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Cross-Cultural Comparison of Maternal Sleep

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Background: To characterize cross-cultural sleep patterns and sleep problems in a large sample of mothers of children (ages birth to 6 years) in multiple predominantly Asian and predominantly Caucasian countries.

Methods: Mothers of 10,085 young children (*predominantly Asian countries/regions*: China, Hong Kong, India, Korea, Japan, Malaysia, Philippines, Singapore, Thailand; *predominantly Caucasian countries:* Australia, Canada, New Zealand, United Kingdom, United States) completed an internet-based expanded version of the Pittsburgh Sleep Quality Index.

Results: Mothers in predominantly Asian countries/regions had later bedtimes, decreased number and duration of night wakings, more nighttime sleep, and more total sleep than mothers from predominantly Caucasian countries, $P < 0.001$. More than half (54.7%) of mothers reported having poor sleep, ranging from 50.9% of mothers in Malaysia to 77.8% of mothers in Japan. Sleep disturbance symptoms were quite common, especially symptoms related to insomnia, and were more likely to be reported by mothers in predominantly Caucasian countries. However, psychosocial factors, including having children of a younger age, being unemployed, and having a lower education level were the best predictors of poor sleep, whereas culture was not a significant predictor.

Conclusions: Overall, mothers in predominantly Asian countries/regions reported later bedtimes but sleeping better and longer than mothers from predominantly Caucasian countries, which is dissimilar to cross-cultural findings of young children. Psychosocial factors were found to be the best predictors of poor sleep, irrespective of culture. Further studies are needed to understand the impact of these findings.

Keywords: Sleep, maternal, mother, adult, cross-cultural

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INTRODUCTION

Sleep disturbances are highly prevalent in the general population and may particularly affect women.[1] Furthermore, cultural context appears to play a role in individual sleep patterns and sleep complaints. The Study of Women's Health Across the Nation (SWAN) found in a sample of 12,603 women (ages 40-55) that 38% of women reported significant sleep disturbances.[2] In this study, conducted in the United States, Caucasian women were more likely to report sleep difficulties (40%) than Japanese women (28%). In one cross-cultural study of adult sleep utilizing data collected from 16,483 university students (men and women) from 24 countries, results indicated significant differences in total sleep times across countries, with shortest total sleep times in Japan, Korea, and Taiwan.[3] Finally, a recent large-scale study of survey data collected through the World Health Organization found that 16.9% of adults reported severe/extreme sleep problems, with prevalence rates ranging from 3.9% in Indonesia and Kenya to 40.0% in Bangladesh. In all eight countries surveyed, women reported higher rates of sleep complaints.[1]

The few cross-cultural studies conducted on women have looked at university students and older women. However, sleep of women is likely to be influenced by their children's sleep, especially those who have young children, thus making mothers particularly vulnerable to sleep problems. Studies on maternal sleep have primarily focused on the immediate postpartum period, indicating increased sleep disruption and insufficient sleep.[4-7] Those studies that have been conducted past the newborn period have mostly focused on sleep in parents who are caregivers of children with medical issues (e.g., epilepsy, physically disabled, asthma, and cystic fibrosis),[8-10] with no studies on sleep in mothers of typical children. Recent research has demonstrated that cross-cultural differences in sleep patterns are already evident in infancy and early childhood. A recent study of almost 30,000 young children (birth to 3 years) found that children from predominantly Asian countries had significantly later bedtimes, shorter total sleep times, and increased parental perception of sleep problems compared with children from predominantly Caucasian countries/regions.[11]

Overall, there has been little research comparing adult sleep across different countries in the world and a lack of data from some countries/regions, especially in terms of maternal sleep. As a start to collecting normative data on maternal sleep throughout the world, this study focuses on predominantly Caucasian and predominantly Asian countries/regions in North America, United Kingdom, and Asia-Pacific. Thus, the primary objective of this study was to characterize sleep patterns, sleep behaviors, and sleep problems in a large sample of mothers of children (ages birth to 6 years) in multiple predominantly Asian and predominantly Caucasian countries/regions.

