, T.; Engstrøm, M.; Zwart, J.-A.; Hagen, K. The impact of headache and chronic musculoskeletal complaints on the risk of insomnia: Longitudinal data from the Nord-Trøndelag health study. *J. Headache Pain.* **2013**, *14*, 24. [CrossRef] [PubMed]