

***Urinary tract infection
among clean room
workers—An intervention on
the health effect of a
controlled environment***

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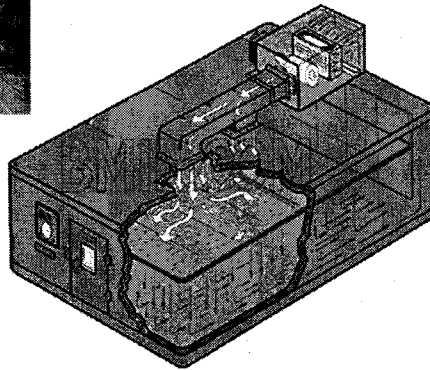
Introduction

- Urinary tract infections (UTIs) are prevalent in women.
- The causes of high prevalent UTIs in female include a shorter urethra and a common opening of urethra and vagina, which may cause ascending infection into bladder by autoinoculation.

Introduction

- Many young female workers are engaged in high-tech electronic and optoelectronic industries and work in clean room environments.
- These female workers are prone to UTIs due to the inconvenience in urine voiding.

Clean Room



Standard Outfit in Clean Room



Introduction

- **Our previous study in 2001 showed female clean-room workers have a higher UTI prevalence (6.2% vs. 2.5%, $p = 0.008$).**
- **Less drinking water intake and voiding frequencies were observed among clean-room workers.**

Table 1. Comparison of clean-room and non-clean-room workers

Characteristic	Clean-room Worker		Non-clean-room Worker		p
	Number	(%)	Number	(%)	
Women	494	(71.3)	144	(39.9)	< 0.001
Age (yr)					< 0.001
< 20	70	(10.1)	5	(1.4)	
20-24	272	(39.3)	42	(11.6)	
25-29	207	(29.9)	129	(35.7)	
> 29	144	(20.8)	185	(51.3)	
Water intake during shift					< 0.001
0-1 time	131	(18.9)	86	(23.8)	
2 times	247	(35.6)	44	(12.2)	
3 times or more	315	(45.5)	231	(64.0)	
Urine voiding during shift					< 0.001
0-1 time	69	(10.0)	72	(19.9)	
2 times	236	(34.1)	50	(13.9)	
3 times or more	388	(56.0)	239	(66.2)	
Urinary tract infection	43	(6.2)	9	(2.5)	0.008

Wang J-N, Su S-B, Guo H-R. Urinary tract infection among clean-room workers. *Journal of Occupational Health* 2002; 44:329

Aim

- A group health interventional education program was implemented in the female clean room workers, aiming at increasing the frequencies of water intake and urine voiding during work shift.
- We conducted a follow-up study to evaluate the effects, including changes in behaviors and the prevalence of UTI.

Program of Intensive Health Education
(since Jan, 2002)

- 1. Health education for all new employees in the new employee orientation: prevent UTI by drinking sufficient water (more than 2000 ml for 1 work shift), frequent urine voiding, and no voluntary urinary retention.**
- 2. Health education lectures on “Female urinary tract infection prevention” for each employee during seasonal training courses.**

Program of Intensive Health Education
(since Jan, 2002)

- 3. Provide medical consultation for employees with UTI and one-to-one health education by occupational nurse.**
- 4. Disseminate information on UTI prevention measures through posters, e-mail, and oral communications.**

Study Population

- We conducted a follow-up study and recruited workers from the same optoelectronic factories located in the Tainan Science Park that received the annual routine health examination during August 1 and September 30, 2003.

Study Population

- In this period, 2,495 female workers from four factories received the health examination at the clinic of the park.
- But 829 were excluded due to pregnancy, menstruation period, or history of urinary stones or trauma to the uro-genital tract.
- Among the remaining 1,666 qualified participants, 1,414 were clean room workers and 252 were non-clean room workers.

Questionnaire

- Demographic data.
- Work history.
- Past history of urinary tract system (trauma, remote infections, or stones), and clinical symptoms of UTI (voiding frequency, urgency, burning sensation during voiding, *etc.*).
- Frequencies of water intake and urine voids during a typical workday (shift).

