

Self-management Behaviours among Nurses and Midwives during Pregnancy and Associated Factors: A Cross-sectional Study

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Abstract: The high rate of perinatal abnormality among pregnant nurses and midwives attributable to their working environment is a serious international occupational health concern. Self-management behaviours can prevent abnormalities, but nurses and midwives have difficulty carrying out these behaviours during pregnancy. This cross-sectional study aimed to examine self-management behaviours and associated factors during pregnancy among nurses and midwives. The participants were 232 pregnant or postpartum registered nurses and midwives from four Japanese general hospitals. Participant recruitment and questionnaire distribution were undertaken through hospital management. Data were collected from July to November 2022. Instruments included the Personal Demographic and Obstetric Conditions Questionnaire, the Self-Management Behaviours Questionnaire, the Working Conditions during Pregnancy Questionnaire, the Social and Workplace Support Scale, the Sense of Coherence Scale, and Self-Management Difficulties Scale. Data analysis used univariate and multiple classification analysis.

Results indicated that participants demonstrated good compliance with contraindications among self-management behaviours but scored lower in knowledge and self-monitoring, abnormalities prevention, and avoiding burden movements. Multiple classification analyses revealed that parity, profession, overtime, acquisition of maternity protection provisions, managers support, family support, and prioritising the foetus were significantly associated with self-management behaviors. Nursing administrators must provide adequate information and adjust the work of pregnant staff. Policymakers need to propose measures to reinforce maternity protection provisions for pregnant nurses and midwives. Pregnant nurses and midwives need to be proactively educated on occupational health and safety. Learning the importance of acquiring maternity protection provisions, receiving support and prioritising the foetus will contribute to effective self-management practices in them. Further research is needed to promote self-management behaviours among pregnant nurses and midwives.

Keywords: Midwives, Nurses, Pregnancy, Self-management, Work environment

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Introduction

Pregnancy and childbirth are among the most important life events for women. The pregnancy period, which brings dynamic changes in the body and mind of a woman as never experienced before, significantly affects the lifelong health of the individual and her offspring. Therefore, proper self-management

behaviours are considered essential for pregnant women to manage their physical and mental health, prevent perinatal abnormalities, ensure safe delivery, and support the subsequent life of mother and child.¹ Self-management behaviours that pregnant women should practice are advocated as recommended behaviours by global standards such as the guidelines

from the World Health Organization (WHO)² and the National Institute for Health and Care Excellence (NICE).³ Smoking, alcohol consumption, and unhealthy nutrition during pregnancy, for example, should be prohibited or corrected.^{2,3} These behaviours are associated with stillbirth,⁴ miscarriage,⁵ preterm birth,^{6,7} low birth weight,^{7,8} and gestational hypertension.⁹ Excessive activities during pregnancy, such as physically demanding movements (e.g., heavy work, lifting, prolonged standing, bending at the waist), night work, and long working hours, are also recommended to be limited or prohibited.^{10,11} These activities can induce foetal malformations, miscarriage and premature birth, low birth weight, gestational hypertension,^{12,13} neonatal death, and other serious perinatal complications.^{6,14} Other recommendations in the guidelines include ensuring adequate sleep and rest and the importance of self-monitoring. Adherence to these recommended behaviours is effective in preventing certain perinatal abnormalities.²

Nurses and midwives, however, face many barriers to implementing recommended self-management behaviours during pregnancy.¹⁵ Their work involves a combination of tasks that are considered hazardous environments in the workplace for pregnant women (e.g., prolonged standing, heavy work, night work, long hours, exposure to radiation and hazardous drugs, caring for patients with infections, exposure to patient violence and prolonged assisted delivery).^{15,16} In Japan, more than half of all nurses and midwives continue night shift during pregnancy due to staff shortages and other reasons.¹⁷ Japan is unique in having many hospitals with 18-hour night shifts.¹⁷ These harsh working conditions hinder self-management behaviours among pregnant nurses and midwives. They also tend to force themselves to work out of concern that they will cause inconvenience to their workplaces, colleagues, and patients.¹⁸ As professionals, nurses and midwives cannot leave any patient requiring care or experiencing a sudden change of condition unattended. Therefore, even if they are aware of the distress and pain associated with pregnancy, they push these away and continue with their work.^{15,16}

They also described the limitations of practising self-management behaviours as long as they are nurses or midwives, emphasising that safe childbirth is a miracle.¹⁵ These nurse- and midwife-specific situations make it challenging to implement recommended behaviours such as avoiding burden movements, getting adequate rest, and self-monitoring. Nurses and midwives are at a higher risk of perinatal abnormalities than non-nurses.¹⁷ In Japan, the rate of threatened miscarriages and premature births among nurses and midwives is 35%, putting the lives and health of more than one in three mothers and babies at risk.¹⁷

Previous studies demonstrate that nurses and midwives need to construct a new self-identity from 'nurse' to 'pregnant nurse or midwife' and maintain a 'prioritising the foetus' mindset to integrate pregnancy, working properly, and delivering safely.^{15,19} The importance of self-management among pregnant nurses and midwives, which involves objectively assessing their physical and mental state and adjusting their workstyle, has also been highlighted.¹⁵ However, these findings have only been qualitatively validated, and no studies have quantitatively investigated self-management behaviours among expectant nursing professionals. Consequently, the actual level of self-management behaviours among pregnant nurses and midwives, including associated factors, remains unknown. Thus, we wanted to fill this gap.