METHODS

Participants

Mothers of 10,085 young children (830 Australia-New Zealand/AU-NZ, 749 Canada/CA, 1,215 China/CN, 586 Hong Kong/HK, 998 India/IN, 712 South Korea/KR, 499 Japan/JP, 513 Malaysia/MY, 396 Philippines/PH, 449 Singapore/SG,

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565 Thailand/TH, 1,335 United States/US, and 1,238 United Kingdom/UK) participated in this study. Countries/regions were grouped as either predominantly Caucasian ([P-C] Australia, Canada, New Zealand, United Kingdom, and United States) or predominantly Asian ([P-A] China, Hong Kong, India, Japan, Korea, Singapore, Malaysia, Philippines, and Thailand).

The participants all had children between the ages of birth to 6 years, with children grouped according to the following ages: 0- to 2-month olds (n = 1,276), 3- to 11-month olds (n = 2,242), 12- to 23-month olds (n = 2,095), 24- to 35-month olds (n = 1,886), 36- to 47-month olds (n = 1,088), 48- to 59-month olds (n = 947), and 60- to 71-month olds (n = 551). Sample sizes were based on urban population, with a target of 800 participants for each country/region with < 100 million urban inhabitants and 1,200 participants for urban populations > 100 million. Data collection in each country/region was terminated when the target sample size was fulfilled.

Procedure

All data were collected online. In almost all countries/regions (Australia, China, India, Malaysia, Singapore, Philippines, UK, US), the questionnaire was set as a pop-up screen at a popular parenting website (BabyCenter). In 2 countries (Japan and Korea), recruitment was conducted via email utilizing mailing lists obtained from local marketing firms, and online advertising at other parenting sites. Completion of the questionnaire was voluntary; there were no exclusionary criteria; and this study was approved by an independent institutional review board. No identifying information was collected. A few areas offered incentives for completion (e.g., free samples or gift voucher), and participants were asked to provide their email address at the end of the survey if they were interested. The complete sample was collected between February 2011 and March 2012.

All participants completed the Pittsburgh Sleep Quality Index (PSQI).[12,11] The PSQI is a widely used and well-validated 19-item self-report instrument that measures sleep disturbances in adults.[13] The PSQI includes 7 subscale scores (sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medications, and daytime dysfunction), and provides a global score ranging from no sleep difficulty to severe difficulties. A global score > 5 indicates a "poor sleeper" and has been shown to have a diagnostic sensitivity of 89.6% and specificity of 86.5%.[13] The expanded version of the PSQI used in this study included additional questions about night wakings and naps, but these additional questions were not included in the global score. Mothers completed this measure regarding their own sleep over the past 2 weeks rather than the past month to be consistent with other measures collected. The questionnaire was translated into each respective language and back-translated to ensure appropriate translation. For quality control, respondents could not provide extreme data (e.g., sleep onset latency > 5 h, total sleep time < 3 h).

In addition to the PSQI, demographic information was collected, including parental age, education, race, and employment status.

Statistical Analyses

Means and frequencies were used for demographic information. Analyses of variance were used to compare sleep variables across countries, with effect sizes (partial eta-squared) reported for all comparisons. Multivariate analysis of covariance analyses (MANCOVA) were performed on the following continuous variables: (1) bedtime (2) sleep onset latency, (3) duration and number of night wakings, (4) nighttime sleep, (5) wake time, (5) total sleep time, (6) daytime sleep (naps), and (7) PSQI score. In these analyses, the variables of mother's age, child's age, maternal education, and employment status (employed vs not employed) were used as covariates to control for their effects. Logistic regression was used to test the prediction of poor sleepers based on the PSQI. Chi-square analyses were conducted for categorical variables, including percent of poor sleepers (PSQI), percent of short sleepers (≤ 6 h) and sleep disturbance variables. Effect sizes reported for χ^2 analyses are phi (φ). Logistic regression utilizing culture (P-A vs P-C), education level, employment status (employed vs non-employed), number of children, and child's and mother's age as predictors was conducted to predict poor versus good sleep using the PSQI total score (> 5 = poor). Because of the large cohort size and the multiple analyses, findings were considered significant if $P < 0.001$.

RESULTS

Demographics

Complete demographic data for the entire sample, and within P-A and P-C, are provided in Table 1. Overall, there were an equal number of mothers of boys (50.4%) and girls (49.6%); approximately half of the respondents had just one child (54.1%). The average child age was 23.58 months (SD 18.86), with no difference between P-C (*M* 23.51) and P-A (*M* 23.64), $P > 0.05$. The majority of respondents (65.9%) were between 25 and 35 years old; most had a college education (65.9%); and almost half were at home full-time or were students (49.9%). There were significant differences between P-A and P-C for age of respondent, education of respondent, and employment status.

