

ORIGINAL RESEARCH ARTICLE

Workplace lactation support, policy awareness, and breastfeeding outcomes among clean room employees in Taiwan's electronics industry – A cross-sectional study

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Su-Ying Tsai

Department of Health Management, I-Shou University, Kaohsiung, Taiwan

*For Correspondence: Email: sytsai@isu.edu.tw

Abstract

While breastfeeding-friendly policies aim to support employed mothers, limited research has examined how specific work environments, such as clean rooms, affect breastfeeding behavior. This study examined how clean room work affects breastfeeding behavior among 608 employed mothers in a Taiwanese electronics company. Data were collected on demographic and employment characteristics, breastfeeding behavior, awareness and use of lactation rooms, and perceptions of breastfeeding-related policies and support. Despite access to certified lactation rooms, clean room workers had lower breastfeeding continuation rates, less awareness and use of policies and facilities, and perceived less workplace support. Mothers in clean rooms with shift work had the highest breastfeeding discontinuation rate and lowest continued breastfeeding beyond six months. Regression analysis showed clean room work was linked to early breastfeeding cessation and reduced policy engagement. Findings suggest that beyond providing facilities, workplaces must address structural and social barriers in controlled environments to better support breastfeeding mothers. (*Afr J Reprod Health* 2026; 30 [13]: 101-111).

Keywords: clean room, shift work, workplace breastfeeding support, breastfeeding continuation, employed mothers

Résumé

Bien que les politiques favorables à l'allaitement visent à soutenir les mères salariées, peu de recherches ont examiné comment des environnements de travail spécifiques, tels que les salles blanches, influencent les comportements d'allaitement. Cette étude a examiné l'impact du travail en salle blanche sur les comportements d'allaitement chez 608 mères salariées dans une entreprise électronique taïwanaise. Des données ont été recueillies concernant les caractéristiques démographiques et professionnelles, les comportements d'allaitement, la connaissance et l'utilisation des salles d'allaitement, ainsi que les perceptions des politiques et du soutien liés à l'allaitement. Malgré l'accès à des salles d'allaitement certifiées, les travailleuses en salle blanche présentaient des taux plus faibles de poursuite de l'allaitement, une moindre connaissance et utilisation des politiques et des installations, ainsi qu'une perception plus faible du soutien en milieu de travail. Les mères travaillant en salle blanche avec des horaires postés présentaient le taux le plus élevé d'arrêt précoce de l'allaitement et le plus faible taux de poursuite de l'allaitement au-delà de six mois. L'analyse de régression a montré que le travail en salle blanche était associé à un arrêt précoce de l'allaitement et à une moindre implication dans les politiques de soutien. Ces résultats suggèrent qu'au-delà de la mise à disposition d'installations, les lieux de travail doivent également prendre en compte les obstacles structurels et sociaux présents dans les environnements contrôlés afin de mieux soutenir les mères allaitantes. (*Afr J Reprod Health* 2026; 30 [13]: 101-111).

Mots-clés: salle blanche, travail posté, soutien à l'allaitement en milieu professionnel, poursuite de l'allaitement, mères salariées

Introduction

Studies have consistently shown that difficulties in balancing breastfeeding with work responsibilities are a key contributor to the early termination of breastfeeding among employed mothers.¹⁻⁴ To support continued breastfeeding without compromising professional obligations, workplaces are encouraged to provide essential

accommodations, including paid breast-pumping breaks and access to private lactation spaces.⁵⁻⁹ Evidence further suggests that high-quality lactation rooms are associated with greater maternal satisfaction, improved ease of milk expression, and stronger perceived support from supervisors and coworkers.^{5,7} A systematic review and meta-analysis found that real-time lactation telehealth services—especially proactive or combined proactive/reactive

support by trained professionals—effectively promote exclusive breastfeeding among working mothers.¹⁰ A recent European scoping review also identified employment-related factors that support breastfeeding continuation, including self-employment, flexible schedules in non-manual jobs, access to lactation rooms, supportive peers, and breastfeeding-friendly workplace policies.⁸ Despite study heterogeneity, the literature consistently highlights the need for workplace environments that reduce barriers and promote equity. Together, these findings emphasize that employment characteristics, organizational infrastructure, structural policies, interpersonal support, and educational components must align to enable milk expression at work.

