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splashed vomitus; via touching contaminated surfaces [4-5]; or through personal contact from caregivers. In addition, the ill food handlers may also contaminate food to cause outbreaks by direct or indirect transmitting the virus through the fecal-oral route [6-7].

Norovirus infection has an average incubation period from 12 to 48 hours [6]. The most common symptoms are vomiting and diarrhea with low-grade fever, muscle ache, fatigue, some respiratory symptoms, and occasional headache and abdominal pain. The symptoms usually persist 12 to 60 hours and subsequently recovering. Infected persons remain contagious after recovery for 3-14 days, and the virus even can be continuously detected from feces in 28 days [8-9]. Death may occur if infection in the immunocompromised population with severe dehydration.

Norovirus clusters have become important nosocomial infection problems. Once the diarrhea cluster breaks out in hospital, it may often lead to significant

impact on the patient care and hospital finance [6], especially common in densely populated institutions like schools [1], psychiatric wards [2,10], intensive care units, elderly wards [11], and elderly care centers [5,12].

Event background

The hospital mainly admitted the acute/chronic mental illness patients and drug-abuser/alcoholism cases, sheltering about 820 residents. The hospital building has 12 floors. The first floor is outpatient clinic; the third floor is for administration and day care; the fourth is for occupational therapies; the second and fifth to eleventh floors are wards; and the twelfth is staff dormitory. Occupational therapies were arranged 3 to 4 times weekly for who with good autonomous behaviors assessed by doctors. They can participate crafts or play balls in the sport room, therefore residents had opportunities to contact with each other during occupational therapies.

This event occurred at the 2A, 5B, 6A, 6B and 8A wards on the second, fifth, sixth and eighth floors. The 2A was an elderly ward; the 5B ward was for drug addicts/alcoholic rehabilitation; the 6A and 6B were female wards; the 8A was a general ward. Each ward admitted about 50 residents. Rooms were classified into single-, double- and quad-rooms. Every room had a bathroom, except the 6A and 6B wards sharing the bathroom. Food supplied by hospital's central kitchen, and residents had meals at activity rooms of each ward. Environmental sanitation was well. Residents drank from the drinking fountain in their own cup, but they sometimes shared cups and cigarettes.

Nurses worked in certain floors without changing or rotating work areas, while 29 staff are doctors, occupational therapists, social workers, secretaries and cleaners would work through the second, fifth, sixth and eighth floors.

Case definition

When health authorities conducted outbreak investigations, due to most residents had mental illness were unable to describe their diarrhea condition in detail, they could only use the diarrhea times on nursing records as reference. A cluster-associated case was defined as a patient who had diarrhea at least

twice or diarrhea with vomiting during March 24 to April 12, 2010.

Epidemic scale

From March 24 to April 12, 2010, a total of 37 residents on the second, fifth and sixth floors and a night shift physician on the eighth floor presented diarrhea and vomit. The total attack rate for residents was 18.5% (37/200). Room settings of diarrhea cases in each ward were displayed in Figure 1. Diarrhea was the predominant symptom accounted for 97.3% (36/37); followed by vomiting, 19% (7/37); fever was only found for 2.7% (1/37).