Conceptual Framework and Literature Review

This study was guided by the Individual and Family Self-management Theory (IFSMT).²⁰ This theory illustrates self-management as a complex dynamic phenomenon of three dimensions: context, process and outcomes.²⁰

Context dimensions are risky or protective factors that are considered to challenge or protect individuals' and families' engagement in self-management.²⁰ The

dimensions include condition-specific factors, physical and social environments, and individual and family characteristics.²⁰ Condition-specific factors include the complexity of the condition or treatment, trajectory, physiological stability, or physiological transitions.²⁰ Physical and social environments include health care, transportation, culture, social capital, and work access. Individual and family characteristics include cognitive status, developmental stages, and individual and family capabilities and cohesion. The process dimensions include knowledge and beliefs, self-regulation skills and abilities, and social facilitation. Finally, the outcome dimensions comprise proximal and distal outcomes. Proximal outcomes include self-management behaviours and the cost of health care services, while distal outcomes include health status and quality of life.

Self-management is a process by which individuals and families use knowledge and beliefs, self-regulation skills and abilities, and social facilitation to achieve health-related outcomes in the IFSMT.²⁰ Individual self-management behaviours manage health conditions and risk factors, prevent and reduce abnormalities and improve health outcomes.²⁰ In pregnant nurses and midwives, it is important to self-manage their health conditions during pregnancy based on their knowledge and beliefs, with social support at work and home, and by adjusting their work and life.¹⁵ Therefore, concerning the IFSMT, this study assumed that self-management behaviours among pregnant nurses and midwives are also directly and indirectly influenced by factors of both the context and process dimensions.

The context dimensions influencing self-management in pregnant nurses and midwives include personal demographics and pregnancy health conditions. The physical and social environment also includes working conditions. Among the working conditions, night work, heavy lifting, standing work, long working time and excessive overtime work among nurses have been alerted as hazardous work content for pregnant women¹⁰ and have been reported to interfere with nurses' and midwives' self-management behaviours.¹⁵ Specifically,

frequent heavy lifting and standing work make it more difficult for pregnant nurses to avoid hazardous movements, while long working hours reduce the time for self-monitoring and rest at work and home.^{15,16}

The process dimensions influencing self-management in pregnant nurses and midwives include a sense of coherence (SOC),²¹ self-management difficulties¹⁵ and social support.^{15,18} The SOC relates to knowledge and beliefs, illustrated as factual information and perceptions about a health condition or behaviour.²⁰ SOC is a central concept in salutogenesis. It refers to a broad attitude that describes how people feel that the life events they encounter are comprehensible, manageable and meaningful.²¹ SOC is a psychological resistance resource that affects people's appraisal of situations and helps them better adapt to or cope with their stressors when they experience life events and adversity, including pregnancy and childbirth.²¹ Previous studies, including scoping reviews, indicate that low SOC scores in pregnant women are associated with lower levels of health behaviours and abnormal birth outcomes, such as preterm delivery.^{22,23}

Self-management difficulties relate to the self-regulation skills and abilities category. This category is illustrated as iterative processes people engage in to achieve health behaviors, and includes goal setting, self-monitoring and reflective thinking, planning and action, self-evaluation, and management of responses are included.²⁰ Self-management difficulties are perceptions of difficulties with self-monitoring and health behaviours practices among pregnant nurses and midwives.¹⁵ This includes goal setting and actions of foetal safety first (prioritising the foetus), repeated planning, acting and reflecting on self-management behaviours (unsure about management), self-evaluation (perceiving one's limits) and managing the social roles (dueling roles of nurse and pregnant woman).¹⁵ Previous research has shown that self-management difficulties influence the practice of self-management behaviours.¹⁵ For example, those with a weaker perception of prioritising the foetus and a stronger perception of

the duelling roles of nurse and pregnant woman described difficulties with self-management behaviours.¹⁵

Social support is a complex, multidimensional concept that involves family, friends, work colleagues and healthcare providers supporting individual health behaviours, and relates to social facilitation.²⁰ Previous studies have reported that social support significantly impacts pregnant women's health promotion behaviour.²⁴ For pregnant nurses and midwives, support from managers and colleagues contributes to their health status and self-management behaviours.^{15,18}

The association between self-management behaviours and work factors, a SOC and social support has been studied in various populations and pregnant women. However, few studies have examined the self-management behaviours and associated factors of pregnant nurses and midwives, which may have a distinctive background in this population.

Study Aim

This study examined self-management behaviours and associated factors during pregnancy among registered nurses and midwives in Japan.

Methods

Design: This study adopted a cross-sectional design, and we used the STROBE guidelines²⁵ to enhance the reporting of observations.

Sampling and Setting: Participants were registered nurses and midwives working in 87 wards across four general hospitals in two cities in Japan. The inclusion criteria were: 1) those who worked during pregnancy and 2) those in the last trimester of pregnancy or less than five years postpartum. The exclusion criteria were: 1) those aged 20 or younger and 2) nursing managers (but not deputy nurse managers). Hospital administrators selected and recruited the participants according to the inclusion criteria.