However, even in the presence of such policies, practical barriers often persist. For example, breastfeeding rates among shift workers decline more rapidly than among non-shift workers.¹¹ Night shift employees may face fatigue and sleep disruption, undermining both parenting capacity and breastfeeding continuity.¹² Likewise, mothers in physically demanding or manual occupations are more likely to discontinue breastfeeding due to job-related exhaustion and stress.^{10,13,14} As such, the impact of employment on breastfeeding is multifaceted, encompassing both physical strain and logistical limitations.¹⁵

Constraints are especially pronounced in clean room environments in the electronics and semiconductor industries, where strict hygiene protocols, specialized clothing, and limited mobility restrict access to lactation facilities and regular milk expression. Despite the growing number of women in clean room roles, research on their impact on breastfeeding and workplace support is limited. This study examines the association between clean room work, breastfeeding continuation, policy awareness, and perceived support among employed mothers in a female-dominated electronics company in Taiwan.

Methods

Sample and setting

The survey was conducted between August 2011 and April 2012 at Company C, a large electronics manufacturing enterprise located in the Tainan Science Park, southern Taiwan. With over 20,000 employees—approximately 45% of whom are women—Company C was chosen for its

implementation of government-funded lactation rooms and its workforce diversity, particularly among office and clean room workers, allowing comparison across work settings. At the time of the study, each of the company's ten manufacturing plants was equipped with at least four lactation rooms (up to eleven in the largest plant). Company policy granted mothers with children under two years of age an additional 60 minutes per day for breastfeeding, typically divided into two 30-minute pumping breaks in addition to regular breaks. A site assessment conducted by the research team classified lactation facilities into dedicated rooms—used exclusively for milk expression—and shared spaces that lacked full privacy or served multiple purposes.

Participant recruitment was coordinated through the company's employee health management department. After formal communication and in-person meetings with department leadership, occupational health nurses assisted in distributing and collecting self-administered, paper-based questionnaires. A total of 981 eligible female employees—those who had taken maternity leave between January 2009 and January 2011—were identified through human resources records and invited to participate. Of these, 715 valid responses were received (response rate: 72.9%). To reduce bias associated with inadequate breastfeeding environments, 107 participants with access only to shared lactation spaces were excluded. The final analytical sample comprised 608 employed mothers with access to private, dedicated lactation rooms. Detailed research methodology is reported elsewhere.^{11,16,17}

Data collection

Data were gathered through structured, paper-based self-administered questionnaires, which focused on female employees' demographic and work-related characteristics, breastfeeding behaviors following their return to work, perceived workplace support and policies related to breastfeeding. On average, participants completed the survey in approximately 15 minutes.

Demographic and employment information

Participants provided personal background and employment details through a structured

demographic section. Information collected included age, educational attainment, and partner's educational level. To estimate socioeconomic status, educational level was used as a proxy indicator and categorized into two groups: (1) high school or below and (2) college or above. Work-related variables encompassed the type of worksite (office vs. clean room), shift work status after returning from maternity leave (yes/no), and daily working hours, which were classified as either standard (8 hours) or extended (9–14 hours).

Breastfeeding behavior post-return to work

In this study, breastfeeding continuation after return to work was defined as providing any breast milk for at least one month following return to employment, regardless of whether it was combined with other types of feeding. Participants were asked: "Did you continue to breastfeed after returning to work? (yes/no)" and "How long did you continue to breastfeed? (in months)." In Taiwan, all companies are required to provide eight weeks of maternity leave for female employees. Therefore, we also assessed breastfeeding behaviors during maternity leave by asking: "Did you breastfeed your baby during maternity leave? (yes/no)"

Use of breast-pumping breaks policy

At the time of the study (2011–2012), Taiwanese law guaranteed eight weeks of paid maternity leave, but breastfeeding accommodations—such as pumping breaks and lactation rooms—were recommended rather than mandated. The company voluntarily adopted these measures before later regulations took effect. Mothers were allowed two paid 30-minute pumping breaks per day, in addition to regular meal breaks, and could bring their own pumps to use in designated lactation rooms. To assess utilization, participants were asked whether they regularly used the pumping breaks (defined as more than four days per week) to express milk after returning to work, using the question: "Did you usually (more than four days a week) use the breast-pumping breaks to express breast milk for children after returning to work (yes/no)?"