Sleep Patterns

Data on nighttime and daytime sleep (see Table 2, 3, and 4) are presented for each country/region, as well as for predominantly Caucasian (P-C) and predominantly Asian (P-A). The MANCOVAs revealed an overall significant effect for the independent variables country (Wilks' lambda = 0.62; $F = 44.3$; $P < 0.0001$) and region (P-C vs. P-A; Wilks' lambda = 0.91; $F = 113.2$; $P < 0.0001$). All sleep measures significantly differed across country/region, with the greatest differences seen in bedtimes. Comparisons for all variables were also significant between P-C and P-A, except for wake times (see Table 4). Overall, mothers in P-A had later bedtimes, decreased number and duration of night wakings, more nighttime sleep, and more total sleep, although there were minimal effect sizes for these variables. Figures 1 and 2 present both bedtimes and total sleep (nighttime sleep + daytime sleep) across countries. Bedtimes were significantly later in P-A countries, with a difference of 1.5 hours. However, nighttime sleep was quite similar across all countries/regions, with the exception of Korea and China, with mothers in China and Korea obtaining 1 to 1.5 h more sleep than mothers in all other countries/regions. The percent of mothers with short sleep duration (≤ 6 h) was also calculated (see Figure 3). Overall, 25.7% of mothers obtained short sleep,

Table 1—Participant demographics

	Total, %	Total, n	P-C, %	P-A, %	χ^2	Effect size φ
Child sex					0.18	0.00
Boy	50.4	5,083	50.7	50.2		
Girl	49.6	5,002	49.3	49.8		
Number of children						
1	54.1	5,456	54.3	53.9	4.23	0.02
2	33.2	3,348	33.7	32.6		
3+	12.6	1,271	12.1	13.4		
Employment status						
Full-time	39.5	3,983	27.0	48.3	689.47*	0.26
Part-time	10.6	1,071	17.6	5.7		
Home/student	49.9	5,031	55.4	46.0		
Education					122.22*	0.11
Elementary school	0.4	41	0.5	0.4		
High school	33.6	3,396	34.3	33.5		
College	47.0	4,739	43.9	49.1		
Post-graduate	18.9	1,909	21.4	17.2		
Age of respondent					363.61*	0.19
< 25	7.2	722	9.0	5.9		
25-29	27.5	2,775	21.2	32.0		
30-34	38.4	3,874	34.9	40.9		
35-39	21.0	2,114	25.6	17.7		
> 40	5.9	600	9.3	3.6		

χ^2 values and effects sizes for between-culture comparisons. P-C, predominantly Caucasian; P-A, predominantly Asian; *P < 0.0001.

Table 2—Nighttime sleep variables across countries

	Bedtime, h		SOL, min		Number of wakings		Duration of wakings, min		Nighttime sleep, h	
	M	SE	M	SE	M	SE	M	SE	M	SE
Australia-New Zealand	10.40	0.045	24.61	0.863	2.47	0.047	17.48	0.616	6.74	0.050
Canada	10.95	0.047	23.93	0.905	2.55	0.049	17.17	0.645	6.61	0.052
China	10.50	0.038	18.17	0.740	2.05	0.040	11.88	0.527	7.23	0.042
Hong Kong	11.78	0.065	18.53	1.244	1.37	0.067	10.18	0.887	7.03	0.071
India	11.25	0.044	24.74	0.846	2.23	0.045	13.36	0.604	6.58	0.049
Japan	11.25	0.056	18.72	1.076	1.51	0.058	8.59	0.767	6.75	0.062
Korea	11.67	0.054	18.25	1.047	1.96	0.057	11.97	0.747	7.28	0.060
Malaysia	11.21	0.058	23.04	1.110	2.17	0.060	13.99	0.792	6.36	0.064
Philippines	10.89	0.065	32.33	1.242	2.67	0.067	14.78	0.886	6.55	0.071
Singapore	11.44	0.051	22.54	1.179	2.12	0.064	15.58	0.841	6.31	0.068
Thailand	10.34	0.051	25.60	0.992	1.91	0.053	12.77	0.707	6.69	0.057
United Kingdom	10.47	0.037	23.79	0.711	2.52	0.038	17.10	0.507	6.76	0.040
United States	10.90	0.035	22.15	0.672	2.45	0.036	17.02	0.479	6.56	0.038
Total	10.97	0.013	21.86	0.227	1.97	0.017	14.41	0.180	6.81	0.014
ANCOVA	87.13*		10.85*		46.96*		20.21*		30.80*	
Effect size	0.11		0.01		0.06		0.03		0.04	

Adjusted means, standard errors, *F* values, and effect sizes for between-country comparisons. M, adjusted mean; SE, standard error, SOL, sleep onset latency; *P < 0.0001.

with no significant differences between P-C and P-A, $\chi^2 = 1.15$, P = 0.284. There were, however, vast country-based differences in prevalence ranging from 8.8% (CN) to 40.0% (SG), P < 0.001.