In this study, it was necessary to include pregnant women in the last trimester of pregnancy or postpartum mothers who had experienced most of the gestational period, as we wanted to test the level of management behaviours throughout the gestational period. A recent study reported that mothers' retrospective recall of their prenatal experiences was consistent, reproducible, and reliable at six months and eight years postpartum.²⁶ Therefore, this study was restricted to mothers less than five years postpartum to reduce recall of the influence of bias further. Additionally, a sensitivity analysis by the number of years postpartum confirmed that the present results were largely unaffected by recall bias. The sample size was calculated as 171 using the G*Power software ver. 3.1.9, with linear multiple regression, effect size = 0.15, power = 0.90, alpha error = 0.05, number of predictors = 15. The response rate was assumed to be 60%, and the final number of distributions was set at 285 to allow for invalid responses.

Ethical Considerations: The study was approved by the ethical review committee of Hokkaido University, Japan (approval number: 22-19) and conducted in accordance with the Declaration of Helsinki.²⁷ Data were handled with strict confidence, and all data were kept anonymous. The participants were informed in writing about the nature of the study and that their participation was voluntary. The research statement described the study's purpose, process, benefits, risks, and ethical considerations regarding anonymity and the right to participate. Filling in the questionnaire was deemed to have consented to participating in this study. Consent was obtained from four general hospitals.

Instruments: Six instruments were employed for data collection.

The Personal Demographic and Obstetric Conditions Questionnaire: This was developed by our research team, including age at childbirth, parity, medical history, previous abortion history, BMI at non-pregnancy, marital status, and the number of family members. Pregnancy conditions, including the

presence of pregnancy complications, timing of pregnancy reports to managers and colleagues, and the total number of minor problems (e.g., morning sickness, general malaise, gastrointestinal symptoms, palpitations, drowsiness, urine leakage, dizziness, oedema of the lower limbs, and back pain), were assessed. Birth conditions, such as the method of delivery and presence or absence of abnormalities (e.g., threatened abortion, threatened birth, and preterm birth), neonatal weight, gestational age at birth, and birth defects in the newborn, were measured.

The Self-Management Behaviours Questionnaire:

Items to assess self-management behaviours were based on guidelines from WHO,² NICE,³ Japan Academy of Midwifery,²⁸ Japan Society of Obstetrics and Gynecology,²⁹ Ministry of Health¹⁰ and the American College of Obstetricians and Gynecologists.¹¹ These guidelines are standards based on a vast body of scientific evidence and have been approved as clinical practice guidelines worldwide. The Japan Academy of Midwifery and the Japan Society of Obstetrics and Gynaecology have translated these global guidelines into Japanese and recommended them as practice guidelines.^{28,29} From these, 35 recommended self-management behaviours for pregnant women were extracted. The recommended behaviors were categorized into the following six subscales: diet and nutrition (seven items), sleep and rest (five items), contraindications (two items), abnormalities prevention (seven items), avoiding burden movements (six items), and knowledge and self-monitoring (eight items). A six-point Likert scale (1 = not at all to 6 = always) was used. Examples of items include “I was eating a balanced diet,” and “I did not smoke.” Regarding the scoring method, the score for each of the six subscales was calculated first, with higher scores indicating better compliance with each subscale. Subsequently, the scores for all subscales were summed to calculate the overall score for self-management behaviours. Possible total scores range from 35 to 210. A higher score reflects better overall compliance with self-management behaviours. All items were selected in consultation with a PhD nursing researcher and five midwives with

at least ten years of clinical nursing experience. Additionally, a pilot test was conducted with eight participants. Cronbach’s alpha in the pilot test showed good internal reliability, ranging from 0.71 to 0.80 for each subscale and 0.87 for the entire set. In the main study, Cronbach’s alpha ranged from 0.70 to 0.82 for each subscale and 0.90 for the entire set, confirming internal reliability. Furthermore, the item-content validity index (I-CVI) and scale-content validity index (S-CVI), assessed by four midwives with over ten years of clinical experience, ranged from 0.9 to 1.0, confirming good content validity. A confirmatory factor analysis of the six subscales showed goodness-of-fit indices of GFI = 0.90, CFI = 0.87, AGFI = 0.84, SRMR = 0.072, and RMSEA = 0.058, indicating good structural validity.

The Working Conditions during Pregnancy Questionnaire:

This instrument was used to ascertain the profession (nurse or midwife), departments, employment type, hazardous work, and utilization of maternal protection provisions (acquisition of provisions). These items were answered through self-administration. The acquisition of provisions was defined as the total number of maternity protection provisions, such as night work exemptions and short-time working measures.

Six items were also measured: availability of night work, total workload, frequency of heavy lifting, frequency of standing work, frequency of taking breaks, and frequency of overtime work. Availability of night work was measured as ‘yes’ or ‘no.’ Total workload item was measured on a 4-point Likert scale from ‘decreased’ to ‘increased.’ Other items were measured on a 4-point Likert scale from ‘no’ to ‘always.’ These data were treated as categorical variables.

The Sense of Coherence Scale 13: The Japanese version of the Sense of Coherence Scale 13 (SOC-13)³⁰ was used. This is the shortened version of the SOC-29 developed by Antonovsky,²¹ and translated into Japanese by Yamazaki³⁰ and comprises 13 items in three subscales (“Comprehensibility,” “Manageability,” and “Meaningfulness”). Examples include “Has your life ever had a clear goal or purpose?” Each item is

rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The scores of all 13 items are summed, with the five negatively-worded items reversed. Possible total scores range from 13 to 91. A higher score indicates a higher level of SOC.³⁰ The SOC Scale has been examined for reliability and validity in Japan.³⁰ Cronbach's alpha in the actual study was 0.79.