Workplace lactation facilities and perceived policy support for breastfeeding

All lactation facilities in the company were equipped with basic amenities, including a table, chair, sink,

electrical outlets, and a refrigerator. In line with the company's breastfeeding-friendly policy, mothers were allowed two 30-minute breast-pumping breaks per day, in addition to regular meal breaks. Site visits were conducted to classify lactation rooms into two types: dedicated spaces (private and used exclusively for breastfeeding) and shared spaces (multi-purpose rooms with limited privacy, often separated by curtains in public health rooms). To minimize confounding related to facility quality, 107 respondents with access only to shared spaces were excluded from analysis.

To assess awareness and use of workplace breastfeeding policies, participants were asked whether they had been informed of the pumping break policy, whether they used the breaks, and whether they experienced discomfort or embarrassment. Social support was also evaluated by asking if encouragement came from colleagues, supervisors, or occupational health nurses. Additionally, perceptions of workplace attitudes were measured, including beliefs about whether taking pumping breaks negatively affected job performance, supervisor evaluations, or work efficiency.

Statistical analysis

This study investigated the association between clean room work environments and breastfeeding continuation, perceived workplace support, and awareness of breastfeeding-related policies among employed mothers in a female-dominated electronics manufacturing company in Taiwan. The primary independent variable was worksite (clean room vs. non-clean room), with covariates including age, education, shift work, and daily working hours. Dependent variables included: (1) breastfeeding behavior (during maternity leave and after returning to work); (2) awareness and use of workplace breastfeeding policies (lactation rooms and breast-pumping breaks); (3) perceived support from colleagues, supervisors, and occupational health nurses; and (4) subjective perceptions of pumping break use (e.g., embarrassment, impact on work efficiency, supervisor evaluations). Statistical analyses were conducted using SAS version 9.4, with significance set at $p < 0.05$. Descriptive statistics summarized participants' demographic and employment characteristics. Chi-square tests compared characteristics and breastfeeding behavior

between clean room and non-clean room workers (Tables 1–2). Participants were also categorized into four subgroups by worksite and shift work status to explore differences in breastfeeding behavior, policy awareness and use, perceived support, and attitudes toward pumping breaks (Table 3).

Variables significantly associated with clean room worksite in bivariate analyses ($p \leq 0.05$) were included in multivariate logistic regression models to assess adjusted odds of breastfeeding-related outcomes (Table 4). Models included clean room worksite as the primary predictor, adjusting for age, education, shift work, and working hours. Outcomes included breastfeeding continuation (1–6 months and >6 months), breastfeeding during maternity leave, use of lactation rooms and pumping breaks, perceived workplace support, and perceived impacts of pumping breaks. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using maximum likelihood estimation.

Ethical considerations

Ethical approval for the study was granted by the Institutional Review Board of I-Shou University (approval number: ISU-IRB-100-09; approval date: September 2, 2011), which reviewed and approved all study procedures, instruments, and materials.

Results

Participant characteristics and breastfeeding behavior by worksite

A total of 608 employed mothers who had access to dedicated lactation rooms were included in the final analysis. Table 1 presents the demographic characteristics of participants, categorized by worksite. Compared to those in non-clean room settings, mothers working in clean room environments were significantly less likely to have college-level education or above ($p < 0.0001$), engage in shift work ($p < 0.0001$), and work longer hours per day (≥ 9 hours; $p < 0.0001$). Additionally, fewer clean room workers reported breastfeeding during maternity leave ($p = 0.0118$) and continuing to breastfeed after returning to work ($p < 0.0001$).

