The Effect of Working-hour Characteristics and Health Status of Nurses on Work–life Balance: Using the 5th Korean Working Conditions Survey

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Purpose: This study aimed to investigate the relationships between the characteristics of nurses' work schedules, health outcomes, and work–life balance. **Methods:** This was a secondary data analysis that included 422 nurses in Korean hospitals. Descriptive analysis, independent sample t-test, one-way ANOVA, Pearson correlation analysis, and multiple linear regression analysis were used to identify the associated factors. **Results:** Multiple linear regression analysis showed that work–life balance was lower when atypical work was performed ($\beta = -.14$, $p = .010$). Nurses who did not work overtime showed a higher level of work–life balance than those who worked overtime infrequently ($\beta = -.11$, $p = .002$) or frequently ($\beta = -.28$, $p < .001$). The work–life balance level increased when nurses had better subjective health status ($\beta = .16$, $p < .001$) or higher sleep quality ($\beta = .29$, $p < .001$). It was verified that the work–life balance level was higher for single-person households than for households with two ($\beta = -.18$, $p = .003$), three to four ($\beta = -.16$, $p = .022$), or five or more ($\beta = -.21$, $p < .001$) persons. **Conclusion:** This study suggests that government and hospital organizations should provide high-quality care and consideration to nurses who do atypical or overtime work as well as their subjective health status and sleep quality. Further research should focus on the development of a policy that improves the work–life balance of nurses, especially for those who work during atypical hours.

Key Words: Health Status; Hospital nursing staff; Shift work schedule; Work–life balance

INTRODUCTION

Work–life balance (WLB) refers to a balanced state of life and work in which time and psychological energy are allocated harmoniously [1]. The recent change in the perception of personal life has caused WLB to become an important topic of research [2,3]. To maintain people's WLB, family-friendly policies and policies to support work–family balance have been implemented by the current South Korean government [4,5]. South Korea is ranked 37th among 41 OECD countries in the Better Life Index in terms of WLB rank, which measures the overall quality of life of a country in 2020 [6]. The WLB system in South Korea has not been effectively implemented despite varying political attempts by the government. Hospitals are implementing WLB policies to arrange for night nurses and prepare childcare centers at work [7]. However, for nurses working in hospitals, the probability of work–life imbalance is higher compared to other occupations due to daily emergencies, irregular shift work, direct patient care, education level of patients and guardians, and tasks that require mutual dependency on various types of occupations [3].

Shift work is necessary for nurses in patient-nurse dynamics for 24 hours to provide continuous high-quality nursing. Nurses are continuously exposed to threats such as infection through contact with patients and their guardians in the hospital environment. Nurses also experience

an excessive workload, which leads to high levels of physical and psychological stress [8]. Shift work disturbs the personal circadian rhythm, which causes biological/psychological changes and irregular sleep patterns, and is closely associated with individual health as well as WLB [9,10]. The working hours of nurses have been shown to influence WLB in previous studies [11-13]. Approximately 70% of shift nurses do overtime work of approximately ten hours a week, and those nurses work more than 40 hours a week. During working hours, regular breaks are not ensured, such as atypical work patterns, including shift work, nighttime work, and weekend work, which decrease the work–family balance for 96% of nurses [9,12,13]. Inflexible working hours, atypical work, and overtime were shown to have negative effects on nurses' WLB [13,14].

The working-hour characteristics of shift nurses were found to negatively affect nurses' health status [4,7,11]; reduced health status, in turn, affects WLB [15]. Shift nurses who could not take a break of at least 11 hours between duties were reported to have a higher risk of shift work sleep disorder and pathological fatigue [16]. Atypical working patterns in working hours interfere with sleep and rest, causing health problems such as obesity, cardiovascular disease, metabolic syndrome, sleep disorder, hypertension, and depression, which negatively affect quality of life [4,7,11]. A high level of nurses' health status has been shown to have a positive influence on WLB [15]. Accordingly, nurses with better health status experience a lower level of work–family conflict and a higher level of work–family balance. Nurses' health status, which indicates their personal health status, is the main factor influencing WLB. Nurses' WLB positively affects their performance in professional roles and patient health management, and maintaining nurses' WLB is essential for both nurses and patients [4]. Work–life imbalance negatively affects not only nurses but also their families with respect to mental health and quality of life [2,3].