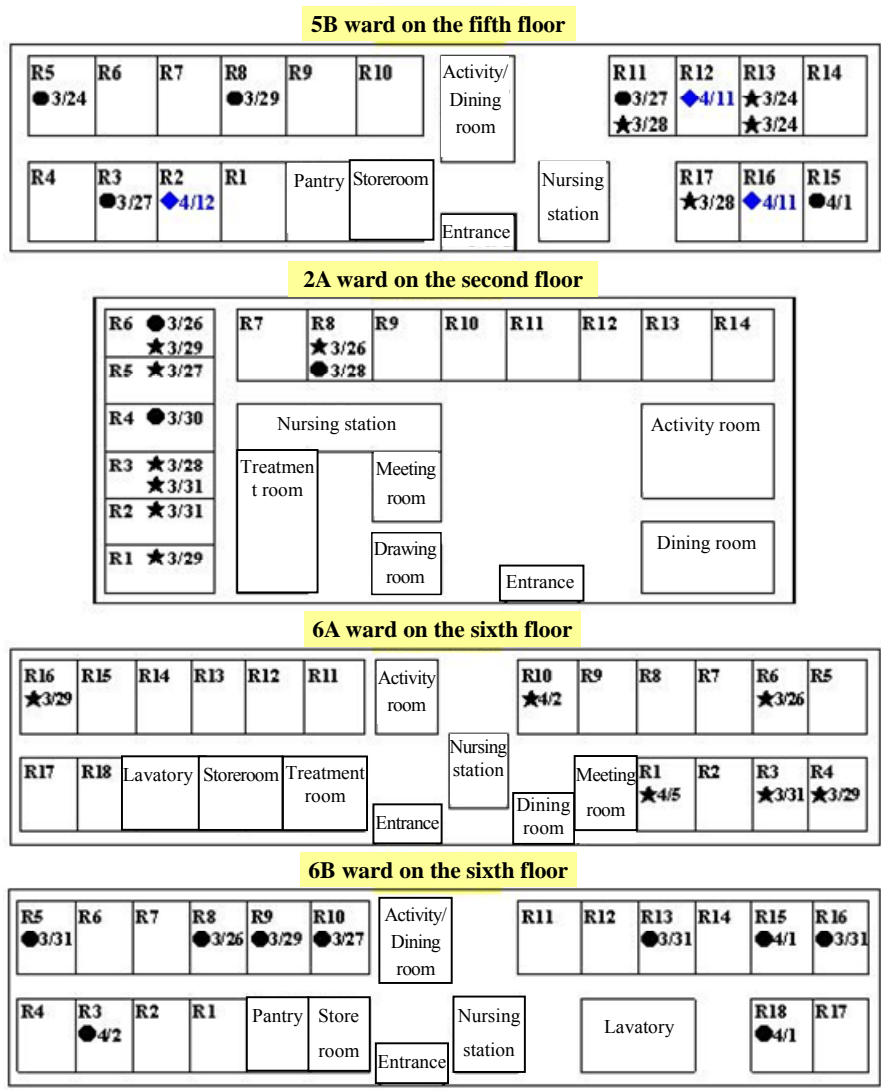


Figure 1. Diarrhea cases distribution in psychiatric wards in hospital
 Note: ● diarrhea case
 ★ case who participated in occupational therapy
 ◆ second wave outbreak case

The epidemic curve based on onset dates of 37 cases in each ward was displayed in Figure 2. The attack rates were 20% (10/50) in 2A ward, 24% (12/50) in 5B ward, 12% (6/50) in 6A ward, and 18% (9/50) in 6B ward, respectively. Statistically, 46% (17/37) of ill residents had participated in occupational therapies.

Specimen collection and test results

Local health bureau took rectal swabs and stool from four patients with persistent diarrhea on March 31 for bacterial test including *Vibrio cholerae*, *Vibrio parahaemolyticus*, *Shigella sonnei* and *Salmonella*, and virus test including norovirus and rotavirus. Test results were negative for four samples in bacterial test and 3 positive for norovirus in virus test.

Control measures

After the outbreak, health authorities received the notification and recommended control measures with physicians of infectious disease on March 31, and

requested the hospital to take the relevant infection control measures in accordance with the "Guidance of control measures for norovirus infection", then suspended occupational therapies since April 1. The implementation of control measures were as follows:

A. For residents

1. To separate ill patients and ask them to wear masks since March 31, and lift the restriction when symptoms relived for 2-3 days. The contacts who share rooms with any cases had to be separated and monitored for 3 days (incubation period).
2. To enhance healthy habits for residents on hand washing before eating and after using the toilet, and stipulate them for washing hand every two hours and making records.
3. To strengthen the health education of not sharing cups, food or cigarette.
4. Residents have to place cups at nursing station and fetch when necessary to avoid cup sharing.

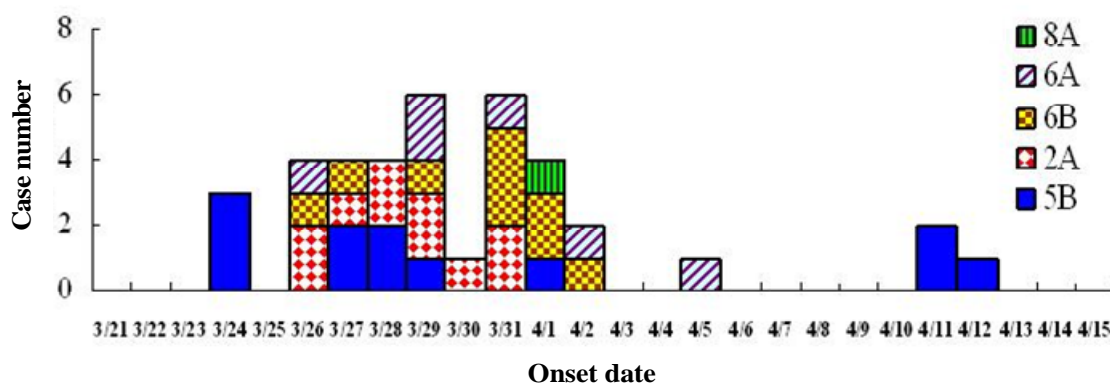


Figure 2. Epidemic curve of the diarrhea cluster in psychiatric wards in hospital

Note: Timing of control measures involved
 March 31 To launch comprehensive infection control measures
 April 1 To suspend occupational therapies
 April 12 To strengthen implementation of control measures

B. Group activities and for visitors

1. To stop all residents' group activities, occupational therapies and exercises at stadium during outbreak to avoid norovirus infection via direct or indirect contact.
2. To control and manage the visitors and teach them to take protective measures.

C. For environment

1. To prepare bleach solution to clean and sterilize the wards, especially surfaces of door handles and stuff in lavatories that the patients easy to access should be disinfected regularly.
2. To totally disinfect the areas for residents' group activities, occupational therapies and sport exercises and establish the standard operating procedures for cleansing these areas including training equipments for occupational therapies, desktop, railings, handles, etc.

D. For staff

1. To ask nurses, security guards, outsourcing cleaner, and caretakers for wearing masks, gloves, and carrying out the hand hygiene and infection control measures.
2. To disinfect with bleach on personal protection equipment according to procedures of dealing infectious waste when handling patients' excreta and contaminant, and enforce hand hygiene.
3. To manage and arrange staff to take care of diarrhea cases during the outbreak and promptly stop duties when diarrhea symptoms occurred.

After the control measures implemented, the hospital had detected no further diarrhea cases since April 5. However, a second wave of outbreak appeared from April 11 to April

12, while three cases increased in the 5B ward that might be induced by incompletely disinfection and isolation. The hospital was requested on April 12 to exactly implement at (1) strengthening the inspection of daily cleaning and disinfection, additionally sterilizing the visitor rooms at least twice a day; (2) extending quarantine up to 7-14 days after diarrhea stopped; (3) observing the suspected symptoms on residents before they returned to hospital and separating the suspects; (4) health examination and quarantine in advance for new residents who admitted during the outbreak.