Workplace lactation policy awareness, utilization, support, and perceptions by worksite

Table 2 summarizes differences in policy awareness, perceived support, and attitudes toward breast-

pumping breaks between clean room and non-clean room workers. Clean room workers reported lower lactation room use, less awareness of pumping break policies, and fewer daily pumping breaks (all $p < 0.05$). They also received significantly less encouragement from colleagues, supervisors, and occupational health nurses to use lactation rooms and pumping breaks. Additionally, clean room workers were more likely to perceive that taking two breast-pumping breaks would influence supervisors' performance evaluations ($p = 0.0123$).

Combined effects of worksite and shift work on breastfeeding outcomes, policy utilization, and workplace support

Table 3 compares breastfeeding behavior, policy use, and perceived support among four groups based on worksite and shift status. Mothers in clean rooms with shift work had the highest breastfeeding discontinuation rate (62.2%, $p < 0.0001$) and lowest continued breastfeeding beyond six months (18.3%). They also reported the lowest lactation room use (39.4%, $p < 0.0001$) and breast-pumping break utilization (25.1%, $p < 0.0001$). Additionally, this group received less encouragement from colleagues, supervisors, and occupational health nurses for lactation room use, and less colleague encouragement for pumping breaks ($p = 0.0170$).

Multivariate associations between clean room work and breastfeeding-related factors

Table 4 shows multivariate logistic regression results adjusting for age, education, shift work, and work hours per day. Working in a clean room was significantly associated with lower odds of continuing breastfeeding for 1–6 months after returning to work (OR=0.517, $p=0.0076$) and breastfeeding during maternity leave (OR=0.434, $p=0.0273$). Clean room workers were also less likely to use lactation rooms (OR=0.573, $p=0.0068$), be aware of pumping break policies (OR=0.522, $p=0.0112$), and utilize the two daily pumping breaks (OR=0.541, $p=0.0040$). They reported receiving less encouragement from colleagues, supervisors, and occupational health nurses regarding lactation support. In terms of perceived support, clean room workers were less likely to report receiving encouragement from colleagues to use lactation rooms (OR = 0.563, $p = 0.0057$) or pumping breaks

Table 1: Characteristics of the study population by work setting (n = 608)

		Clean room workers (n=301)		Non-clean room workers (n=307)		P-value
Variables		n	%	n	%	
Age (years)	20-29	93	30.9	46	15.0	<0.0001
	≥30	208	69.1	261	85.0	
Education	College or above	185	61.5	254	82.7	<0.0001
	Below college level	116	38.5	53	17.3	
Shift work	Yes	251	83.4	77	25.1	<0.0001
	No	50	16.6	230	74.9	
Work hours per day	8 hours	5	1.7	47	15.3	<0.0001
	9-14 hours	296	98.3	260	84.7	
Breastfeeding during maternity leave	Breastfed during maternity leave	266	88.4	289	94.1	0.0118
	Did not breastfeed during maternity leave	35	11.6	18	5.9	
Continue to breastfeed after returning to work	Stopped	183	60.8	116	37.8	<0.0001
	1-6 months	59	19.6	84	27.4	
	>6 months	59	19.6	107	34.8	

Table 2: Comparison of policy awareness, peer and supervisor support, and perceptions of breast-pumping breaks between clean room and non-clean room work environments

Variables	Total N (%)	Clean room workers N (%)	Non-clean room workers N (%)	P-value
Awareness of the lactation room (Yes)	595 (97.9)	293 (97.3)	302 (98.4)	0.3804
Ever using a lactation room (Yes)	311 (51.2)	122 (40.5)	189 (61.6)	<0.0001
Awareness of breast pumping breaks policy (Yes)	482 (79.3)	226 (75.1)	256 (83.4)	0.0115
Taking two breast pumping breaks per day (Yes)	228 (37.5)	80 (26.6)	148 (48.2)	<0.0001
Colleague support				
-Encouraged lactation room use (Yes)	348 (57.2)	145 (48.2)	203 (66.1)	<0.0001
-Encouraged pumping breaks (Yes)	477 (78.5)	220 (73.1)	257 (83.7)	0.0014
Supervisor support				
-Encouraged lactation room use (Yes)	261 (42.9)	107 (35.6)	154 (50.2)	0.0003
-Encouraged pumping breaks (Yes)	371 (61.0)	177 (58.8)	194 (63.2)	0.2673
Occupational health nurse support				
-Encouraged lactation room use (Yes)	297 (48.9)	121 (40.2)	176 (57.3)	<0.0001
-Encouraged pumping breaks (Yes)	418 (68.7)	196 (65.1)	222 (72.3)	0.0556
Perceived embarrassment when using breast-pumping breaks (Yes)	186 (30.6)	96 (31.9)	90 (29.3)	0.4904
Perceived benefit that two breast-pumping breaks can help working mothers continue breastfeeding (Yes)	568 (93.4)	279 (92.7)	289 (94.1)	0.4722
Perceived impact that two breast-pumping breaks can reduce work efficiency (Yes)	319 (52.5)	175 (58.1)	144 (46.9)	0.0055
Perceived impact that taking two breast-pumping breaks may influence supervisors' performance evaluation (Yes)	270 (44.4)	149 (49.5)	121 (39.4)	0.0123