Previous studies have investigated the quality of work by female workers, including working conditions, work intensity, the effects of shift work, and leisure activities related to nurses' WLB [11-13]. It was challenging to find studies comparing the diverse working hours and health status of nurses. Previous studies revealed that nurses' work on weekends and overtime was a factor in decreasing WLB. Working-hour characteristics, such as autonomy and flexibility of working time, have not been analyzed in previous studies.

Thus, this study investigated the effects of working-hour characteristics and health status on nurses' WLB using raw data from the 5th Korean Working Conditions Survey (KWCS) of 2017, with the aim of providing basic data for realizing efficient management strategies to enhance the WLB of nurses with shift work.

1. Purpose

This study aimed to identify the effects of working-hour characteristics and health status on nurses' WLB. The specific goals are as follows:
1) To investigate nurses' general characteristics, working-hour characteristics, health status, and WLB
2) To investigate WLB according to nurses' general characteristics
3) To investigate the effects of the working-hour characteristics and health status on nurses' WLB

METHODS

1. Study design

This study was conducted to investigate the effects of working-hour characteristics and health status on nurses' WLB, as a secondary data analysis of the raw data of the 5th KWCS (2017) by the Occupational Safety and Health Research Institute (OSHRI). The KWCS was performed based on the European Working Conditions Survey (EWCS) to determine the occupation, work type, employment type, working conditions, exposure to individual risk factors per work type and employment type, organizational communication, psychosocial factors, health impact factors, and work satisfaction of workers throughout South Korea.

2. Participants

The participants in this study were 494 nurses among the 50,250 participants in the raw data of the 5th KWCS (2017) by the OSHRI based on the occupation code (#2430). Among the 494 nurses, 468 working at a public health care or social welfare center, hospital, or clinic were selected, of whom 451 nurses aged over 20 years and with an associate degree or above were selected. The number of participants in the final dataset was 422, without any missing values.

3. Instruments

The variables and questions were based on the 5th KWCS (2017) by the OSHRI, while the factors identified in the review of previous studies on nurses' WLB were considered. The questionnaire items were developed by translating the 6th EWCS and revising certain items to suit the situation in South Korea and in reference to the raw data guidelines of

the KWCS by the OSHRI.

1) General characteristics

Participants' general characteristics were categorized into gender, age, education, career length, monthly wage, time spent travelling from home to work and back, and number of household members. Education was subcategorized into associate, undergraduate, and graduate degrees. The career length per unit of year was divided into <1, 1-4, 5-9, and ≥10. Monthly wages in unit of million KRW were divided into ≤1.99, 2.00-2.99, 3.00-3.99, and ≥4.00. The time spent travelling from home to work and back, which included the time taken to travel to work and the time taken to travel back home, was divided into ≤30 minutes and >30 minutes. The number of household members was divided into 1, 2, 3-4, and ≥5.

2) Working-hour characteristics

The measured variables of working hours were atypical work, overtime, working hours per week, autonomy of working time, flexibility of working time, shift work, and recovery time between shifts. Atypical work was divided into night work, evening work, and Saturday work and Sunday work, and the number of selected subcategories was used to classify the score in the range between 0 and 4 [12]. Overtime work was measured based on the response to the question, "*How often were you required to work outside your official working hours to meet the work demand in the past 12 months?*", and groups were formed based on the replies of "No" (i.e., those who never worked overtime and hence checked "Never") and "Sometimes" and "Often" (i.e., those who worked overtime every day, several times a week, or several times a month) [13]. Working hours per week was divided into <40 hours (below the possible hours of work in a week), 40-52 hours (the legally permitted working hours), and ≥53 hours (above the legally permitted working hours) [17,18]. The autonomy of working time, flexibility of working time, shift work, and recovery time between shifts were measured based on "Yes" or "No" responses [11].