Finally, health authorities demanded the hospital to continuously monitor residents' health status and notify immediately if find any suspect cases with diarrhea symptoms. After strengthening the implementation of these prevention measures, no more cases occurred since April 13, and health units also concluded the monitoring and tracing of the outbreak on April 20.

Discussion

A. Transmission speculation

The transmitting of diarrheal clusters can be either common sources exposure and human-to-human contact transmission [3]. For speculating the possible transmission in this event, we first investigated several common sources of infection.

With regard to food, there had been norovirus infection clusters caused by ingesting oysters in UK, France, and Norway [7,13], while norovirus also had been detected in seawater of northern Taiwan [14] that could be contained in food ingredients in Taiwan. With investigation, the barrel meals

supplied by hospital's central kitchen and distributed to each wards at A and B buildings of the hospital. As only 37 residents in psychiatric wards on the second, fifth, sixth floors of A building experienced diarrhea, the possibility of infection by food supply was excluded. As for the drinking water, the hospital used pipe water and the drinking fountains set on 1-12th floors were the only drinking source for the residents. Since diarrhea cases had not been covered all residents in the buildings, drinking water was excluded as the of infection source.

In viewing the distribution of diarrhea cases in each ward (Figure 1) and the epidemic curve (Figure 2), we noticed four cases disclosed in the 2A, 6A and 6B wards on March 26 subsequent to three cases detected in the 5B ward on March 24, within 15-48 hours interval, which was consistent with incubation period of norovirus infection [8]. Afterward another 30 cases successively occurred in the 2A, 6A, 6B and 5B wards showed a single peak distribution between the date of March 26 to April 2, however, the irregular distribution of this peak resembled to the mode of human-to-human transmission, suggesting the possible transmission as following:

1. Group activities of occupational therapies increased opportunities for contact.

When three diarrhea cases first appeared in the 5B drug addicts /alcoholic rehabilitation ward on March 24, the staff was unaware that it could be a diarrhea cluster caused by norovirus and didn't immediately launch a comprehensive infection control

measures because drug addicts and alcoholic regularly used laxatives during treatment. Therefore within the incubation period, four diarrhea cases arose in the 2A, 6A and 6B wards on March 26, and diarrhea clusters broke out in 2A, 6A, 6B and 5B wards hereafter. Analysis of wards association revealed that 60.7% (17/28) cases in the 5B, 2A and 6A wards (except the 6B ward) had participated in occupational therapies; particularly all cases in the 6A ward were involved. In addition all occupational therapies in the hospital were confined on the fourth floor, suggesting as a way to spread the outbreak.

2. Contaminated surfaces of objects in wards, lavatories and public areas caused direct or indirect contact.

Researches illustrated that norovirus could spread out by touching surfaces of seven different items (door knobs, telephone handsets, etc.) in succession [4-5]. Upon inspection, the objects like assistive devices and desktop (except the floor) in the occupational therapy rooms were not contained in the daily clean scope, and residents in the 6A and 6B wards shared public bathrooms that increased opportunities for contact infection. Besides, rooms in the 2A, 6A, 6B and 5B wards and public areas like occupational therapy rooms shared same cleaning staff and tools such as mops, buckets and rags. Thus incomplete sterilization on object surfaces during the outbreak and sharing cleaning tools were likely factors of forming transmission routes.

3. Ill cases with preference for interaction with other people or with poor ability of self-care would raise the risk of human-to-human transmission.

Analysis of the two outbreak waves in the 5B ward, the initial three cases with the onset on March 24 had frequent interaction with each other and had shared cigarettes as well as had taken part in occupational therapies. After the hospital launched comprehensive infection control measures on March 31 and suspended the group activities of occupational therapies on April 1, there had no further cases since April 6. However, following a five days free interval, the 5B ward experienced the second outbreak wave from April 11 to April 12 while three cases became ill. The three cases (A, B, C) were investigated. Case A from Room R16, an acute psychotic, who would take or eat others' stuff, was believed to be affected by contact. Case B from Room R12, a new resident admitted on April 6, went out for medical consultation on April 9 and April 10 during hospitalization. It was initially presumed that Case B was classified as nosocomial transmission with low probability of imported infection as cases concentrated at the right side of 5B ward especially around the Room R12. Case C from Room R2 who accomplished quarantine on April 2, was close to Case D from Room R11 with onset date of March 27. Since asymptomatic carriers of norovirus could spread the virus for up to 14 days to cause secondary infection [3,8], it was suggested that Case C remained contagious to Cases D although recovered

for three days after isolation period.

As for the 6A ward, two days after April 2, a case emerged on April 5 due to an active patient who would invite residents to join in occupational therapies and would assist in environment cleaning or bathing other residents including the case occurred on April 5 above-mentioned. Hence in psychiatric wards, besides implementing the infection control measures during outbreak, to extend quarantine period according to characteristics of cases and to avoid contact with others become an essential control as well.

Another analysis on possible causes of the diarrhea cluster at right six rooms in the 2A elderly ward and the night shift doctor of the 8A ward (took spells at 6A, 6B and 8A wards) appeared diarrhea symptom on April 1st assumed indirect infection since residents in the 2A ward needed caretakers for mobile assistance and the 8A physician with low awareness didn't fulfill infection control measures.

B. General evaluation

The most likely transmission route of this event was determined to be human-to-human transmission through direct or indirect fecal-oral, droplets or vehicle spread.