Table 3: Breastfeeding behavior, peer support, and perceptions of breast-pumping breaks by work environment and shift work status

Variables	Group 1: Clean room workers with shift work N=251 (41.3%)	Group 2: Clean room workers with non-shift work N=50 (8.2%)	Group 3: Non- clean room workers with shift work N=77 (12.7%)	Group 4: Non- clean room workers with non-shift work N=230 (37.8%)	Group Difference X ² test P-value
Continue to breastfeed after returning to work					
Stopped					<0.0001
1-6 months	156 (62.2)	27 (54.0)	40 (52.0)	76 (33.0)	
>6 months	49 (19.5)	10 (20.0)	23 (29.9)	61 (26.5)	
	46 (18.3)	13 (26.0)	14 (18.1)	93 (40.4)	
Breastfeeding during maternity leave (Yes)	224 (89.2)	42 (84.0)	72 (93.5)	217 (94.4)	0.0495
Ever using lactation room (Yes)	99 (39.4)	23 (46.0)	39 (50.7)	150 (65.2)	<0.0001
Awareness of breast pumping breaks policy (Yes)	189 (75.3)	37 (74.0)	68 (88.3)	188 (81.7)	0.0473
Taking two breast pumping breaks per day (Yes)	63 (25.1)	17 (34.0)	28 (36.4)	120 (52.2)	<0.0001
Colleague -Encouraged lactation room use (Yes)	119 (47.4)	26 (52.0)	44 (57.1)	159 (69.1)	<0.0001
Colleague -Encouraged pumping breaks (Yes)	183 (72.9)	37 (74.0)	64 (83.1)	193 (83.9)	0.0170
Supervisor -Encouraged lactation room use (Yes)	89 (35.5)	18 (36.0)	34 (44.2)	120 (52.2)	0.0020
Supervisor-Encouraged pumping breaks (Yes)	150 (59.8)	27 (54.0)	45 (58.4)	149 (64.8)	0.4256
Occupational health nurse -Encouraged lactation room use (Yes)	95 (37.9)	26 (52.0)	38 (49.4)	138 (60.0)	<0.0001
Occupational health nurse - Encouraged pumping breaks (Yes)	161 (64.1)	35 (70.0)	51 (66.2)	171 (74.4)	0.1070
Perceived embarrassment when using breast-pumping breaks (Yes)	79 (31.5)	17 (34.0)	27 (35.1)	63 (27.4)	0.5318
Perceived benefit that two breast-pumping breaks can help working mothers continue breastfeeding (Yes)	236 (94.0)	43 (86.0)	72 (93.5)	217 (94.4)	0.1754
Perceived impact that two breast-pumping breaks can reduce work efficiency (Yes)	147 (58.6)	28 (56.0)	38 (49.4)	106 (46.1)	0.0450
Perceived impact that taking two breast-pumping breaks may influence supervisors' performance evaluation (Yes)	125 (49.8)	24 (48.0)	34 (44.2)	87 (37.8)	0.0642

Table 4: Adjusted odds ratios for factors associated with breastfeeding behavior, peer support, and perceptions of breast-pumping breaks