Mothers who worked full-time (n = 3,983) compared to mothers who worked part-time or were not employed (n = 6,102) had earlier bedtimes (10.84 vs 11.06), fell asleep quicker (19.96 vs 23.10 min), had fewer number and shorter duration of night wakings (1.82 times for 13.16 min vs 2.07 times for 15.20 min), and earlier wake times (6.67 vs 7.15), P < 0.0001. Interestingly, there were no differences in total nighttime sleep

Table 3—Daytime sleep variables across countries

	Wake time, h		Nap duration, h		Total sleep time, h	
	M	SE	M	SE	M	SE
Australia-New Zealand	6.76	0.040	0.179	0.018	6.92	0.051
Canada	7.04	0.043	0.266	0.019	6.87	0.053
China	6.95	0.035	0.764	0.015	8.00	0.044
Hong Kong	7.71	0.059	0.046	0.026	7.08	0.074
India	6.97	0.040	0.330	0.018	6.91	0.050
Japan	6.73	0.051	0.175	0.022	6.93	0.064
Korea	7.30	0.049	0.222	0.022	7.50	0.062
Malaysia	6.84	0.052	0.275	0.023	6.64	0.066
Philippines	6.61	0.059	0.403	0.026	6.96	0.074
Singapore	7.04	0.560	0.244	0.025	6.55	0.070
Thailand	6.49	0.047	0.303	0.021	6.99	0.059
United Kingdom	6.92	0.034	0.143	0.015	6.90	0.042
United States	6.88	0.031	0.266	0.014	6.82	0.040
Total	6.96	0.012	0.297	0.005	7.10	0.147
ANCOVA	32.49*		113.71*		64.27*	
Effect size	0.04		0.14		0.08	

Adjusted means, standard errors, *F* values, and effect sizes for between-country comparisons. M, adjusted mean; SE, standard error; *P < 0.0001.

Table 4—Sleep measures of predominantly Caucasian and predominantly Asian

	Total		P-C		P-A			
	M	SE	M	SE	M	SE	*F*	Effect size
Bedtime, hours	10.97	0.013	10.67	0.021	11.06	0.018	170.26**	0.02
Sleep onset latency, minutes	21.86	0.227	23.52	0.389	21.91	0.333	10.85*	0.001
Number of wakings	1.97	0.017	2.50	0.021	1.98	0.018	365.97**	0.04
Duration of wakings, minutes	14.41	0.180	17.27	0.276	12.43	0.237	196.26**	0.02
Nighttime sleep, hours	6.81	0.014	6.66	0.022	6.81	0.019	38.51**	0.004
Wake time, hours	6.96	0.012	6.90	0.018	6.94	0.016	1.03	–
Nap duration, hours	0.297	0.005	0.22	0.008	0.36	0.007	144.23**	0.02
Total sleep time, hours	7.10	0.147	6.87	0.024	7.17	0.020	104.79**	0.01
PSQI score	6.30	0.031	6.80	0.050	6.37	0.043	61.93 **	0.01

Adjusted means, standard errors, *F* values, and effect sizes for between-region comparisons. M, adjusted mean; SE, standard error; P-C, predominantly Caucasian; P-A, predominantly Asian; PSQI, Pittsburgh Sleep Quality Index; *P < 0.001; **P < 0.0001.

(6.79 vs 6.82 h), P = 0.41. However, full-time working mothers obtained less overall sleep across the 24-h day (6.99 vs 7.12 h), P < 0.0001.

Similarly, mothers of ≥ 3 children had more night wakings (1.96 vs 1.93 vs 2.15 wakings, respectively, for 1 child, 2 children, or ≥ 3 children), earlier wake times (7.02 vs 6.92 vs 6.81), less total nighttime sleep (6.85 vs 6.84 vs 6.63 h), and less total sleep (7.16 vs 7.11 vs 6.87 h), P < 0.0001. There were no differences in bedtimes (11.00 vs 10.93 vs 10.94), sleep onset latency (21.96 vs 21.26 vs 22.59 min), or night waking duration (14.30 vs 14.61 vs 15.25 min), P > 0.05.

