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Original article

Nephrolithiasis screening for people with self-perceived exposure to melamine-contaminated milk products in Taipei County, Taiwan

Jeng-Cheng Wu [a,*], Fu-Li Chen [b]

[a] Department of Urology, Taipei Medical University Hospital, Taipei, Taiwan
[b] Department of Public Health, College of Medicine, Fu Jen Catholic University, New Taipei City, Taiwan

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ABSTRACT

Objective: The outbreak of renal diseases caused by melamine-contaminated milk products in China in 2008 was one of the most serious food safety events in recent years. Because of the heavy volume of trade between Taiwan and China, the Taiwanese government was very concerned about its effects on the Taiwanese people, and conducted a nephrolithiasis screening program in government hospitals. We report the results of the screening program conducted by the Taipei County Hospital, Taiwan.
Methods: Residents of Taipei County, Taiwan who perceived that they had exposed themselves to melamine-contaminated milk products, self-referred to Taipei County Hospital for nephrolithiasis screening from September 24, 2008 to September 30, 2008. Plain abdominal radiography and urinary analysis were provided, and the final diagnosis of nephrolithiasis was confirmed with renal ultrasound examination. Their urine analysis results were compared with those of other people who underwent health screening at the same hospital in September 2008.
Results: A total of 721 participants were included in the program, of which 33 were diagnosed to have nephrolithiasis, representing an overall prevalence of 4.6%. After adjusting for age and sex according to the census data of Taipei County, the prevalence of nephrolithiasis was 5.1% in all and 6.5% among adults; these figures did not exceed the prevalence rate in the general adult population of Taipei County (9.2%) and among all Taiwanese adults (9.6%), based on a previous nationwide survey conducted in Taiwan.
Conclusion: These results suggested that governments can carry out a good risk communication program in relation to melamine-contaminated milk product events, and thus reassure the public as well as allay fears over perceived health risks stemming from such events.

1. Introduction

The outbreak of renal diseases caused by melamine-contaminated milk products (MCMPs) in China in 2008 was one of the most serious food safety events in recent years. According to the official report by the Chinese government, about 294,000 infants were affected, of which >50,000 were hospitalized, and six eventually died.[1] This highlighted the fact that large amounts of milk products imported from China were consumed in Taiwan. Furthermore, some of the milk products manufactured in Taiwan were also contaminated because of the contaminated raw materials that came from China. This train of events was extensively covered by the Taiwanese media on September 23, 2008, leading people in Taiwan to panic over the health effects of MCMPs. The Taiwanese government, concerned about their effects on Taiwanese consumers, instructed government hospitals to conduct a nephrolithiasis screening program (NSP) starting on September 24, 2008. Therefore, the main purposes of this study were to explore the effects of MCMPs on the residents of Taipei County (has been promoted as one of the municipalities of Taiwan called as New Taipei City since December 25, 2010), Taiwan, through the NSP, as well as to draft a list of suggestions to the Taiwanese government.

2. Materials and methods

Residents of Taipei County who perceived that they had exposed themselves to MCMPs, self-referred to the Taipei County Hospital (has been reorganized and re-entitled as New Taipei City Hospital since 2010) for nephrolithiasis screening from September 24, 2008 to September 30, 2008. Plain abdominal radiography and urinary analysis (urine pH, specific gravity, RBC (red blood cell) and WBC

* Corresponding author. Department of Urology, Taipei Medical University Hospital, No. 252, Wu Hsing Street, Taipei 110, Taiwan, ROC.
E-mail address: wujengcheng@mail.yahoo.com.tw (J.-C. Wu).

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(white blood cell) count by microscopic examination) were provided, and the final diagnosis of nephrolithiasis was confirmed with renal ultrasound examination. The urine analysis results of NSP participants were compared with those of other people who underwent health screening at the same hospital in September 2008. The main statistical methods used in this study consisted of the Chi-square test (to test the categorical data), binary logistic regression (to adjust the variables of age and sex), and *t* test (to test the continuous variables). The analyses were done using SPSS version 14.0 software (SPSS Inc., Chicago, IL, USA). The prevalence of nephrolithiasis was adjusted for age and sex according to the census data of Taipei County, and compared with that of the general population based on a previous nationwide survey conducted in Taiwan.

Research ethic approval

This research was reviewed and approved by the Human Experiment and Ethics Committee at Taipei County Hospital in Taiwan (NO. TPCH-IRB-9906).

3. Results

A total 721 participants were enlisted, which consisted of 280 males and 441 females, aged 0 to 94 years (mean = 32.70 years; standard deviation = 21.58 years). After the NSP, 33 individuals were diagnosed to have nephrolithiasis, comprising 20 males and 13 females (age range, 8–84 years) with a mean age of 48.45 years (standard deviation = 15.51 years); the overall prevalence was 4.6% (7.1% in males and 2.9% in females). After adjusting for age and sex according to the census data of Taipei County, the prevalence of nephrolithiasis was 5.1% (7.3% in males and 2.9% in females) in all and 6.5% (9.6% in males and 3.5% in females) among adults (≥ 20 years old). These figures did not exceed the prevalence rate for the general adult population in Taipei County (9.2%) and all Taiwanese adults (9.6%), based on a previous nationwide survey conducted in Taiwan.[2] The prevalence of nephrolithiasis in our study showed a trend for male predominance and increased with increasing age; the highest rate was found in the age group of 60–69 years (Table 1).