Variables	Clean room (Yes) Adjusted OR ^a (95%CI)	P-value
Continue to breastfeed after returning to work		
1-6 months vs stopped	0.517 (0.318-0.839)	0.0076
>6 months vs stopped	0.611 (0.372-1.005)	0.0513
Breastfeeding during maternity leave (Yes)	0.434 (0.204-0.899)	0.0273
Ever using a lactation room (Yes)	0.573 (0.382-0.858)	0.0068
Awareness of breast pumping breaks policy (Yes)	0.522 (0.314-0.858)	0.0112
Taking two breast pumping breaks per day (Yes)	0.541 (0.356-0.822)	0.0040
Colleague support		
-Encouraged lactation room use (Yes)	0.563 (0.374-0.845)	0.0057
-Encouraged pumping breaks (Yes)	0.524 (0.316-0.859)	0.0112
Supervisor support		
-Encouraged lactation room use (Yes)	0.611 (0.407-0.914)	0.0168
Occupational health nurse support		
-Encouraged lactation room use (Yes)	0.655 (0.438-0.977)	0.0378
Perceived impact that two breast-pumping breaks can reduce work efficiency (Yes)	1.452 (0.975-2.169)	0.0670
Perceived impact that taking two breast-pumping breaks may influence supervisors' performance evaluation (Yes)	1.377 (0.874-2.023)	0.0734

^a Adjusted for age, education, shift work, and work hours per day.

(OR = 0.524, $p = 0.0112$), as well as from supervisors (OR = 0.611, $p = 0.0168$) and occupational health nurses (OR = 0.655, $p = 0.0378$) regarding lactation room use.

Discussion

This study was conducted in Taiwan's electronics manufacturing sector, where women constitute a substantial proportion of the clean room workforce, making this an important yet underexamined population in breastfeeding research. The findings highlight key structural and psychosocial barriers faced by employed mothers in clean room settings, particularly shift workers, in sustaining breastfeeding and accessing workplace support. Clean room workers were significantly less likely to breastfeed during maternity leave (OR = 0.434) and to continue breastfeeding for 1–6 months after returning to work (OR = 0.517), even after adjustment for demographic and job-related factors. Although the association with breastfeeding beyond six months did not reach statistical significance (OR = 0.611, $p = 0.0513$), the observed trend suggests a persistent disadvantage among clean room workers in sustaining longer-term breastfeeding. They also demonstrated lower awareness of breastfeeding-friendly policies and received less encouragement from colleagues, supervisors, and occupational

health nurses regarding lactation room use. Notably, the lower breastfeeding rate observed even during maternity leave among clean room workers (84.4% vs. 94.1%, $p = 0.0118$; Table 1) suggests that barriers to breastfeeding in this population may extend beyond workplace constraints alone, potentially reflecting differences in breastfeeding knowledge, breastfeeding intention, or social support prior to returning to work.

Clean room environments pose unique challenges—such as strict hygiene rules, specialized attire, and limited mobility—that restrict employees from leaving workstations to express milk. Despite company provisions of multiple lactation rooms and two paid pumping breaks per day, utilization among clean room workers remained low. This gap between policy and practice highlights the importance of workplace culture, accessibility, and supervisory support. Prior studies^{17–20} indicate that occupation and job demand strongly influence breastfeeding outcomes; rigid schedules, frequent travel, and low autonomy increase discomfort and stigma.^{18, 19} Women in professional or managerial roles are more likely to breastfeed, likely due to greater flexibility and institutional support,^{20,21} revealing clear occupational disparities. In the present study, clean room workers were also more likely to have lower educational attainment and to work longer daily hours compared to their non-clean room

counterparts. These factors may compound the structural barriers already present in clean room environments. Lower educational attainment has been associated with reduced breastfeeding knowledge and intention, while extended working hours leave mothers with less time and energy for milk expression, further undermining breastfeeding continuation. Importantly, even clean room workers without shift work (Group 2) showed a notably higher breastfeeding discontinuation rate (54.0%) compared to non-clean room workers without shift work (Group 4, 33.0%), suggesting that the clean room environment itself poses significant barriers to breastfeeding continuation. This finding underscores the need to address the unique physical and operational constraints of clean room settings.