Sleep Disturbances

Utilizing the PSQI global score, more than half (54.7%) of mothers reported poor sleep, ranging from 50.9% of mothers in Malaysia to 77.8% of mothers in Japan (Table 5, Figure 4). Sleep disturbance symptoms were quite common, especially symptoms related to insomnia, including taking > 30 min to fall asleep (12.3%) and waking during the night or too early in the morning (37.0%). These symptoms were more likely to be reported by mothers in predominantly Caucasian countries than mothers from predominantly Asian countries/regions (14.8% vs 10.6% for prolonged sleep onset latency; 46.2% vs 30.6% for night wakings or early morning awakenings), P < 0.0001. Approximately 5% of mothers reported loud snoring, with a similar percentage reporting trouble staying awake during the day (3.9%) and experiencing a lack of enthusiasm (5.5%).

Full-time working mothers had lower average PSQI scores (5.88 vs 6.58), with 48.4% of mothers employed full-time classified as poor sleepers compared to 58.8% of other mothers, P < 0.0001. Mothers with more children were significantly likely to have poorer PSQI scores (6.17 vs 6.37 vs 6.71), with

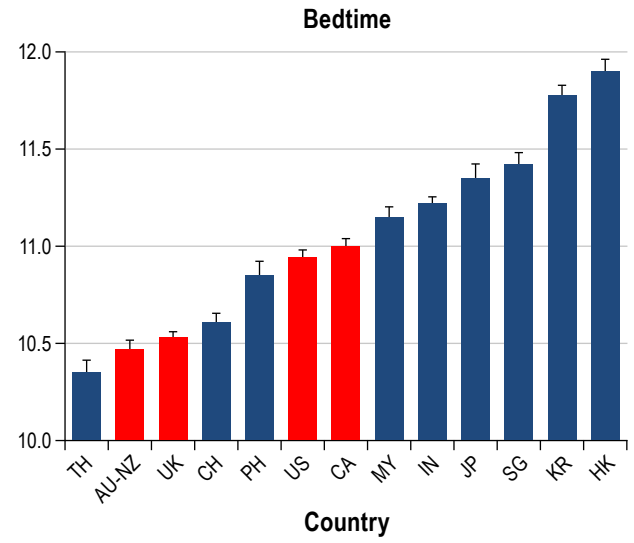

Figure 1—Bedtimes across countries. Predominantly Asian countries in blue, predominantly Caucasian countries in red. AU-NZ, Australia-New Zealand; CA, Canada; CN, China; HK, Hong Kong; IN, India; KR, South Korea; JP, Japan; MY, Malaysia; PH, Philippines; SG, Singapore; TH, Thailand; UK, United Kingdom; US, United States.

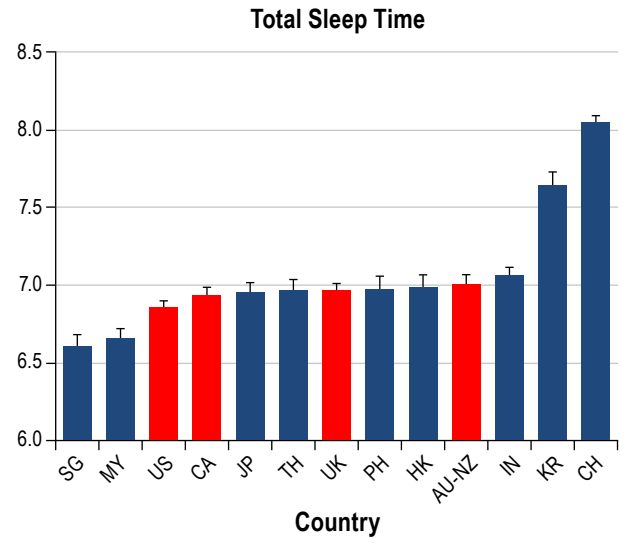

Figure 2—Total sleep times across countries. Predominantly Asian countries in blue, predominantly Caucasian countries in red. AU-NZ, Australia-New Zealand; CA, Canada; CN, China; HK, Hong Kong; IN, India; KR, South Korea; JP, Japan; MY, Malaysia; PH, Philippines; SG, Singapore; TH, Thailand; UK, United Kingdom; US, United States.