3) Health status

The measured health status variables were subjective health status, mental health, physical health, and sleep quality. Subjective health status was measured on a 5-point Likert scale from "Very good" (score 1) to "Very poor" (score 5) for the question, "*How is your overall health status?*". The negative questions were reverse-coded in the analysis, with higher scores indicating higher levels of subjective health status. Mental health was mea-

sured using the World Health Organization Well-being Index (WHO-5) [19]. The tool consisted of five questions on feeling cheerful, calm and relaxed, active and vigorous, fresh and rested, and interested in daily life; each question was rated on a 6-point Likert scale from "Never" (score 0) to "Always" (score 5), and the sum of all scores was multiplied by 4 to obtain the score out of a total of 100. The tool was developed in 1988 and has since been used globally, as it has been proven to show high levels of sensitivity and validity regarding the measurements of mental health and depression [19,20]. Higher scores indicate higher levels of mental health. The tool reliability was Cronbach's α=.80 in Kim et al. [21] and Cronbach's α=.92 in this study. Physical health was measured based on "Yes" or "No" responses for back pain, upper extremity pain, lower extremity pain, headache, eye fatigue, and full body fatigue. Sleep quality was measured based on the response to the question "*How often have you encountered the following problem(s) related to sleep in the past 12 months?*" across three items: "It is difficult for me to fall asleep"; "I wake up repeatedly during sleep"; "I wake up feeling exhausted or with extreme fatigue," each rated as follows: "Never" as score 1, "Sometimes" as score 2, "Several times a month" as score 3, "Several times a week" as score 4, and "Every day" as score 5. The total score ranges from 3 to 15, and reverse coding was applied. Higher scores indicated higher levels of sleep quality. The reliability was Cronbach's α=.87 in Bae and Kim [22] and Cronbach's α=.88 in this study.

4) Work-life balance (WLB)

WLB was measured based on six questions: one positive and five negative items. The positive item was "*Does your working hour suit your family life or social life?*" which was rated on a 4-point scale from "Highly suitable" (score 1) to "Highly unsuitable" (score 4), and reverse coding was applied. The negative items were as follows: "*I cannot stop worrying about work even when I am not at work,*" "*I cannot do housework when I get home from work because I am too tired,*" "*I do not have enough time to spend with my family because of work,*" "*I do not have enough time for work due to family affairs,*" and "*I cannot focus on work due to family responsibility,*" each being rated on a 5-point scale from "Always" (score 1) to "Never" (score 5). Higher scores indicated higher levels of WLB [23]. The reliability regarding negative WLB was Cronbach's α=.84 in Hong [13]. The reliability of the WLB in this study was Cronbach's α=.82.

4. Data collection

The 5th KWCS was performed to determine the working conditions

of workers aged ≥15 years nationwide. Data collection in 2017 was performed in 17 cities and provinces throughout the nation from July to November 2017. Prior to the survey, the participants were given explanations of the study purpose, duration, data collection method, and ethical considerations, and data were collected from those who voluntarily agreed to participate and submitted signed written consent to compile the raw data.

5. Data analysis

The sample design for the KWCS raw data in this study involved primary enumeration to extract the data that satisfied the enumeration district and secondary probability proportion stratified cluster sample survey to extract the data of households and their members. For more accurate estimations of the KWCS cluster results based on the sample survey results, weighting was applied. The collected data were analyzed using IBM SPSS (version 25.0; IBM SPSS Inc., Armonk, NY, USA). The detailed methods are as follows.

1) To analyze nurses' general characteristics, working-hour characteristics, health status, and WLB, the frequency, percentage, mean, and standard deviation were estimated.

2) To identify the significance of the variation in WLB according to the subjects' general characteristics, working hours, and health status, the independent sample t-test and one-way ANOVA were used, and the Scheffé test was performed as a post-hoc test.

3) Multiple linear regression analysis (enter method) was used to identify factors with a significant influence on nurses' WLB.

6. Ethical considerations

The KWCS was a survey conducted by a public institution on human subjects, and as its raw data were analyzed in this study, the data analysis was preceded by the approval of exemption from review by the Institutional Review Board of C University (1041078-202108-HRSB-257-01). For this study, the researcher requested raw data based on the KWCS regulations for raw data sharing and utilization. The raw data were delivered as a coded file in a state without the personal data of the subjects. Data were stored and analyzed using hardware with a double-lock device.