A particularly noteworthy finding of this study is that clean room workers were significantly less likely to breastfeed during maternity leave (OR = 0.434), a period when workplace constraints should not directly apply. This suggests that the lower breastfeeding rates observed among clean room workers cannot be attributed solely to workplace barriers encountered after returning to work. Several factors may account for this finding. First, anticipatory concerns about the difficulty of combining breastfeeding with clean room work may discourage mothers from initiating or sustaining breastfeeding during maternity leave. Research indicates that mothers' expectations about workplace support and the feasibility of milk expression significantly influence their breastfeeding intentions even before returning to work.^{18–19} The lower levels of social support reported by clean room workers from colleagues, supervisors, and occupational health nurses may further reflect a broader workplace culture that is less conducive to breastfeeding, potentially influencing mothers' decisions even prior to their return to employment. Second, clean room workers in this study had lower educational attainment on average, which may be associated with less exposure to breastfeeding education and fewer opportunities to access lactation support resources during the perinatal period. These findings highlight the importance of initiating breastfeeding support interventions before maternity leave ends, rather than focusing exclusively on post-return accommodations.

Our study found that clean room workers reported significantly lower perceived support from coworkers, supervisors, and health personnel,

consistent with prior research showing that negative social norms, fear of stigma, and job evaluation concerns discourage mothers—especially those in production-based, high-visibility roles—from using lactation accommodations.^{22,23} Many avoid requesting schedule adjustments, fearing it signals misplaced priorities.²⁴ A narrative study based on work–family conflict theory found that mothers returning to work within six months postpartum faced heightened conflict due to low milk supply, inflexible schedules, limited workplace support, and minimal paternal involvement, often leading to conflicts with managers or early breastfeeding cessation.²⁵ Of particular concern is the significantly lower awareness of pumping break policies among clean room workers (OR = 0.522), which suggests that existing communication channels for disseminating breastfeeding-related information may be inadequate for this workforce. In environments where workers have limited autonomy and restricted mobility, passive information dissemination—such as posted notices or general company communications—may be insufficient. More targeted and proactive approaches, such as individual briefings by occupational health nurses before returning from maternity leave or peer-led information sessions within clean room units, may be necessary to ensure that all eligible employees are aware of their entitlements and available support resources.

Our findings (Table 3) showed that clean room workers, regardless of shift status, were more likely than non-clean room workers to believe that taking two daily pumping breaks would reduce work efficiency ($p = 0.0450$). Managerial attitudes strongly influence such perceptions.^{26–30} A longitudinal study found that employer support during pregnancy predicted breastfeeding intentions, while negative supervisor remarks increased the likelihood of early cessation of exclusive breastfeeding eightfold.²⁷ Consistent evidence indicates that support from supervisors and colleagues promotes continued breastfeeding after returning to work.^{28–30} Although the associations between clean room work and perceived impacts on work efficiency (OR = 1.452, $p = 0.0670$) and supervisor performance evaluations (OR = 1.377, $p = 0.0734$) did not reach statistical significance in the multivariate analysis, the direction of these odds ratios consistently indicates that clean room workers are more likely to hold such concerns. These trends

are clinically and practically meaningful, as even moderate levels of concern about job performance consequences may be sufficient to deter mothers from utilizing available lactation accommodations. In production-oriented environments where output is closely monitored and linked to performance appraisals, the perceived cost of taking pumping breaks may outweigh the perceived benefits, creating a chilling effect on policy utilization even when formal accommodations exist.