The cleaning staff didn't follow the principles of environmental surface cleaning and disinfection. The tools and gloves they use, without complete disinfection and without replacing cleaning tools, if clean up the ground, toilets and other public areas on different floors, might indirectly lead to the transmission when direct or indirect accessed to the objects contaminated by carriers'

excreta or vomitus (such as diapers, toilets, clothing, etc.) [4-5].

Moreover, staff with low awareness to implement infection control measures, the hospital failed to immediately suspend the group activities of occupational therapies, ill residents shared cigarettes and cups and participated in group activities of occupational therapies, all of these contributed the transmission. And in psychiatric wards, active residents and patients who liked to contact with others went through inadequate quarantine span would trigger the secondary infection.

Infection control and preventive recommendations

Norovirus can be excreted as long as two weeks, with low minimal infective dose (1-10 virus particles can cause infection) and can survive in environment for at least 12 days [3,8], as well as can tolerate high concentration of chlorine and survive under the temperature range 0-60°C, so that it is difficult to sterilize. It can also be transmitted by droplets, contact or indirectly contaminate environment and cause infection, forming diarrhea clusters in long-term care facilities [6,15].

It is suggested that densely populated institutions should keep high vigilance during epidemics of viral gastroenteritis to establish a daily syndromic surveillance on residents for early detection and prompt implementation of infection control measures, carry out patient isolation and environmental disinfection, and avoid direct or indirect contact that leading cross infections. In addition to take relevant infection control measures according to

"Guidance of control measures for norovirus infection"[16], following the investigation and evaluation of the incident we propose to psychiatric hospitals in disease prevention as the following:

A. Complete quarantine according to residents' characteristics

1. To forbid residents to share cups, cigarettes and food. For residents with poor ability of self-care in psychiatric hospitals, staff is recommended to conduct their hand washing regularly and increase the frequency on patrol in order to educate them in hygiene and maintain a clean environment at any time.
2. To specifically manage the residents with poor ability of self-care (poor of personal hygiene, independence and compliance) or with lively characteristics who may invite residents to join in group activities and assist in environment cleaning or bathing other residents during outbreak in order to avoid them becoming transmissible source if they were infected and still contact with others everywhere. Cases with diarrhea symptoms should be completely quarantined even though get remission without diarrhea symptoms and lifted until 7-14 days so as to avoid secondary infection.
3. To pay attention to patients who take laxatives in drug addicts/alcoholic rehabilitation wards and check their defecation status to distinguish the diarrhea cases.

B. Management on group activities of occupational therapies

1. To particularly notice and manage the

sites of occupational therapies or group activities which tend to be transmitting source during outbreak, and timely suspend occupational therapies or group activities to avoid contagion.

2. To fully disinfect the environment and materials in public areas of occupational therapies and group activities every day including aids, equipment, desktop, handrails, the buttons, and door handles in occupational therapy rooms.

C. Entry and exit control on residents

1. To inquire families whether suspected symptoms appeared during homestay while a resident returns to hospital, and settle him in an isolation room if ill or in a general room if asymptomatic.
2. To query whether any family member has suspected symptoms before a resident plans to come home, and postpone the homestay if any family member is ill. For those residents allowed to homestay, the hospital should well communicate with families and educate about personal hygiene and hand washing habits in the outbreak period especially should clean up the household environment and toilets for whom with symptoms to avoid further environmental contamination and spreading the infection to community.
3. To conduct physical examination for new residents and take them in general wards after quarantine till without risks of infection.

D. Management of cleaning appliances

1. To assign respective cleaning tools for each ward on each floor during the outbreak, and formulate the standard

operating procedures for environmental disinfection, the concentration of disinfectant and cleaning area. In addition to the floors, the essential sterilization spots should include the door handles, toilet flush handles, faucets, public tables and chairs, handrails and cleaning appliances. Daily monitoring sheets shall be established for inspecting the exactitude in bleach disinfection by cleaners.

2. To stipulate the concentration of disinfectant and the frequency of sterilization. The general public areas and ground should be disinfected with 1000ppm bleach. The body fluids and secretions such as feces and vomitus should be discarded following disinfection by 5000ppm bleach [6,17]. The frequency of cleaning toilets and public areas during the outbreak should be added to more than 2-3 times per day.

Finally, infection control staff are recommended to formulate standard operating procedures for dealing with clusters which are suitable for their own facility, and implement education on hospital wide infection control including regular disease surveillance, notification, defining criteria and span of quarantine, infection control measures, radius and frequency of sterilization, as well as strengthen surveillance and notification of diarrhea and relative symptoms for other units in the hospital in order to early implement the epidemic control measures and prevent the diarrhea cluster to spread.

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Sexual Behavior, Condom Use, and Associated Factors Among Grades 10-12 Students in Night Schools, Taoyuan, Taiwan

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Abstract

In Taiwan, being sexually experienced is high among 10th through 12th grade students who study at night, but condom use among these students is unknown. We investigated sexual behavior and condom use among 10th through 12th grade night school students in Taoyuan, Taiwan.