The Self-Management Difficulties Scale: This questionnaire was developed by our research team to assess self-management behaviour difficulties based on nurses' and midwives' perceived difficulties with self-management in a previous grounded study,¹⁵ which yielded four factors: Prioritising the foetus, Duelling roles of nurse and pregnant woman, Unsure about management, and Perceiving one's limits. We generated items based on these four factors and constructed a scale in extensive consultation with a PhD nursing researcher and four midwives with over ten years of clinical experience. The scale consists of 35 items, with four subscales: Prioritising the foetus (10 items), Duelling roles of nurse and pregnant woman (10 items), Unsure about management (7 items), and Perceiving one's limits (8 items). Examples of items include "I was conflicted between my two roles as a nurse and a pregnant woman," and "The life of the foetus was my top priority." Items were measured using a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). The scoring method calculated a total score for each subscale, with higher scores indicating a higher perception of each concept. Possible total scores range from 10 to 60 for Prioritising the foetus and Duelling roles of nurse and pregnant woman, 7 to 42 for Unsure about management, and 8 to 48 for Perceiving one's limits.

The Cronbach's alpha coefficients for each factor in the pre-test with ten participants ranged from 0.83 to 0.88, and 0.90 for the entire set. In the actual study, Cronbach's alpha coefficients for each factor ranged from 0.83 to 0.91 and 0.91 for the entire set, confirming good internal reliability. The scale was

reviewed by four midwives with over ten years of clinical experience, yielding I-CVI and S-CVI, which ranged from 0.9 to 1.0, respectively. Confirmatory factor analysis of the four subscales showed good structural validity, with goodness-of-fit indices of GFI = 0.92, CFI = 0.88, AGFI = 0.86, SRMR = 0.066, and RMSEA = 0.049.

The Social and Workplace Support Scale: Five subscales (family, friends, significant others, managers, and colleagues support) were measured. The social support scale is the Japanese version of the Social Support Scale,³¹ a translation of the Multidimensional Scale of Perceived Social Support developed by Zimet et al.³² This scale has been confirmed to be reliable and valid in Japan.³¹ Workplace support is based on House's social support need framework (emotional, instrumental, informational, and evaluative support).³³ An item example is "My family really helped me." The scale consists of five subscales (four items each), 20 items in total. Items are measured on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). Scores are calculated for each subscale, and possible total scores range from 4 to 28. The higher scores indicate a greater amount of support for each. Cronbach's alpha for each subscale in the actual study ranged from 0.88 to 0.93.

Data Collection: Data were collected from July to November 2022. After obtaining approval, the principal investigator and research assistant explained the purpose and process of the study to the hospital administrators and requested their cooperation. Hospital administrators distributed questionnaires with an enclosed research description to potential participants, who were asked to seal the completed questionnaire in an envelope and deposit this in a box in each hospital. The deadline was set at one month after distribution.

Statistical Analysis: Descriptive analyses included means and standard deviations (SD) for continuous variables and frequencies and percentages for categorical variables. First, the means and SDs of

the scores for the overall score and each subscale were calculated to examine the characteristics of self-management behaviours. As the number of items included in each subscale differed, item means, and SDs were also calculated for score difference comparisons. Univariate analyses of the overall score for self-management behaviours were subsequently conducted to screen for factors associated with self-management behaviours. Before the analysis, it was confirmed that the overall score for self-management behaviours was normally distributed. Student's t-test, ANOVA, and Spearman's rank correlation coefficient were used for analysis. Subsequently, the overall score for self-management behaviours was used for dependent and independent variables that were statistically significant (p -value < 0.01) in the univariate analyses results, and non-significant variables deemed meaningful from a professional point of view were included in the multiple classification analysis. Before the analysis, each study

variable was tested for multivariate assumptions, including normality, linearity, homoscedasticity and multicollinearity. The results confirmed that all assumptions were satisfied. Statistical significance was set at $p < 0.05$. Statistical analyses were performed using JMP Pro, ver. 16.1 (SAS Institute Inc.). These statistical analysis processes were conducted with the advice of a biostatistician.

Results

Participant characteristics

A total of 235 questionnaires were collected (82.5% response rate). After excluding those with incomplete answers or returned from those who did not meet the inclusion criteria, 232 valid responses (98.7% valid response rate) were included in the analysis. The participants' characteristics are shown in **Table 1**. The participants' mean age (SD) was 34.9 (4.8), with an age range of 25 to 48 years.

Table 1. Participant characteristics

Variables	Frequency (%)	Mean (SD)
Age (years); mean (SD)	34.9	(4.8)
Age at childbirth (years); mean (SD)	32.3	(4.3)
25-29	70	(30.2)
30-34	97	(41.8)
35-39	50	(21.6)
≥ 40	15	(6.5)
Parity		
Nulliparous	88	(37.9)
1 Parous	100	(43.1)
2 or more	44	(19.0)
Medical history		
Yes	54	(23.3)
Previous abortion history		
Yes	65	(28.0)
BMI at non-pregnancy (kg/m ²); mean (SD) (n = 225)	21.1	(3.1)
< 18.5	29	(12.5)
≥ 18.5-25.0	175	(75.4)
≥ 25.0	21	(9.1)

Table 1. Participant characteristics (Cont.)