RESULTS

1. General characteristics

Table 1 presents the general characteristics of the study participants.

Most of the 422 participants in this study were females (96.4 %), while 3.6% were males. Nurses in their twenties accounted for the highest percentage at 40.6%, followed by those in their thirties at 32.8%, those in their forties at 19.4%, and those in their fifties at 7.2%. Most nurses had an undergraduate degree (60.3%), and those with a graduate degree or above accounted for the lowest percentage. Most nurses (40.9%) had a career length of 1-4 years, and the lowest percentage (6.6%) had a career length of <1 year. Monthly wage on average was ≤1.99 million KRW for 17.4%, 2.00-2.99 million KRW for 58.5%, 3.00-3.99 million KRW for 17.3%, and ≥4.00 million KRW for 6.8%. The time spent travelling from home to work and back was ≤30 minutes (43.1%) and >30 minutes (56.9%), respectively. The number of household members was 1 for 5.6%, 2 for 13.0%, 3-4 for 73.2%, and ≥5 for 8.2%.

2. Working-hour characteristics, health status, and WLB

The mean working hours per week were 43.83 (±6.59) hours, while 2.5% of nurses worked <40, 91.7% worked 40-52, and 5.8% worked ≥53. The nurses without autonomy of working time were 78.6%, and in the analysis of flexibility of working time, 66% stated that cases where they had to change their working time on a regular basis and that they did not have a say in it, as it was decided by the organization they worked for.

Table 1. General Characteristics (N = 422)

Variables	Categories	n (%)
Gender	Male	6 (3.6)
	Female	416 (96.4)
Age (yr)	≤29	94 (40.6)
	30-39	179 (32.8)
	40-49	109 (19.4)
	≥50	40 (7.2)
Education	Associate degree	170 (38.8)
	Bachelor	248 (60.3)
	Graduate school	4 (0.9)
Work experience in an organization (yr)	<1	20 (6.6)
	1-4	176 (49.0)
	5-9	113 (23.8)
	≥10	113 (20.6)
Monthly wage (million KRW)	≤1.99	83 (17.4)
	2.00-2.99	223 (58.5)
	3.00-3.99	87 (17.3)
	≥4.00	29 (6.8)
Time spent travelling from home to work and back (min)	≤30	214 (43.1)
	>30	208 (56.9)
The number of household members	1	52 (5.6)
	2	86 (13.0)
	3-4	262 (73.2)
	≥5	22 (8.2)

The percentage of nurses working shifts was 39.1%. The mean score of atypical work on a 4-point scale (night work, evening work, and Saturday work and Sunday work) was 1.74 (±1.50). For recovery time between shifts, 5.5% stated that they had had <11 hours of experience between the end of shift and subsequent work. For overtime work, most nurses (60.8%) said "No," while 24.6% said "Sometimes" and 14.6% said "Often." The mean score of subjective health status in the range of 1 to 5 was high at 4.03 (±0.60). The mean mental health score was 63.51 (±18.34) out of 100, a level lower than subjective health status. In the questionnaire on health problems in the past 12 months, back pain was experienced by 5.2%, upper extremity pain by 13.8%, lower extremity pain by 7.9%, headache and eye fatigue by 8.4%, and full body fatigue by 18.0%. The mean score of sleep quality as the sum of the scores of three items on a scale of 1-5 and with the total score range of 3-15 was high at 13.32 (±2.09). The mean score of WLB as the sum of the scores of one item on a scale of 1-4 and five items on a scale of 1-5, with a total score range of 6-29, was not low at 21.10 (±3.99). For each item used to measure WLB, the mean score for "*Does your working hour suit your family life or social life?*", on a scale of 1-4, was 2.74 (±0.55); the mean score for "*I cannot stop worrying about work even when I am not at work*", on a scale of 1-5, was 3.93 (±0.95); the mean score for "*I cannot do housework when I get home from work because I am too tired,*" on a scale of 1-5, was 3.46 (±0.94); the mean score for "*I do not have enough time to spend with my family because of work,*" on a scale of 1-5, was 3.42 (±0.98); the mean score for "*I do not have enough time for work due to family affairs,*" on a scale of 1-5, was 3.74 (±1.00); the mean score for "*I cannot focus on work due to family responsibility,*" on a scale of 1-5, was 3.82 (±1.00) (Table 2).