A cross-sectional study design and multistage cluster sampling procedures were used to obtain the samples. Students were asked to anonymously complete a questionnaire including demographic information, sexual behavior, attitudes toward sex, sexual knowledge, and condom use. In

September through October of 2005, we obtained 533 valid questionnaires (response rate, 94.7%). The overall proportion of students who reported being sexual experienced was 42.1% (95% CI, 38.5%-48.7%). A much higher proportion of private school students (54.2%; CI, 48.8%-59.7%) as compared to public school students (21.6%; CI, 15.7%-27.4%) reported having had sex. Multiple logistic regression revealed that school type, attitudes about sexual ethics, openness to premarital sex, and school grade were significantly associated with sexual experience. Among students with sexual experience, only 20.0% always used condoms when having sex. A multinomial logit model revealed that attitudes about sexual education and concern about interpersonal relationships were significantly associated with condom use.

In Taoyuan, a high proportion of students in grades 10-12 who were studying at night had sexual experience, but reported low condom use. Students who had higher scores on attitudes about sexual education and concerns about interpersonal relationships were more willing to use condoms when having sex.

Keywords: sexual behavior, acceptance of sex education, sexual attitudes, night school students

Introduction

As adolescents' sexual attitudes have become more open and the age of their first sexual experience has decreased, the proportion of adolescents with sexual experience has greatly increased [1-2].

Unfortunately, condom use remains low [3], which may increase the probability of premarital pregnancy, transmission of sexually transmitted diseases (STDs) such as HIV/AIDS, and other adverse outcomes [4-5]. Hence, adolescents should be educated about accurate sexual knowledge, positive attitudes towards sex and safe practices of having sex (including how to protect themselves and use condoms during the whole process of having sex).

Many studies have found that gender, school grade, attitudes about sex, and knowledge of sex are variables associated with sexual behavior [1,6-12]. Compared to females, males are more open about sex and more likely to have sexual experience [1,6,8-9]. In addition, high school students are more likely to have sexual experience than are younger students [6]. Three studies have found that adolescents who are more open to sex are more likely to have sex [7,11-12]. The association between sexual knowledge and sexual behaviors is still controversial. One study reported that adolescents who know more about sex are less likely to have sex [12], but two studies concluded the exact opposite that adolescents who know more about sex are more likely to have sex [6,8].

In Taiwan, as in the United States, the primary and secondary educational system includes elementary school (6 years), junior high school (3 years), and senior high school (3 years). In Taiwan, compulsory education is limited to 9 years. After junior high school, students are admitted to senior high school or vocational school according to their scores on a basic competency test. In general, those who want to attend a university will choose senior

high school; those who want to be employed sooner will choose vocational school. Furthermore, senior high school or vocational school can be public or private. The tuition for public schools is cheaper than that of private schools. Another interesting contrast is that there are night school programs in both senior high schools and vocational schools. Although the curricula for the day and night programs are similar, the schedules of night students differ greatly from those of day students. One study reported that the number of night school students with sexually experience is considerably higher than that of day school students [7].

We investigated sexual behavior and condom use among grades 10-12 students studying at night in Taoyuan, Taiwan. To assist in the future design and development of a sex education program, we attempted to determine if sexual behavior and condom use were associated with gender, school type, school grade, parental education level, sexual knowledge, or attitudes towards sex.

Methods

1. Study participants

The study was cross-sectional, and the sample was obtained using multistage cluster sampling. In 2005, there were 13,510 students in 18 night schools (5 public and 13 private schools) in Taoyuan. In the first stage of the study, 5 schools (2 public schools and 3 private schools) were randomly selected. During the second stage, classes within a selected school were randomly selected for each school grade, according to the size of the school. All students (n=563) in the selected classes were asked to fill out an anonymous questionnaire.

2. Measurements

An anonymous punch-card questionnaire was used to collect the following information:

- (1) Demographics: school grade, gender, parental educational level, and family structure.
- (2) Sexual behavior: prior sexual experience and condom use.
- (3) Sexual attitude scale: After a review of the relevant literature [7,13], 5 subscales were developed (attitude to premarital sex, sexual ethics, concern about interpersonal relationships, acceptance of sex education, and acceptance of contraception). A total of 30 items were included in these 5 subscales. Using a 4-point Likert scale, respondents were asked to indicate their response to each item: strongly disagree (1 point), disagree (2 points), agree (3 points), and strongly agree (4 points). Scoring was reversed for reversed items, so that the direction of the items within each subscale was consistent. Because the directions of the 5 subscales were different and simple addition of total scores would lead to counterbalancing, the effect of each subscale on sexual behavior was examined separately. In addition, the numbers of items for each subscale differed; thus, the analysis was based on the means rather than the totals of the subscales. For the subscales on attitudes to sexual ethics and premarital sex, higher scores indicated a more open attitude. For the subscale on concern about interpersonal relationships, higher scores indicated that the respondent was concerned about how peers regarded the respondent's sexual behavior; lower scores indicated an absence of such concern. For the subscale on acceptance of sex education, higher scores

indicated that the respondent was receptive to sex education courses. For the subscale on acceptance of contraception, higher scores indicated that the respondent was more willing to use contraception such as condoms.

- (4) Sexual knowledge: the design of this scale was also based on a review of the relevant literature and it has good reliability and validity [14]. The scale items were 20 Yes/No questions. A higher number of correct answers indicated greater sexual knowledge. The scale was evaluated for expert validity (the average rating for the sexual questionnaire by 9 experts was 4.11 out of 5), known group difference of construct validity (significant difference in correct proportion among junior high students (44.2%), night school students (53.7%), vocational school students (56.4%), and senior high students (63.2%)), item analysis (item difficulty ranged from 30.5% to 75.1% and item discrimination ranged from 28.6% to 67.3%). The Cronbach's α was 0.78 for internal consistency and correlation coefficient was 0.75 for test-retest reliability.