Variables	Frequency (%)	Mean (SD)
Marital status		
Married	215	(92.7)
Unmarried (single/divorced)	17	(7.3)
Number of families; mean (SD)	1.8	(1.0)
Gestational age (weeks); mean (SD)	38.6	(1.7)
Neonatal weight (g); mean (SD)	2,996.7	(420.0)
Pregnancy and birth conditions		
Number of minor problems; mean (SD)	4.5	(2.8)
Threatened abortion	24	(10.3)
Threatened preterm birth	42	(18.1)
Preterm birth	8	(3.4)
HDP/GDM	28	(12.1)
Low birth weight (< 2500 g)/SGA	29	(12.5)
Profession		
Registered nurse	221	(95.3)
Midwife	11	(4.7)
Department		
Outpatient	59	(25.4)
Ward	128	(55.2)
ICU/HCU	20	(8.6)
Others	25	(10.8)

Note. SD = standard deviation; BMI = body mass index; HDP = hypertensive disorders of pregnancy; GDM = gestational diabetes mellitus; SGA = small for gestational age; ICU = intensive care unit; HCU = high care unit

Self-management behaviours during pregnancy among nurses and midwives

Among the six subscales of self-management behaviours, the highest item mean score was for

contraindications. The lowest item mean score for knowledge and self-monitoring was observed, followed by abnormalities prevention and avoiding burden movements (**Table 2**).

Table 2. Self-management behaviours scores of participants

Variables	Range of possible scores	Total Mean (SD)	Range of this study	Item mean (SD)
Overall SMB	35-210	127.9 (21.5)	70-182	3.3 (0.6)
Diet and nutrition	7-42	28.1 (5.2)	12-42	4.0 (0.7)
Sleep and rest	5-30	19.4 (4.3)	5-30	3.9 (0.9)
Contraindications	2-12	11.9 (0.7)	6-12	5.9 (0.4)
Abnormalities prevention	7-42	25.3 (6.3)	7-42	3.6 (0.9)
Avoiding burden movements	6-36	22.8 (5.4)	6-36	3.8 (0.9)
Knowledge and self-monitoring	8-48	20.5 (6.9)	8-41	2.6 (0.9)

Note. SD = standard deviation; SMB = self-management behaviours; Item mean = total average divided by number of items

Factors associated with self-management behaviours

Univariate analyses were conducted on the overall score for self-management behaviours during pregnancy (Table 3). Statistically significant differences in self-management behaviours were

found for the following variables: parity, department, timing of pregnancy reports to managers, timing of pregnancy reports to colleagues, amount of workload, frequency of heavy lifting, acquisition of maternity protection provisions, social support, and SOC-13 ($p < 0.05$).

Table 3. Results of univariate analyses of overall score of self-management behaviours and all variables

Variables	Mean	(SD)	r _s /t/F	p-value
Age at childbirth	32.2	(4.3)	-0.14	0.04
Parity: Primiparous	132.2	(19.7)	2.38	0.02
Multiparous	125.3	(22.2)		
Abortion history/ Yes	128.1	(21.7)	0.08	0.94
No	127.8	(21.5)		
BMI at non-pregnancy	21.1	(3.1)	-0.02	0.73
Marital status: Married	128.0	(21.1)	0.28	0.78
Unmarried	126.4	(27.4)		
Number of families	1.9	(1.0)	-0.09	0.18
Number of minor problems	4.5	(2.8)	0.08	0.21
GDM/HDP: Yes	132.6	(22.1)	1.14	0.25
No	127.7	(20.3)		
Profession: Registered nurse	127.2	(21.3)	1.68	0.10
Midwife	138.3	(22.9)		
Department: Outpatient	123.5	(23.4)	2.77	0.03
Ward	130.0	(20.3)		
ICU/HCU	118.9	(22.1)		
Others	134.2	(19.4)		
Reporting pregnancy:				
To managers: Before the stable period	113.8	(22.6)	2.00	0.04
After the stable period	128.3	(21.3)		
To colleagues: Before the stable period	121.1	(19.2)	2.20	0.03
After the stable period	129.2	(21.7)		
Night work: No	128.5	(22.1)	0.54	0.60
Yes	127.0	(21.0)		
Workload:				
Decreased/Slightly decreased	135.7	(23.8)	3.11	< .01
Not changed/Increased	111.3	(23.0)		
Frequency of heavy lifting:				
No/Not often [less]	138.7	(22.2)	2.89	< .01
Sometimes/Always [more]	124.1	(19.9)		
Frequency of standing work:				
No/Not often [less]	135.8	(24.9)	1.19	0.27
Sometimes/Always [more]	128.4	(22.0)		
Frequency of taking breaks:				
Always/Mostly get [more]	129.0	(20.9)	2.91	< .01
Not often/No [less]	111.8	(21.9)		

Table 3. Results of univariate analyses of overall score of self-management behaviours and all variables (Cont.)