Clinical Evaluations

- **Urinalysis.**
A midstream freshly voided urine sample for dipstick tests (nitrite, leukocyte esterase, protein, occult blood, pH, specific gravity, *etc.*) and other urine routine examinations, including gross appearance and microscopic examination of the centrifuged urinary sediment (for white blood cells, red blood cells, bacteria, and other abnormalities).
- **Physical examination.**

Case Definition

(Symptomatic UTI)

- With clinical symptoms or signs of UTI (voiding frequency, urgency, burning sensation during voiding) over the last three weeks , and urinalysis revealed more than 10 WBCs per high power field (pyuria) or bacteria (bacteriuria).
- Currently under the treatment for UTI.

Demographic characteristics of study population

Characteristic	Clean Room Workers (n=1,414)	Non-clean Room Workers (n=252)	p-value
<i>Marriage</i>			
Unmarried	1146 (81.3%)	175 (69.5%)	< 0.01 ^a
Married	265 (18.7%)	77 (30.5%)	
<i>Age (years old)</i>			
< 24	606 (42.6%)	33 (13.1%)	< 0.01 ^a
24-27	461 (32.6%)	81 (32.1%)	
28-30	191 (13.5%)	72 (28.6%)	
> 30	156 (11.0%)	66 (26.2%)	
<i>Employment years (years)</i>			
0-2	435 (30.7%)	56 (22.2%)	< 0.01 ^a
3-4	608 (43.0%)	100 (39.7%)	
> 5	129 (9.1%)	55 (21.8%)	

Demographic characteristics of study population.

Characteristic	Clean Room Workers (n=1,414)	Non-clean Room Workers (n=252)	p-value
<i>Water intake during shift</i>			
0-1time	101 (7.1%)	17 (6.7%)	< 0.01 ^a
2 times	318 (22.5%)	24 (9.5%)	
3 times or more	992 (70.2%)	194 (77.0%)	
<i>Urine voiding during shift</i>			
0-1time	14 (1%)	11 (4%)	< 0.01 ^a
2 times	179 (13%)	13 (5%)	
3 times or more	1221 (86%)	217 (91%)	
<i>Urinary tract infections</i>			
Normal	1231 (87%)	219 (87%)	0.99 ^a
Asymptomatic UTI	171 (12%)	31 (12%)	
Symptomatic UTI	12 (1%)	2 (1%)	
<i>Urine pH</i>	5.84 ± 0.79	5.92 ± 0.83	0.12 ^b

Longitudinal Follow-up

- 366 workers were recruited in both the 2001 and 2003 studies.
- Each participant served as her own control.

Behavior Modification: Water intake

The proportion of participants who drank water 3 times or more during a shift increased (48.9% vs. 72.4%, $p < 0.001$ by McNemar test)

Intervention		2001	2003	Total
2001	≥ 3 times	25(6.8%)	154(42.1%)	179(48.9%)
	Total	101(27.6%)	265(72.4%)	366(100%)

* McNemar's test

Behavior Modification: Urine voiding

After Intervention 2003

p^*

Participants who had urine voiding 3 times or more also increased (60.4% vs. 87.2%, $p < 0.001$).

intervention		2001	2003	Total
2001	≥ 3 times	16(4.4%)	205(56.0%)	221(60.4%)
	Total	47(12.8%)	319(87.2%)	366(100%)

* McNemar's test

Reduced UTIs

The workers have achieved effective health behavior modification.

Before Intervention 2001	UTI	2(0.5%)	34(9.3%)	36(9.8%)
	non-UTI	4(1.1%)	326(89.1%)	330(90.2%)
	total	6(1.6%)	360(98.4%)	366(100%)

* McNemar's test

Conclusions

- Drinking less or infrequently is a common practice to avoid the need of going to bathroom during work shift and that may increase the risk of developing UTI.
- Intensive health education can improve the behavior: void frequently, drink more water, and avoid voluntary urine retention.

Implications

- **This is a study to confirm the relations of female UTI to urine voiding in an actual occupational setting.**
- **Intensive health education and behavior modification are technically feasible and effective to reduce UTI among all female workers in occupational settings.**

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