3. Statistical analysis

The data were expressed as mean, standard deviation (SD), frequency, and percentage. An independent t-test, chi-square test, chi-square test for trend, or analysis of variance (ANOVA) was used to examine the differences among the groups, where appropriate. For sexual behavior, logistic regression with forward selection was used to identify important factors. For condom use, a multinomial logit model with forward selection was used to identify important factors. For both the logistic regression and multinomial logit model, odds ratios (ORs) with 95%

confidence intervals (CIs) were computed [15]. A value of $P < 0.05$ was considered statistically significant. SAS 9.1 was used to analyze the collected data.

Results

1. Demographic characteristics of participants

From September through October 2005, there were 533 valid samples (94.7%). The participants included 201 (37.7%) public school students and 332 (62.3%) private school students. Because there is no night school program in the public senior high school in Taoyuan, students from public schools were all from vocational schools ($n=201$), 86 from private vocational schools, and 246 private

senior high schools. School grade was equally distributed. Parents' education levels were mainly senior high school or vocational school. There was no difference in school grade or the parents' education levels among students between public and private schools. There were, however, significant differences in gender and family structure between public schools and private schools. Regarding gender, as compared to public school students, there was a higher proportion of females among private school students ($p=.0242$). Regarding family structure, most students in both groups were members of a nuclear family; however, students in private schools were more likely to be from single-parent families ($p=.0004$) (Table 1).

Table 1. Demographic characteristics by school type (public vs. private) among 10th-12th grade students in night schools, Taoyuan, Taiwan (n=533)

	Public(n=201)	Private(n=332)	<i>P</i> [†]
School type			<.0001
Senior high school	0 (0.0%)	246 (74.1%)	
Vocational school	201 (100.0%)	86 (25.9%)	
School grade			.8422
10 th	70 (34.8%)	122 (36.8%)	
11 th	64 (31.9%)	107 (32.2%)	
12 th	67 (33.3%)	103 (31.0%)	
Gender ⁺			.0242*
Male	118 (58.7%)	160 (48.6%)	
Female	83 (41.3%)	169 (51.4%)	
Family structure ⁺			.0004*
Single parent	38 (19.0%)	107 (32.3%)	
Grandparent raising	6 (3.0%)	6 (1.8%)	
Nuclear family	132 (66.0%)	166 (50.1%)	
Extended family	20 (10.0%)	29 (8.8%)	
Other	4 (2.0%)	23 (7.0%)	
Paternal education ⁺			.4337
Illiterate	1 (0.5%)	6 (1.9%)	
Elementary school	30 (15.0%)	62 (19.3%)	
Junior high school	49 (24.5%)	87 (27.0%)	
Senior high or vocational school	90 (45.0%)	125 (38.8%)	
Junior college	21 (10.5%)	28 (8.7%)	
University or above	9 (4.5%)	14 (4.3%)	
Maternal education ⁺			.5458
Illiterate	5 (2.5%)	10 (3.1%)	
Elementary school	31 (15.5%)	70 (21.5%)	
Junior high school	56 (28.0%)	92 (28.2%)	
Senior high or vocational school	88 (44.0%)	124 (38.0%)	
Junior college	15 (7.5%)	20 (6.1%)	
University or above	5 (2.5%)	10 (3.0%)	
Sex experience ⁺			<.0001*
No	149 (78.4%)	147 (45.8%)	
Yes	41 (21.6%)	174 (54.2%)	

[†] Chi-square test. ⁺ Missing data: 3 in gender, 2 in family structure, 11 in paternal education, and 7 in maternal education, 22 in sex experience.

2. Sexual experience

A total of 215 students were sexually experienced (42.1%; 95% CI, 38.5% to 48.7%). Among private school students, senior high (125, 52.5%) and vocational students (49, 59.0%) were similar in sexual experience. Private school students (54.2%; 95% CI, 48.8% to 59.7%) had a higher proportion of being sexually experienced than public school students (21.6%; 95%CI, 15.7% to 27.4%). In addition, students in higher grades were more likely to be sexually experienced (Figure).

3. Univariate and multivariate analysis of sexual experience

Univariate analysis revealed that school type, attitudes about sexual ethics, attitudes about premarital sex, school grade, sexual knowledge, and attitudes about contraception were significantly associated with sexual experience. In comparison to public school students, students in private schools tended to have more sexual

experience. Students with sexual experience had a higher score on attitudes about sexual ethics and on attitudes about premarital sex than those without sex experience. Students in higher grades were also more likely to have sexual experience than those in earlier grades. Students with sexual experience also tended to have more sexual knowledge. Finally, as compared to students without sexual experience, those with sexual experience reported more acceptance of contraception (Table 2).

The results of the logistic multiple regression show that school type, attitudes about sexual ethics, attitudes about premarital sex, and school grade were significantly associated with sexual experience. When compared with students in public vocational schools, the odds ratio of sexual experience was 4.08 for students in private senior high schools, and 5.82 for students in private vocational schools. Regarding attitudes about