Variables	Mean	(SD)	r _s /t/F	p-value
Frequency of overtime work:				
No/Not often [less]	134.6	(20.1)	2.74	0.04
Sometimes/Always [more]	125.5	(21.6)		
Acquisition of provisions	1.32	(1.1)	0.32	< .01
Social supports: Family	23.1	(4.3)	0.35	< .01
Friends	21.8	(5.0)	0.35	< .01
Others	23.3	(4.0)	0.19	< .01
Managers	18.8	(5.5)	0.38	< .01
Colleagues	20.7	(4.8)	0.36	< .01
SOC-13	53.5	(10.1)	0.17	< .01
SMD: Prioritising the foetus	37.3	(6.3)	0.54	< .01
Duelling roles	38.3	(8.2)	-0.19	< .01
Unsure about management	26.8	(6.0)	-0.02	0.73
Perceiving one's limits	33.2	(6.7)	-0.11	0.11

Note. SD = standard deviation; r_s = Spearman's rank correlation coefficient; t = t value of Student's t-test; F = F value of ANOVA; BMI = body mass index; ICU = intensive care unit; HCU = high care unit; SOC-13 = Sense of Coherence 13 Scale; SMD = Self-management Difficulties Scale; Duelling roles = duelling roles of nurse and pregnant woman

Multivariate classification analysis of health self-management behaviours

Multiple classification analysis with the overall score for self-management behaviours as dependent variables indicated the following (**Table 4**): Positively associated factors with self-management behaviours were parity [primiparous] (p = 0.02), profession

[nurse] (p = 0.04), overtime work [less] (p < 0.01), acquisition of maternity protection provisions (p < 0.01), managers support (p < 0.01), family support (p < 0.01), and prioritising the foetus (p < 0.01). A variance inflation factor (VIF) was calculated to avoid the influence of multicollinearity on the results; VIF = 1.052.01, confirming negligible influence.

Table 4. Result of multiple classification analysis of the overall score of self-management behaviours

Variables	Adjusted deviation	Beta	p-value
General characteristics			
Parity [Primiparous]	1.85	0.13	0.02
Work conditions			
Profession [Nurse]	-1.93	-0.10	0.04
Night work [Yes]	-0.21	-0.02	0.78
Workload [Increased]	-1.06	-0.10	0.09
Standing work [more]	-1.46	-0.03	0.59
Heavy lifting [more]	-0.29	-0.04	0.48
Taking breaks [more]	0.17	0.05	0.36
Overtime work [less]	2.16	0.12	0.03
Acquisition of provisions	2.81	0.14	< .01

Table 4. Result of multiple classification analysis of the overall score of self-management behaviours (Cont.)

Variables	Adjusted deviation	Beta	p-value
Reporting pregnancy:			
To colleagues:[After stable period]	-1.04	-0.09	0.08
Social supports: Family	0.93	0.18	< .01
Managers	0.72	0.11	< .01
Colleagues	0.25	0.06	0.39
SMD: Prioritising the foetus	1.32	0.39	< .01
Duelling roles	-0.04	-0.01	0.80
Adjusted R ²	0.51		
p	< .001		

Note. SMD = Self-management Difficulties Scale; Duelling roles = duelling roles of nurse and pregnant woman; R² = adjusted R-squared; Multiple classification analysis, adjusted by department and age at childbirth

Discussion

This study examined the actual level of self-management behaviours and the associated factors during pregnancy among nurses and midwives. The study revealed that nurses were relatively compliant with contraindications among self-management behaviours but scored the lowest on knowledge and self-monitoring. Factors associated with self-management behaviours included not only work factors, but also individual and socio-psychological factors. Work factors are limited in their ability to be modified by individual pregnant nurses and midwives. However, the results indicate that knowledge provision and psychological and behavioural encouragement to individual pregnant nurses and midwives may contribute to promoting self-management behaviours.

As a feature of self-management behaviours among pregnant nurses and midwives, the scores for the items, knowledge and self-monitoring, abnormalities prevention, and avoiding burden movements were in descending order. Prior research has shown that nurses and midwives do not receive adequate information and support when they become pregnant and are unsure about how to work and protect themselves.^{15,18} Additionally, the shortage of manpower affects team collaboration, which is essential, and the high demand for unexpected

and sudden care, such as sudden patient changes, interferes with pregnant women's avoidance or modification of dangerous and burdensome tasks.^{15,16} These findings support the characteristics of self-management behaviours among nurses and midwives in this study.

The personal factor parity, the work factor profession, overtime, acquisition of maternity protection provisions, managers support, family support, and prioritising the foetus were significantly related to self-management during pregnancy among nurses. Regarding parity, Korukcu³⁴ demonstrated that women's problem-coping and self-management skills improve with pregnancy and childbirth experience, suggesting greater management skills among multiparas than among primiparas. However, the present results contradict this. Fear of delivery and states of characteristic anxiety were found to be significantly higher among primiparas, while childbirth self-efficacy was significantly lower than that of multiparas.³⁵ This suggests that strong pregnancy fears and worries may have contributed to more careful self-management behaviours and practices among the primiparas in this study. Additionally, the object of care, their child, could have been a barrier to self-management among multiparas. Sleep quality, duration, and efficiency during pregnancy were reported to be lower or shorter in multiparas than in primiparas, likely influenced by the demands of childcare and the

night-time waking of children in care.³⁶ This finding supports the present results. Overtime, associated with self-management behaviours, has been suggested to reduce sleep and rest quality. Overtime is a hazardous labour factor, which leads to longer working hours, interrupts rest, and causes nonrestorative sleep.³⁷ Pregnancy is particularly prone to sleep deprivation due to hormonal and physical changes.³⁸ Therefore, ensuring adequate rest periods and overtime exemptions should be applied, especially for multiparas, to promote self-management behaviours.