3. WLB according to general characteristics

Nurses with monthly wage ≤1.99 million KRW showed significantly higher WLB than those with monthly wage ≥4.00 million KRW (F=2.89, *p*=.035). Nurses in one-person households showed significantly higher WLB than those living with five or more household members (F=4.81, *p*=.003) (Table 3).

4. Effects on nurses' WLB

To verify the effects on nurses' WLB, multiple regression analysis was performed. The variables shown to have significant correlations in the univariate analysis were monthly wage, number of household members, autonomy of working time, shift work, atypical work, overtime work,

Table 2. Characteristics of Working Hours, Health Status, and Work-life Balance Levels   (N=422)

Variables	Categories	n (%) or Mean ± SE	Min	Max	Range
Working hours characteristics		43.83 ± 6.59	5	75	
Working hours per week	<40 hr	13 (2.5)			
	40-52 hr	389 (91.7)			
	≥53 hr	20 (5.8)			
Autonomy of working time	No	338 (78.6)			
	Yes	84 (21.4)			
Flexibility of working time	No	281 (66.0)			
	Yes	141 (34.0)			
Shift work	No	267 (60.9)			
	Yes	155 (39.1)			
Atypical work		1.74 ± 1.50	0	4	0-4
Recovery time between shifts	No	401 (94.5)			
	Yes	21 (5.5)			
Overtime work	Never	269 (60.8)			
	Sometimes	92 (24.6)			
	Often	61 (14.6)			
Health condition					
Subjective health status		4.03 ± 0.60	2	5	1-5
Mental health		63.51 ± 18.34	0	100	0-100
Physical health					
Back pain	No	395 (94.8)			
	Yes	27 (5.2)			
Upper extremity pain	No	360 (86.2)			
	Yes	62 (13.8)			
Lower extremity pain	No	383 (92.1)			
	Yes	39 (7.9)			
Headache & Eye fatigue	No	384 (91.6)			
	Yes	38 (8.4)			
Full body fatigue	No	345 (82.0)			
	Yes	77 (18.0)			
Quality of sleep		13.32 ± 2.09	6	15	3-15
Work-life balance		21.10 ± 3.99	11	29	6-29
Appropriate working hours for family or social life		2.74 ± 0.55	1	4	1-4
Worrying about work		3.93 ± 0.95	1	5	1-5
Too tired for housework		3.46 ± 0.94	1	5	1-5
No time for family because of job		3.42 ± 0.98	1	5	1-5
No time for job because of family		3.74 ± 1.00	1	5	1-5
Cannot focus on job due to family responsibility		3.82 ± 1.00	2	5	1-5

SE=Standard Error.

subjective health status, physical health status (back pain, upper extremity pain, lower extremity pain, and full body fatigue), and sleep quality as independent variables, while WLB was the dependent variable. The Durbin-Watson statistics was 2.00, indicating a lack of autocorrelation. The test of multicollinearity showed that the tolerance was ≥0.1, in the range of 0.26-0.99, and the variance inflation factor (VIF) was <10 in the range of 1.01-3.86, indicating no multicollinearity problem. The co-

Table 3. Work-life Balance according to General Characteristics (N = 422)