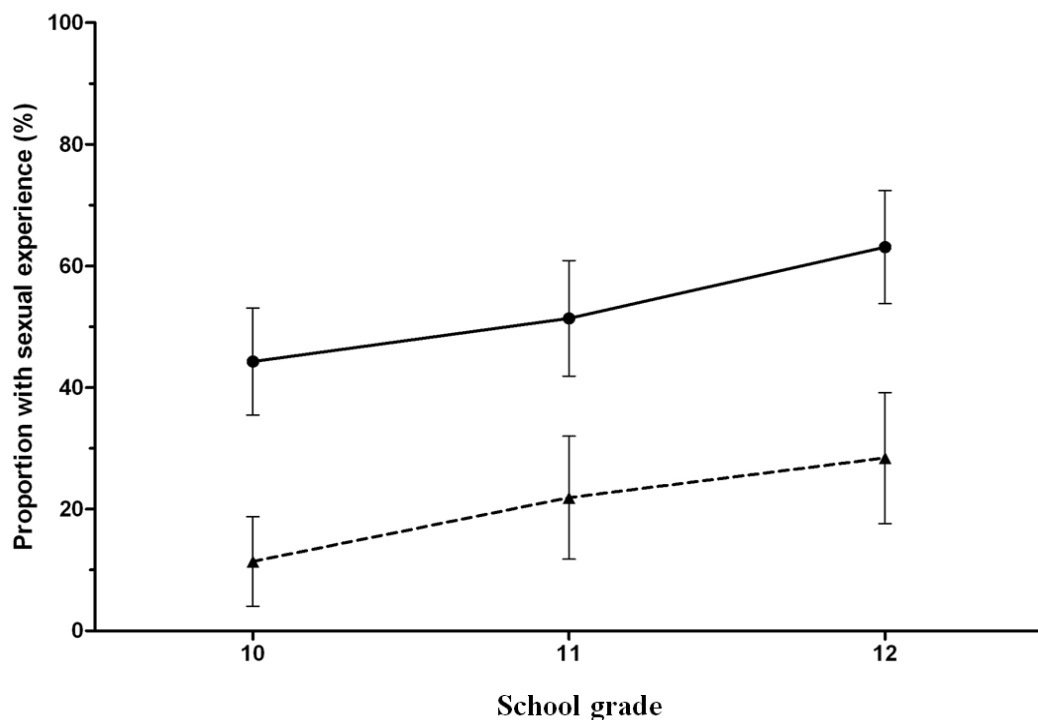


Figure. Proportion of sexual experience by school grade and type among 10th-12th grade students in night schools, Taoyuan, Taiwan (n=215)

The solid line represents private school students; the dotted line represents public school students.

sexual ethics, the score increased every 1 point, and the odds of sexual experience increased 1.86 fold ($=2.86-1$). Regarding attitudes about premarital sex, the score increased every 1 point and the odds of sexual experience increased 0.67 fold ($=1.67-1$). Students in grades 11 and 12 were more likely to be sexually experienced with odds ratios of 1.35 and 2.09, respectively, when compared with students in grade 10 (Table 2).

4. Condom use and reasons of not using condoms

Among students with sexual experience ($n=215$), 205 students completed the questions about use of condoms during sex with the following results: 41 (20.0%) always used condoms, 119 (58.1%) sometimes used

condoms, and 45 (21.9%) never used condoms. Students listed the reasons for not using condoms as follows: “dislike condoms” was most frequently mentioned (39.0%), followed by “condom not at hand” (37.8%), “used other means of birth control” (24.4%), and “not necessary” (11.6%).

The results of the univariate analysis showed that acceptance of sex education and interpersonal relationships were significantly associated with the use of condoms. As compared to students who always used condoms, those who never used condoms tended to care more about other people being aware of their sexual behavior and to be less accepting of any contraception including condoms (Table 3).

Table 2. Univariate and multivariate analysis of sexual experience among 10th-12th grade students in night schools, Taoyuan, Taiwan (n=533)

	Univariate analysis			Logistic regression		
	Not sexually experienced (n=296)	Sexually experienced (n=215)	<i>p</i>	OR	95% CI	<i>p</i>
School type			<.001 ¹			
Public vocational school	149(78.4%)	41(21.6%)		reference	—	
Private high school	113(47.5%)	125(52.5%)		4.08	2.58-6.46	<.0001
Private vocational school	34(41.0%)	49(59.0%)		5.82	3.14-10.79	<.0001
Attitudes about sexual ethics⁺	2.36±0.42	2.47±0.44	<.001 ²	2.86	1.52-5.40	.0012
Attitudes about premarital sex⁺	2.32±0.68	2.72±0.61	<.001 ²	1.67	1.12-2.51	.0127
School grade			.001 ³			
10 th	121(66.1%)	62(33.9%)		reference	—	
11 th	94(57.7%)	69(42.3%)		1.35	0.83-2.21	.2295
12 th	81(49.1%)	84(50.9%)		2.09	1.27-3.43	.0035
Sexual knowledge⁺⁺	51.5±25.5	57.2±26.8	.015 ²			
Attitude about acceptance to contraception⁺⁺⁺	2.87±0.56	2.98±0.61	.036 ²			

⁺The scores for attitudes about sexual ethics and the premarital sex scale were between 1 and 4, with higher scores indicating a more open attitude. ⁺⁺ A higher number of correct answers indicated greater sexual knowledge. On attitudes about acceptance of contraception, a higher score indicated a greater willingness to use contraception. ⁺⁺⁺ The scores for attitudes about acceptance of contraception were between 1-4 with higher scores indicating more willing to use contraception such as condoms. 1: Chi-square test. 2: Independent t test. 3: Chi-Square test for trend

5. Multivariate analysis on condom use

The results of a multinomial logit model showed that acceptance of sex education and concern about interpersonal relationships were significantly associated with condom use. Every 1 point increase in acceptance of sex education increased the odds of never using condoms, as compared to always using condoms, by 0.34 times, and the odds of sometimes using condoms, as compared to always using condoms, by 0.28 times. Every 1 point increase in concern about interpersonal relationships increased the odds of never using condoms, as compared to always using condoms, by 2.20 times, and the odds of sometimes using condoms, as compared to always using condoms, by 1.83 times. In other words, students who were more concerned

about whether other people knew they had sexual experience were less likely to use condoms when having sex (Table 4).