Besides overtime, other work factors related to the overall score of self-management behaviours included profession, acquisition of maternity protection provisions, and managers support. Midwives, as professionals with perinatal expertise and knowledge, may explain why they had higher scores on management behaviours than nurses. However, this study showed that nurses, even among the same health professionals, may need more knowledge about the perinatal period and information on safe working practices. Previous research has shown that nurses experience uncertainty and anxiety owing to a lack of access to information about safe working practices,¹⁸ which aligns with the results of this study. Knowledge and self-monitoring had the lowest item scores, suggesting providing adequate knowledge and information, especially to nurses, is important. Regarding maternity protection provisions, the highest acquisition rate among nurses and midwives in Japan was 49.9% for night work exemption, with other provisions, such as conversion to light duties, ranging from 2.7 to 13.1%.¹⁷ Additionally, in this study, the acquisition rate of the provisions was low, at 47.6% for night work exemption, 19.6% for conversion to light duties, and 7–10% for others. Prior findings indicate that nurses' and midwives' reasons for not acquiring provisions include busyness in the workplace, feeling sorry for colleagues, and financial reasons.¹⁷ However, this study showed that the parties' lack of knowledge and information may also prevent them from acquiring appropriate provisions. For nurses in hazardous

occupational environments, the information provided and appropriate use of the maternity protection provisions are essential.

Managers support was associated with nurses' and midwives' self-management behaviours. Managers' workload and emotional support contribute to the safe employment of pregnant nurses and midwives¹⁸ and improve their ability to navigate pregnancy safely.¹⁶ Additionally, family support has been reported to reduce stress and promote health behaviours in pregnant women,²⁴ potentially reducing the pregnant woman's wife/mother role and physical and mental stress at home, thereby limiting burden movements and allowing time for sleep and rest.

Prioritising the foetus was identified as a psychological factor associated with self-management behaviours. Previous research suggests that nurses and midwives forget their pregnancies in a busy environment, lacking time to focus on the foetus or implement self-management practices, which is one of the factors contributing to abnormalities.^{15,19} The findings of this study are supported by these previous studies and emphasise the importance of 'prioritising the foetus' for nurses and midwives.

Limitations

This study had several limitations. First, owing to the cross-sectional design, it was difficult to clarify causal relationships between the observed variables. In the future, prospective observational studies should be conducted to examine the association between self-management behaviours, and other variables. Second, there was potential for recall bias due to the inclusion of postpartum women as study participants. As described in the methods section, this bias was minimised based on previous research findings. Additionally, a sensitivity analysis of the present results by the number of years postpartum was conducted, demonstrating that there was little effect of recall bias. Finally, non-response bias was a concern owing to

several invalid responses in this study, which was a limitation of the data collection process.

Conclusions and Implications for Nursing Practice

This study demonstrated the characteristics of self-management behaviours during pregnancy among nurses and midwives. Among nurses, scores on self-management behaviours such as knowledge and self-monitoring, abnormalities prevention, and avoiding burden movements were lower. Parity, profession, overtime, acquisition of maternity protection provisions, managers support, family support, and prioritising the foetus were associated with self-management behaviours during pregnancy among nurses.

Healthcare providers, nursing administrators, and pregnant nurses need to acknowledge that nurses and midwives work in a hazardous environment and are at high risk of abnormalities, highlighting the necessity of appropriate self-management practices. Nurses and midwives face particular challenges with knowledge, self-monitoring, and abnormality prevention. They should be offered health education and provided with specific information on implementing these practices. Hospitals and nursing administrators should support their self-management behaviours by providing information on maternal protection provisions, their appropriate use, and improving work conditions, including reducing overtime. Notably, the acquisition rate of maternal protection provisions was less than half for our participants. This suggests that policymakers must propose and implement measures to adhere to and enforce these provisions for pregnant nurses and midwives. Specifically, more adaptive maternity protection schemes may need to be considered. Pregnant nurses and midwives should be proactively educated on occupational health and safety and acquire accurate knowledge about self-management. Learning that proper acquisition of maternal protection provisions, support from those

around them, and prioritising the foetus promote self-management can empower nurses to implement these practices effectively. Further research should be conducted in the future to use these findings and promote self-management behaviours among pregnant nurses and midwives. Specifically, studies are necessary to develop self-management support programs based on the findings and test their usefulness. The accumulation of these studies may reduce the risk of perinatal abnormalities among pregnant nurses and midwives.

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Appendix

Supplementary file. Assessment items for self-management behaviours

Diet and nutrition

1. I was eating a balanced diet.
2. Fat and sugar were kept to a minimum.
3. I was taking folic acid/vitamins.
4. I had appropriate weight control.
5. I did light exercise, such as stretching, according to my physical condition.
6. I abstained from caffeine.
7. I was eating and drinking to keep my body cool.

Sleep and rest

1. I was getting enough sleep at home.
2. I had tried to lighten the load on my body.
3. I tried to limit my overstraining behaviours as much as possible at work.
4. I made sure I got enough rest at home before and after work.
5. I tried to find time to rest well between shifts.

Contraindications

1. I did not smoke.
2. I did not consume alcohol.

Prevention of abnormalities

1. I consulted my doctor and midwife as appropriate to resolve my concerns.
2. I had disclosed my pregnancy early and ensured that I had support from others.
3. I had called for help when I needed help.
4. I adjusted my behaviours early on after finding out I was pregnant.
5. I worked within what was safe for me.
6. I discussed my workload and applied for provisions with my managers as appropriate.
7. I had to ask people to help me with my work depending on my physical condition.

Avoiding burden movements

1. I routinely refrained from heavy lifting.
2. I routinely avoided prolonged standing.
3. I routinely refrained from bending at the waist.
4. I was careful to avoid or limit strain movements.
5. I adjusted my movements according to any physical symptoms.
6. I had immediately quit the burden movements when I felt anomalies.