59.4% of mothers of ≥ 3 children classified as poor sleepers compared to 56.3% of mothers with 2 children and 47.1% of mothers of just one child, $P < 0.0001$.

Finally, the global analysis to predict poor versus good sleep (PSQI total score > 5 = poor), utilizing culture (P-A vs P-C), education level, employment status (employed vs non-employed), number of children, and child's and mother's age as predictors, was highly significant, $\chi^2 = 262$, $P < 0.0001$. Child's age (odds ratio = 1.10; CL = 1.07-1.12; Wald $\chi^2 = 63.55$), maternal education (odds ratio = 1.14; CL = 1.07-1.13; Wald $\chi^2 = 38.11$), and employment status (odds ratio = 0.65; CL. = 0.60-0.70; Wald $\chi^2 = 113.68$) were all significant predictors ($P < 0.0001$). Younger child, not being employed, and lower education level predicted higher likelihood of having poor sleep. Region (P-C vs P-A) was not found to be a significant predictor in this analysis.

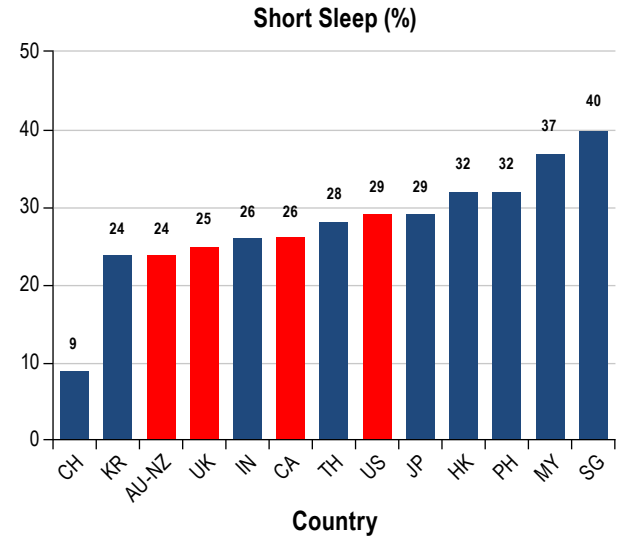

Figure 3—Percent short sleep duration across countries. Predominantly Asian countries in blue, predominantly Caucasian countries in red. AU-NZ, Australia-New Zealand; CA, Canada; CN, China; HK, Hong Kong; IN, India; KR, South Korea; JP, Japan; MY, Malaysia; PH, Philippines; SG, Singapore; TH, Thailand; UK, United Kingdom; US, United States.

DISCUSSION

This is the only large-scale cross-cultural survey of maternal sleep to date, and involves a large cohort of predominantly Caucasian and predominantly Asian mothers across 14 countries/regions. The most striking results of this study were the high percentage of mothers who were poor sleepers (PSQI score > 5) and getting insufficient sleep. Overall, 55% of mothers were found to be poor sleepers, ranging from 43% in China to 78% in Japan. This global score greater than 5 indicates that an individual is having severe difficulties in at least two sleep-related areas, or moderate difficulties in more than three areas.[13] Other studies have found similar rates of poor sleeping in women. For example, a study that included 300 women from Taiwan found that 48% were considered poor sleepers.[14] Similarly, in another study of older black and white women in the United States, 52% were classified as poor sleepers.[15] In contrast, a lower prevalence of poor sleepers was found in a study conducted in Tehran, with 35% of women noted to be poor sleepers.[16]

Surprisingly, in our study only 3.9% of mothers reported having difficulty staying awake during the day, and only 5.1% indicated a lack of enthusiasm. The prevalence of these self-reported symptoms is lower than reported in other studies of women, although it is difficult to compare as the wording of the questions is different. For example, a study of 7,051 women in Sweden reported prevalence rates of 16.1% for excessive

Table 5—Percent sleep problems (3 or more times per week)