Variables	Categories	n	Mean ± SE	t/F	p	Scheffe
Gender	Male	6	22.24 ± 0.83	t = 1.36	.175	
	Female	416	21.06 ± 0.17			
Age (yr)	≤ 29	94	21.27 ± 0.26	F = 0.46	.713	
	30-39	179	21.02 ± 0.28			
	40-49	109	21.09 ± 0.34			
	≥ 50	40	20.53 ± 0.67			
Education	Associate degree	170	21.16 ± 0.27	F = 0.04	.965	
	Bachelor	248	21.06 ± 0.21			
	Graduate school	4	21.08 ± 0.55			
Work experience in an organization (yr)	< 1	20	21.81 ± 0.82	F = 0.54	.658	
	1-4	176	21.13 ± 0.22			
	5-9	113	20.98 ± 0.32			
	≥ 10	113	20.93 ± 0.37			
Monthly wage (million KRW)	≤ 1.99[a]	83	21.91 ± 0.40	F = 2.89*	.035	d < a
	2.00-2.99[b]	223	21.05 ± 0.21			
	3.00-3.99[c]	87	20.97 ± 0.35			
	≥ 4.00[d]	29	19.81 ± 0.82			
Time spent travelling from home to work and back (min)	≤ 30	214	21.40 ± 0.24	t = 1.62	.106	
	> 30	208	20.87 ± 0.22			
The number of household members	1[a]	52	22.47 ± 0.79	F = 4.81**	.003	d < a
	2[b]	86	20.61 ± 0.45			
	3-4[c]	262	21.27 ± 0.19			
	≥ 5[d]	22	19.45 ± 0.52			

*$p < .05$, **$p < .01$, ***$p < .001$.
SE = Standard Error.

efficient of determination (R^2), indicating the explanatory power of the variables, was 30.2%.

Regression coefficients were tested for significance. As a result, atypical work was shown to have a significant negative effect on WLB ($\beta = -.14$, $p = .010$); for example, nurses doing more atypical work are conjectured to have low WLB. For overtime work, WLB was low for nurses who sometimes worked overtime ($\beta = -.11$, $p = .002$) or often ($\beta = -.28$, $p < .001$) compared to nurses who did not work overtime. The WLB according to the number of household members was low for nurses in a household of two members ($\beta = -.18$, $p = .003$), three to four members ($\beta = -.16$, $p = .022$), and five or more members ($\beta = -.21$, $p < .001$), compared to nurses in a one-person household. For subjective health status and sleep quality, significant positive effects on WLB were shown; higher scores on subjective health status ($\beta = .16$, $p < .001$) and higher scores on sleep quality ($\beta = .29$, $p < .001$) led to a high level of WLB (Table 4).

DISCUSSION

As a secondary data analysis study, the 5th KWCS data were used to verify the effects of the working-hour characteristics and health status

Table 4. The Effects on Work-life Balance (N = 422)

Variables	B	SE	β	t	p
(Constant)	12.48	1.40			
Monthly wage	0.00	0.00	0.00	0.09	.929
The number of household members					
1	(ref)				
2	-2.11	0.71	-0.18	-2.97**	.003
3-4	-1.41	0.61	-0.16	-2.30*	.022
≥ 5	-2.99	0.78	-0.21	-3.81***	<.001
Autonomy of working time	-0.13	0.36	-0.01	-0.36	.719
Shift work	-0.15	0.45	-0.02	-0.32	.750
Atypical work	-0.38	0.15	-0.14	-2.58*	.010
Overtime work					
Never	(ref)				
Sometimes	-1.05	0.34	-0.11	-3.15**	.002
Often	-3.18	0.43	-0.28	-7.33***	<.001
Subjective health status	1.05	0.25	0.16	4.29***	<.001
Back pain	0.44	0.70	0.02	0.62	.533
Upper extremity pain	-0.14	0.53	-0.01	-0.26	.792
Lower extremity pain	-0.53	0.64	-0.04	-0.83	.405
Full body fatigue	-0.23	0.44	-0.02	-0.52	.600
Quality of sleep	0.56	0.07	0.29	7.78***	<.001
F = 16.68 ($p < .001$), R^2 = .302, adj R^2 = .284					

*$p < .05$, **$p < .01$, ***$p < .001$.

on nurses' WLB with the aim of providing basic data for developing ways to enhance nurses' WLB.