Although many employees are aware of breastfeeding support, clean room workers often face barriers to using these resources due to rigid schedules and limited mobility, reducing policy effectiveness.³¹ Similar patterns appear among blue-collar workers, who underutilize accommodations not from lack of interest but due to inflexible work conditions and limited managerial support. In such settings, supervisors often act as gatekeepers, prioritizing production over employee well-being.³² These issues are most evident among clean room shift workers, who showed the highest breastfeeding discontinuation rate (62.2%) in our study (Table 3). In tech manufacturing, where productivity links to performance bonuses, postpartum employees may feel pressured to skip lactation breaks to avoid workflow disruption.²⁸ Such performance-driven cultures weaken policy impact and exacerbate workplace health inequities. Addressing these barriers requires more than infrastructure—effective implementation depends on clear communication, supervisor training, embedded support systems (e.g., peer advocates or occupational health staff), and fair performance evaluations that do not penalize breastfeeding accommodations. Without cultural alignment, even well-designed policies risk becoming symbolic. Previous research³³ highlights that managerial breastfeeding support should begin before maternity leave and that immediate supervisor support—beyond providing private spaces or milk storage—is crucial for fostering breastfeeding-friendly workplaces. Our findings suggest the need for industry-specific standards, particularly in high-tech and clean room settings. Strategies such as flexible scheduling, clean room-adapted lactation protocols, shift-specific breaks, and on-site support staff can enhance policy awareness and utilization. Equally important is fostering empathy among supervisors and coworkers to create an environment where mothers can take

breaks without fear of judgment. Beyond the Taiwanese context, the findings of this study have broader relevance for occupational health policy in countries undergoing rapid industrialization or with significant female participation in electronics and semiconductor manufacturing. Policymakers and employers in these contexts may benefit from adopting industry-specific breastfeeding support frameworks that go beyond generic workplace lactation policies, incorporating the operational realities of controlled manufacturing environments. Future research should employ longitudinal designs to establish causal relationships, utilize validated instruments to assess workplace breastfeeding support, and explore the role of organizational culture and leadership in shaping breastfeeding outcomes among women in high-demand industrial settings.

Strengths and limitations

One of the major strengths of this study is its focus on clean room work environments, which have been understudied in breastfeeding research, despite the significant number of women working in the electronics and semiconductor industries. The research was conducted in a large manufacturing company that has established workplace lactation facilities, enabling an examination of breastfeeding behavior and the level of workplace support available. Additionally, the study included a relatively large sample of employed mothers and thoroughly evaluated various aspects of their breastfeeding experiences, such as breastfeeding continuation, awareness of policies and their utilization, perceived workplace support, and attitudes toward breaks for breast pumping. Furthermore, the subgroup analysis based on worksite and shift work status provided a deeper understanding of how structural workplace factors might interact to influence breastfeeding outcomes.

This study has several limitations. Its cross-sectional design limits causal inference, and dichotomous variables may oversimplify complex constructs. Self-reported data also raise the risk of response bias. Future studies should use validated instruments to enhance reliability. Despite these limitations, the findings reveal that clean room work is associated with lower breastfeeding rates during maternity leave and up to six months postpartum,

reduced lactation room use, and less workplace support. These results underscore the need for interventions beyond infrastructure—such as supervisor training, clear policies, and institutional support—to reduce stigma. Industry-specific strategies, including flexible scheduling and clean room-adapted lactation practices, are essential to support breastfeeding and promote inclusive, health-supportive workplaces.

These findings have important implications for workplace policy and occupational health practice. The availability of facilities alone may be insufficient without supportive organizational culture and practical implementation strategies. Policymakers should consider strengthening monitoring and implementation mechanisms to ensure that workplace breastfeeding policies are not only available in principle but also accessible and feasible in practice, particularly for women working in highly regulated and production-oriented environments.

Conclusion

This study examined the relationship between clean room work environments and breastfeeding outcomes among employed mothers in Taiwan's electronics industry. Despite access to certified lactation rooms, clean room workers had lower breastfeeding continuation, lower awareness and use of breastfeeding-related policies, and lower perceived workplace support than non-clean room workers. Mothers in clean rooms with shift work experienced the greatest difficulties in maintaining breastfeeding. The findings suggest that providing lactation facilities alone may be insufficient in clean room environments, highlighting the need for supportive workplace culture, flexible implementation strategies, and stronger supervisor and coworker support to improve breastfeeding outcomes.

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Authors' contributions

The author makes substantial contributions to conception and design, acquisition of data, analysis

and interpretation of data, and participates in drafting the article.

Conflict of interests

The author has no conflict of interest, financial or otherwise.

Data availability

The datasets used during the current study are available from the corresponding author on reasonable request.

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