Knowledge and self-monitoring

1. I had a good understanding of the system of maternal protection.
 2. I had an understanding of the 'Maternal Protection Contact Card.'
 3. I had a good understanding of financial compensation schemes during pregnancy.
 4. I collected information on safe working practices.
 5. I reflected on and kept records of my physical condition and health.
 6. I had taken part in foetal movement counts at work.
 7. I had measured the intervals between abdominal contractions at work.
 8. I had taken time out from my duties to make time for the foetus and myself.
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พฤติกรรมกรรมการจัดการตนเองของพยาบาลและผดุงครรภ์ในระหว่างตั้งครรภ์ และปัจจัยที่เกี่ยวข้อง : การศึกษาแบบตัดขวาง

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บทคัดย่อ: พยาบาลและผดุงครรภ์ที่ตั้งครรภ์มีอัตราความผิดปกติที่สูงในช่วงก่อนคลอด ซึ่งเกิดจากสภาพแวดล้อมในการทำงาน ถือเป็นปัญหาด้านอาชีวอนามัยที่สำคัญในระดับนานาชาติ พฤติกรรมการจัดการตนเองสามารถป้องกันความผิดปกติได้ แต่พยาบาลและผดุงครรภ์มักประสบกับปัญหาความยากลำบากในการจัดการตนเองในระหว่างตั้งครรภ์ การศึกษาแบบตัดขวางนี้มีวัตถุประสงค์เพื่อศึกษาพฤติกรรมกรรมการจัดการตนเองและปัจจัยที่เกี่ยวข้อง ในระหว่างตั้งครรภ์ของพยาบาลและผดุงครรภ์ ผู้เข้าร่วมวิจัยคือ พยาบาลวิชาชีพและผดุงครรภ์ที่ตั้งครรภ์หรือหลังคลอดจำนวน 232 ราย จากโรงพยาบาลทั่วไปในประเทศญี่ปุ่น 4 แห่ง การคัดเลือกผู้เข้าร่วมวิจัยและการส่งแบบสอบถามได้ดำเนินการผ่านฝ่ายบริหารของโรงพยาบาล รวบรวมข้อมูลตั้งแต่เดือนกรกฎาคม ถึง พฤศจิกายน พ.ศ. 2565 เครื่องมือที่ใช้ในการวิจัยได้แก่ แบบสอบถามข้อมูลส่วนบุคคล สภาวะการตั้งครรภ์และการคลอด แบบสอบถามพฤติกรรมกรรมการจัดการตนเอง แบบประเมินสภาพการทำงานในระหว่างตั้งครรภ์ แบบประเมินการสนับสนุนทางสังคมและสถานที่ทำงาน แบบประเมินความเข้มแข็งในการมองโลก และแบบประเมินความยากลำบากในการจัดการตนเอง การวิเคราะห์ข้อมูล ใช้การวิเคราะห์การจำแนกแบบตัวแปรเดียวและการจำแนกพหุ

ผลการศึกษาพบว่าผู้เข้าร่วมการวิจัยปฏิบัติตามข้อห้ามในพฤติกรรมกรรมการจัดการตนเองได้ดี แต่มีคะแนนที่ต่ำด้านความรู้และการติดตามเฝ้าระวังตนเอง การป้องกันความผิดปกติ และการหลีกเลี่ยงการเคลื่อนไหวที่รับน้ำหนักมาก การวิเคราะห์การจำแนกพหุ พบว่าจำนวนครั้งของการตั้งครรภ์ อาชีพ การทำงานล่วงเวลา การได้รับสิทธิการคุ้มครองการคลอดบุตร การสนับสนุนจากผู้จัดการ การสนับสนุนจากครอบครัว และการให้ความสำคัญกับทารกในครรภ์มีความสัมพันธ์อย่างมีนัยสำคัญกับพฤติกรรมกรรมการจัดการตนเอง ผู้บริหารทางการแพทย์จำเป็นต้องให้ข้อมูลที่เพียงพอและปรับการทำงานของบุคลากรที่ตั้งครรภ์ ผู้กำหนดนโยบายควรต้องเสนอมาตรการเพื่อการคุ้มครองในการคลอดบุตรสำหรับพยาบาลและผดุงครรภ์ที่ตั้งครรภ์ เป็นสิ่งจำเป็นอย่างยิ่งที่พยาบาลและผดุงครรภ์ที่ตั้งครรภ์ต้องได้รับความรู้ในเชิงรุกเกี่ยวกับความปลอดภัยด้านอาชีวอนามัย การเรียนรู้ถึงความสำคัญของการได้รับความคุ้มครองด้านการตั้งครรภ์ การได้รับการสนับสนุน และการให้ความสำคัญกับทารกในครรภ์เป็นอันดับแรกจะช่วยให้พยาบาลและผดุงครรภ์ที่ตั้งครรภ์มีแนวทางการจัดการตนเองที่มีประสิทธิภาพ และควรมีการวิจัยเพิ่มเติมเพื่อใช้ในการส่งเสริมพฤติกรรมกรรมการจัดการตนเองในพยาบาลและผดุงครรภ์ที่ตั้งครรภ์

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คำสำคัญ: ผดุงครรภ์ พยาบาล การตั้งครรภ์ การจัดการตนเอง สภาพแวดล้อมในการทำงาน

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