The investigation of the current working conditions for nurses in South Korea showed that the mean working hours per week were 44.9 hours based on the 4th KWCS (2014) data and 43.83 hours based on the 5th KWCS (2014) data. A trend of decrease in mean working hours per week was observed in the 5th KWCS data compared to the 4th KWCS data; however, compared to the mean working hours per week of 36 hours for shift nurses in the U.S., the working hours were longer in South Korea [24]. The Labor Standards Act in South Korea currently states that workers at workplaces should be guaranteed a rest of ≥ 30 minutes for every 4 hours of work and ≥ 1 hour at every 8 hours of work [18]; however, for 96% of the nurses in South Korea, the basic time of rest at regular hours during their working time was not guaranteed [9,13]. On the contrary, 75% of nurses in the U.S. reported that they could rest for 30 minutes during shift work in a previous study [25]. Additionally, nurses in California were given a meal time of ≥ 30 minutes if they worked for ≥ 5 hours, with an additional meal time of 30 minutes if they worked for 8 hours overtime [17]. Long work hours, atypical work, and work without rest are factors that negatively affect nurses' WLB [9,11-13]. To reduce the negative effects on WLB, a system of appropriate assignment of nurses and political devices should be developed to ensure that nurses are given a reward for the quality of working time [13], while ensuring adequate time for rest with legally permitted working hours.

In a study by Veldhoven et al. [26], where the WLB was investigated according to gender, the level of work–family conflict was higher overall for female workers than for male workers. In this study, however, sex was not found to be a significant influencing factor of WLB. This is presumed to be due to the far higher percentage of female nurses than that of male nurses. Therefore, in a follow-up study, the impact on WLB should be investigated with additional specific variables of gender roles such as housework and childcare.

In this study, education was not found to be a significant factor influencing WLB. In a previous study conducted on workers in an English-speaking country, paid working time was generally the longest for workers with an undergraduate degree [27]. The working time and flexibility of working time are the identified influencing factors of WLB, and in a follow-up study, the effect of education on working time and flexibility of working time in relation to the impact on WLB should be investigated.

Age and career length were not significant influencing factors for WLB. This contrasted with the report from a previous study by Jung et al. [28] on clinical nurses, where lower levels of age and career length led to a lower level of WLB. In this study, nurses with a wage of ≤ 1.99 million KRW showed a significantly higher level of WLB than nurses with a wage of ≥ 4 million KRW. This was supported by a previous study, where WLB was high for nurses with shorter career lengths and, hence, lower wages, as these nurses were yet to have a family of their own to be free to enjoy hobbies or self-improvement activities that contributed to WLB [28]. Thus, a replication study should be conducted to investigate the effects of nurses' marital status on WLB.

The factors influencing WLB identified in this study were atypical work, overtime work, subjective health status, sleep quality, and number of household members, while the explanatory power of these variables on WLB was 28.4%. The level of WLB was lower for nurses doing more atypical work and those with an experience of overtime work, in line with a previous study reporting that atypical work patterns such as shift work, night work, and weekend work had a negative impact on WLB by lowering work–family balance [12]. In another previous study on nurses' working hours, the number of days of weekend work, increase in working hours, and non-official work negatively affected nurses' WLB, lending support to this study [13]. The negative effect of overtime on WLB was also shown in a study on workers other than nurses [10]. In a study of nurses at a university hospital in Malaysia, overtime work and the level of rest during working time were found to have significant effects on WLB [29]. These results indicate that overtime work that had not been predicted within the scope of official work had a negative impact on nurses' WLB. Thus, to prevent unforeseen changes in working hours and overtime for nurses, healthcare institutions should ensure an adequate number of personnel as well as various policies of flexibility at work. To protect nurses' WLB in South Korea, a policy of flexibility at work has been implemented since 2018 through an extended level of nursing personnel to provide improved working conditions and care for nurses [7]. Nevertheless, the effect of this policy varied according to the region and type of healthcare institution, while it is necessary to support and change the political agenda on the problem of nursing personnel so that the policy can be applied to healthcare institutions of hospital level or higher [30].

WLB was lower for nurses with a lower subjective health status. Physical health status, mental health status, pain, upper extremity pain, lower extremity pain, and full-body fatigue did not have a significant effect on WLB. This result lent support to the study by Jung et al. [15], which reported that nurses with higher health status showed a lower level of

work–family conflict and a higher level of work–family balance. Additionally, a previous study on shift nurses [31] reported that the level of health-promoting behavior was lower in shift nurses than in workers of different occupations, and shift nurses also showed a lower subjective health status. This was in line with a previous study on health and WLB, where a lower subjective health status prevented WLB [27]. Thus, to enhance shift nurses' WLB, a health-related program should be activated to help nurses maintain good health, and managers should check the individual subjective health status of nurses and perform work scheduling accordingly.