Based on the NSP results, the trends in age and sex were similar to those reported in a previous study.[2] Those who were confirmed to have nephrolithiasis were significantly older than non-nephrolithic individuals (average age, 48.45 years vs. 31.94 years, $p < 0.001$) and those with more hematuria (age- and sex-adjusted OR, 8.25; 95% confidence interval, 3.34–20.39) and pyuria (age- and sex-adjusted OR, 2.60; 95% confidence interval, 1.02–6.64). The pH value and specific gravity of urine were similar in both groups (Table 2).

Table 2
Characteristics of NSP participants with or without nephrolithiasis.

	Nephrolithic ($n = 33$)	Non-nephrolithic ($n = 688$)	t/χ^2	p
Sex (male/female)	20/13	260/428	6.901	0.009
Age (y)	48.45 ± 15.506	31.94 ± 21.553	5.853	<0.001
Urine analysis	$n = 31$	$n = 652$		
pH	6.177 ± 0.541	5.991 ± 0.660	1.548	0.122
Specific gravity	1.016 ± 0.008	1.017 ± 0.009	−0.547	0.566
Pyuria cases[a]	7 (22.6)	74 (11.3)	3.571	0.059
Hematuria cases[b]	9 (29.0)	33 (5.1)	29.464	<0.001

Data are presented as *n* (%) or mean ± SD.
NSP = nephrolithiasis screening program; HPF = high power field; WBC = white blood cell; RBC = red blood cell.
[a] Urine analysis: WBC≧5/HPF.
[b] Urine analysis: RBC≧5/HPF.

Table 3
Urine analysis of NSP screen group and control group.

	Screen group ($n = 683$)	Control group ($n = 282$)	t/χ^2	p
Sex (male/female)	263/420	116/166	0.578	0.447
Age (y)	33.94 ± 21.18	50.86 ± 12.55	−15.352	<0.001
Urine pH	5.999 ± 0.656	6.066 ± 0.685	−1.049	0.159
Pyuria cases[a]	81 (11.9)	38 (13.5)	0.482	0.488
Hematuria cases[b]	42 (6.1)	11 (3.9)	1.944	0.163

Data are presented as *n* (%) or mean ± SD.
NSP = nephrolithiasis screening program; HPF = high power field; WBC = white blood cell; RBC = red blood cell.
[a] Urine analysis: WBC ≥5/HPF.
[b] Urine analysis: RBC ≥5/HPF.

Finally, we compared the urine analysis results of NSP participants to those of 282 individuals who visited Taipei County Hospital for health screening in September 2008. There was no significant difference between the two groups (Table 3).

4. Discussion

Melamine is an organic compound with the appearance of a whitish powder and is partially soluble in water at room temperature. It was first synthesized by German chemist Justus von

Table 1
Prevalence of nephrolithiasis following MCMP events based on results of an NSP conducted by Taipei County Hospital between September 24, 2008 and September 30, 2008.

Age group (y)	Male		Female		Total	
	Crude prevalence	Adjusted prevalence[a]	Crude prevalence	Adjusted prevalence[a]	Crude prevalence (*n*)	Adjusted prevalence[b]
0–9	0.0 (0/95)		2.1 (2/97)		1.0 (2/192)	1.0
10–19	0.0 (0/13)		0.0 (0/19)		0.0 (0/32)	0.0
20–29	0.0 (0/19)		0.0 (0/42)		0.0 (0/61)	0.0
30–39	6.8 (3/44)		1.0 (1/96)		2.9 (4/140)	3.9
40–49	18.4 (9/49)		5.5 (4/73)		10.7 (13/122)	11.7
50–59	12.9 (4/31)		3.9 (3/76)		6.5 (7/107)	8.2
60–69	22.2 (4/18)		6.9 (2/29)		12.8 (6/47)	14.2
≥70	0.0 (0/11)		11.1 (1/9)		5.0 (1/20)	5.5
Total	7.1 (20/280)	7.3	2.9 (13/441)	2.9	4.6 (33/721)	5.1
<20	0.0 (0/108)	0.0	1.7 (2/116)	0.9	0.9 (2/224)	0.4
≥20	11.6 (20/172)	9.6	3.4 (11/325)	3.5	6.2 (31/497)	6.5

Data are presented as %, or % (*n*/*N*), unless otherwise indicated.
MCMP = melamine-contaminated milk products; NSP = nephrolithiasis screening program.
[a] Adjusted for age according to the census data of Taipei County.
[b] Adjusted for age and sex according to the census data of Taipei County.