	> 30 min sleep onset latency	Wakes during night or too early	Snores loudly	Bad dreams	Taken sleep medication	Trouble staying awake	Lack of enthusiasm	Percent poor sleepers (PSQI)	PSQI score	Short sleep (≤ 6 h)
AU-NZ	17.1	44.5	3.4	2.3	0.0	4.0	8.7	59.6	6.75	23.8
Canada	16.4	45.3	4.6	3.6	0.0	3.2	10.0	57.0	6.63	25.5
China	9.1	29.4	4.5	4.2	0.0	4.0	2.1	43.3	5.48	8.8
Hong Kong	6.3	29.0	2.4	1.9	0.0	2.2	0.3	46.1	5.61	31.5
India	12.3	28.4	5.1	5.0	0.0	6.2	5.5	51.4	6.12	25.8
Japan	11.6	23.1	4.0	1.4	1.2	3.4	1.6	77.8	7.57	29.3
Korea	13.1	21.6	5.1	1.8	0.0	4.5	1.7	53.2	5.89	23.8
Malaysia	7.6	37.2	6.6	2.3	0.0	5.1	2.3	50.9	6.17	36.5
Philippines	14.9	38.1	5.3	1.5	0.0	5.3	3.0	59.3	6.55	31.7
Singapore	11.8	42.5	6.0	4.0	0.0	5.4	5.4	57.5	6.56	40.0
Thailand	9.7	36.3	5.0	1.6	0.0	4.8	0.5	56.5	6.43	27.6
United Kingdom	12.0	43.5	4.9	3.6	0.0	2.1	7.5	53.3	6.30	25.3
United States	15.2	50.2	3.8	3.2	0.0	3.2	9.4	59.0	6.58	29.0
Total	12.3	37.0	4.6	3.1	0.1	3.9	5.1	54.7	6.30	25.7
P-C	14.8	46.2	4.2	3.2	0.0	3.0	8.8	57.1	6.54	26.2
P-A	10.6	30.6	4.8	3.0	0.1	4.6	2.6	53.1	6.14	25.3
χ^2/ANOVA	88.47	685.12*	20.73	42.25*	192.77*	40.25*	239.42*	222.50*	22.24*	290.1*
Effect size	0.09	0.26	–	0.06	0.14	0.06	0.15	0.15	0.03	0.17

AU-NZ, Australia-New Zealand; PSQI, Pittsburgh Sleep Quality Index; P-C, predominantly Caucasian; P-A, predominantly Asian; *P < 0.0001.

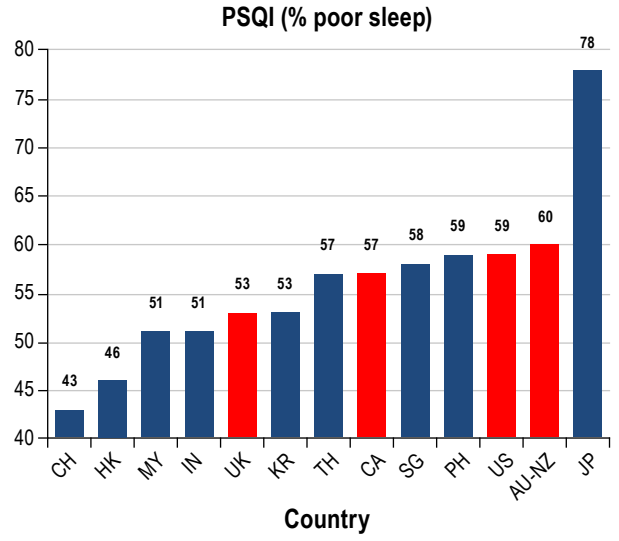

Figure 4—Percent poor sleepers across countries. Predominantly Asian countries in blue, predominantly Caucasian countries in red. AU-NZ, Australia-New Zealand; CA, Canada; CN, China; HK, Hong Kong; IN, India; KR, South Korea; JP, Japan; MY, Malaysia; PH, Philippines; SG, Singapore; TH, Thailand; UK, United Kingdom; US, United States.

daytime sleepiness and 14.3% for fatigue.[17] In this Swedish study, having children did not increase the risk for these daytime symptoms, which is similar to other studies of large samples of women.[18] Not only was the risk not increased, but rather having children, as well as the total number of children, was actually negatively associated with reports of daytime sleepiness. The results of our survey, however, indicate that on a more global level the more children a women has, the more likely she is to have poor sleep, as well as later bedtimes, more night wakings, and less overall sleep. It may be that women of young children, although getting less sleep and having poorer sleep, need to be highly active throughout the day and are either able to compensate for insufficient sleep or ignore these feelings. These findings are consistent with other studies that have found that young women may be more resilient to sleep disruption.[19] Furthermore, employment status had an interesting effect in our study, with mothers employed full-time outside the home getting more sleep and overall being more likely to be classified as good sleepers. It may be that these women are more likely to have additional help within the home or maintain more strict sleep schedules for themselves, and possibly their children. Further research needs to explore this finding of a positive relationship between full-time employment and sleep patterns and sleep disturbances. Interestingly, these psychosocial factors, including having children of a younger age, being unemployed, and having a lower educational level, were found to be the best predictors of poor sleep, irrespective of culture. These results are consistent with previous studies on the role of psychosocial factors, especially socioeconomic status, in women's poor sleep.[20,21]