WLB was lower for nurses with poorer sleep quality. Shift work disturbs the individual's unique circadian rhythm to cause sleep problems as well as fatigue [16], and reduced sleep quality causes the accumulation of fatigue to increase extensive anxiety, which leads to increased risks of cardiovascular disease and gastrointestinal disorders with an impact on natural birth and the risk of low weight or premature birth [24]. As such, reduced sleep quality is the main factor of stress in nurses and is closely associated with quality of life, which demands increased attention. Compared to night-work nurses, three-shift nurses showed lower levels of both sleep quantity and quality [32]. Thus, it is necessary to advance the system of the specialized team of night-work nurses to improve work scheduling by reducing the number of days of night work for nurses with sleep disorders.

WLB was higher for nurses in one-person households than for those living with two, three, four, or five or more household members. This coincided with a previous study on married nurses in the family expansion stage, who were shown to be unable to have their own time even on weekends, as they were required to perform work, housework, and childcare simultaneously [33]. In contrast, a study conducted in Japan [3] reported that nurses in a household with two or more members showed more positive WLB than those in a one-person household with a lower level of turnover intention. This is presumed to be due to the lower mean age of the subjects in this study so that they received support from their family members rather than being responsible for supporting the family members instead. The results imply that it is not up to shift nurses alone to enhance WLB in relation to work–family balance, but a process of interaction and cooperation with spouses, family members, and colleagues at work is a prerequisite. Thus, to protect the work–family balance of shift nurses, it is crucial for hospital organizational culture to improve. Additionally, as the marital status of the nurses was unknown in

this study, a follow-up study should be conducted by dividing nurses into unmarried and married groups for a more in-depth analysis of WLB based on marital status.

CONCLUSION

This study aimed to investigate the working-hour characteristics and health status of nurses and their effects on nurses' WLB, using the 5th KWCS (2017) data, to provide basic data to develop plans to promote the clear recognition of WLB by hospital organizations and the creation of working conditions for WLB. The results of this study showed that the factors influencing nurses' WLB were atypical work, overtime work, subjective health status, sleep quality, and number of household members. Thus, shift work should be predetermined in consideration of the health status and sleep disorder of shift nurses, and flexibility in work scheduling should be allowed by assigning an adequate number of personnel. Additionally, the hospital organization where nurses work should have an organizational culture to protect work–family balance, while the working conditions for WLB should be established.

This study had some limitations. First, as a cross-sectional study with secondary data analysis, this study cannot clearly define the cause–effect relationships across variables. While the instruments for the WLB, mental health, and sleep quality were suitable, those to measure working-hour characteristics and health status were based solely on the presence or absence of a given variable, which implies a need for more suitable instruments. Second, the data analyzed in this study were the existing data of the 5th KWCS, so the variables were selected among those of the 5th KWCS, which prevented more in-depth analyses of variables. The measurements of autonomy of working time, flexibility of working time, shift work, recovery time between shifts, and physical health status did not have a specific instrument but were based on the presence or absence of the variable. To ensure more accurate measurements, nurses' working-hour characteristics and health status should be measured using a reliable instrument. Nevertheless, despite these limitations, the results of this study can be generalized as the data were collected from individuals throughout the nation via region-based stratification and random sampling. The significance of this study lies in its extensive evaluation and analysis of the effects of shift work on nurses' WLB and the influencing factors of WLB using the aforementioned data. The findings of this study indicate that these factors should be taken into consideration

while developing policies and intervention programs to realize the welfare of shift nurses toward WLB. Thus, the data provided by this study will prove valuable in achieving nurses' actual WLB in the future.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORSHIP

EC, JJ, and BO contributed to the conception and design of this study; JJ and BO performed the statistical analysis and interpretation; EC, JJ, and BO drafted the manuscript; EC, JJ, and BO critically revised the manuscript; and EC supervised the whole study process. All authors have read and approved the final manuscript.

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