As mentioned above, another interesting finding was the total sleep times obtained by the women in this study. Overall, women averaged 6.8 hours at night and 7.1 hours total sleep time. These amounts are lower compared to other normative samples. For example, studies of women in the immediate postpartum period found averages of 7.2 hours at night,[7] and another study found total sleep time of 7.8 hours.[22] Furthermore, in our study 26% of the mothers surveyed had short sleep duration (≤ 6 h). Such

short sleep duration has been associated with significant performance deficits, cardiovascular risk, obesity, increased risk of motor vehicle accidents related to drowsy driving, and general health/psychological stress,[23] which is concerning, especially in this particular population.

Another striking finding of this study was that total sleep times were remarkably consistent across countries, other than those mothers in China and Korea who obtained significantly more sleep. This result is quite different from our previous cross-cultural study of young children (birth to age 3) across the same countries/regions.[11] In that study, there were vast country-based differences, as total sleep times varied by 101 minutes (11.62 h in Japan compared to 13.31 in New Zealand). Looking more specifically at the percentage of mothers with short sleep duration, country-based differences become more apparent, with prevalence rates ranging for most countries from 24% to 32%, although in China it was only 9% and in Singapore it was as high as 40%. This consistency in total sleep times is surprising given the vast country-based differences in bedtimes, ranging from 10:21 (Thailand) to 11:54 (Hong Kong), a range of over 1.5 hours. Differences in wake times and napping appear to compensate for the late bedtimes in some countries, resulting in these quite similar total sleep times.

As with all studies there are a number of limitations that must be considered when interpreting these findings. First, as can be expected from an Internet-based survey, the cohort in this study is skewed toward higher education. This bias, however, was likely consistent across all countries and we believe that we obtained similar segments of the population within each country/region. In addition, these results are likely not representative of all mothers within each country. We expect that this sample represents more urban-based populations, especially in the predominantly Asian countries, given the need for internet access to participate. Given that this was primarily a web-based study, it was also not possible to control for the possibility that participants completed the survey more than once or that the person actually had a child. However, cases with unreasonable responses were removed to exclude random or inconsistent data entry. This is an inherent limitation to web-based surveys. Mothers with concerns about their or their child's sleep also may have been more likely to participate, but again, it is expected that these differences are likely consistent across all countries. Finally, as always, the reliance on self-report has inherent limitations. Although the Pittsburgh Sleep Quality Index is a widely used instrument, there is the possibility that given that this is reported sleep, individuals in different cultures may have different subjective perceptions or response sets (e.g., for reporting difficulties). Finally, other basic sociodemographic information, such as socioeconomic status, marital status, household conditions (e.g., living with partner, living with parents), body weight, as well as physical and mental health status, were not collected, which may be important influences on maternal sleep.

Overall, this study is the first study to provide normative data of sleep for women of young children (birth to 6 years), across a large cross-cultural sample. A large percentage of these mothers experience poor sleep and a substantial number do not get adequate sleep. These results also indicate moderate cross-cultural differences in sleep patterns in maternal sleep; results that are not as dramatic as the cross-cultural differences in sleep in young children from these same countries/regions. These results, however, do provide a cultural perspective that can serve clinicians to be aware of normative sleep practices. Finally, further studies are needed to understand the impact of the poor sleep and sleep loss experienced by many mothers, as well as there is a need to expand our study of maternal sleep to other areas of the world (e.g., Latin America, Europe, Africa).

ABBREVIATIONS

SD, standard deviation
PSQI, Pittsburgh Sleep Quality Index
P-A, predominantly Asian
P-C, predominantly Caucasian
AU-NZ, Australia-New Zealand
CA, Canada
CN, China
HK, Hong Kong
IN, India
JP, Japan
KR, South Korea
MY, Malaysia
PH, Philippines
SG, Singapore
TH, Thailand
UK, United Kingdom
US, United States

DISCLOSURE STATEMENT

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