Discussion

1. High proportion of sexual experience

This study found that 42.1% (95% CI, 38.5-48.7%) of students in grades 10-12 in night school, in Taoyuan, Taiwan, were sexually experienced, which is lower than the 50.4% reported by Kim-Godwin et al. in their study of the sexual experience of senior high school students in North Carolina in the United States [16]. However, the percentage noted in the present study is significantly higher than the 14.9% reported by Ko et al. [2] in their investigation of the sexual experience of full-time vocational school students in

Table 3. Condom use during sexual intercourse among 10th-12th grade students in night schools, Taoyuan, Taiwan (n=205)

	Use condoms			<i>p</i> ¹
	Always (n=41)	Sometimes (n=119)	Never (n=45)	
Acceptance of sex education	2.93±0.47 ^A	2.67±0.45 ^B	2.70±0.40 ^{AB}	.0058*
Concern about interpersonal relationships	2.40±0.79 ^A	2.77±0.64 ^B	2.83±0.71 ^B	.0066*

note¹: When the ANOVA reached statistical significance, Scheffe's multiple comparison was made. The same letters represent no significant difference and different letters represent a significant difference. The scores for acceptance of sex education and concern about interpersonal relationships were between 1 and 4. On acceptance of sex education, a higher score indicated the respondent was receptive to sex education courses. On concern about interpersonal relationships, a higher score indicated greater concern about how peers regarded the respondent's sexual behavior.

Table 4. Multinomial logit analysis of condom use during sexual intercourse among 10th-12th grade students in night schools, Taoyuan, Taiwan (n=205)

	Use condoms				
	Always	Never vs. always		Sometimes vs. always	
	OR	OR	95%CI	OR	95%CI
Acceptance of sex education	1	0.34	0.12-0.98	0.28	0.11-0.72
Concern about interpersonal relationships	1	2.20	1.11-4.33	1.83	1.05-3.20

Taipei City, Taiwan, and the 0.9%, 4.2%, and 8.5% reported by Deng et al. [6] in a study of sexual experience among junior high school, senior high school, and vocational school students in day schools in Taoyuan. These findings indicate that, among teenagers, night school students are the group most likely to be sexually experienced.

This study reveals that private school students had a higher proportion of being sexually experienced than did public school students, as compared to senior high or vocational school students. In addition, students in higher grades were more likely to be sexually experienced. Lee's study also reports that private vocational school students had higher proportion of being sexually experienced than public vocational school students [17]. Deng et al.'s study surveyed students in vocational school and reported that the proportion of sexually experienced students was 3.3% for grade 10, 7.8% for grade 11, and 15.9% for grade 12. The US National Adolescent Health Information Center reported that 47% of senior high students in the U.S. were sexually experienced, with a range of 34% in grade 9 and to 63% in grade 12 [18].

2. Condom use

In this study, 20.0% of night school students reported always using condoms when having sex. This percentage is lower than the 31% reported by Hingson et al. [19] in their study of teenagers in the US state of Massachusetts, and the 34.0% reported by Ko et al. in their study of daytime vocational school students in Taipei City [2].

The reasons given by night school students in this study for not using condoms

were: "dislike them" (39.0%), followed by "condom not at hand" (37.8%). In a study of the factors associated with condom use among vocational school and university students, Yeh cited the reasons for not using condoms given by teenagers as follows: condoms hinder sexual pleasure, and their sex partner objects. In addition, the reason for not using condoms during their first sexual experience was that most of them did not expect to have sex at that time. Moreover, most of them had never discussed sex with their sex partners [20].

3. The influence of attitudes toward sex

Attitudes about sex, particularly one's sexual ethics and attitudes about premarital sex, is the key factor in determining sexual behavior. In this study, night school students who had more open attitudes about sexual ethics and premarital sex, were more likely to have sexual experience. These findings are consistent with those of Hsu et al., who investigated sexual behavior among senior high school and vocational school students in Taipei City [7]. In the present study, students with sexual experience tended to agree with premarital sex, compared with those with no sexual experience.

Studies indicate that implementation of sex education programs could delay the age of the first sexual experience and reduce the number of sex partners. Such programs could also increase correct condom use and bolster student's motivation to use condoms [21-24]. Yang indicated that night school students who had participated in classes with AIDS-related content were more willing to always use condoms, as compared to students who did not receive such

instruction [25]. The present study found that condom use was associated with acceptance of sex education, which indicates that effective sex education courses might reduce unsafe sexual behavior among teenagers.

Studies have indicated that the content of sex education courses should be based on the needs of the participants. By utilizing simulation-based instruction and a student-centered curriculum, courses can allow students to participate in discussions, thereby affording opportunities for teenagers to hear and assess their classmates' opinions [22, 26]. It has been observed that the timing of the first sexual experience is related to ignorance regarding rejection from the sex partners, to the use of coercion by partners, and to ambiguity regarding the intention to have sex [27-28]. Most teenagers do not know how to reject the advances of their sex partners. Thus, sex education courses for night school students should include lessons on rejecting sexual advances and emphasize knowledge of the transmissibility of STDs, such as HIV/AIDS, so that students can develop concepts of safe sex, learn correct contraception techniques, and prevent infection by STDs.

In 1990, the concept of "sexual health promotion" had the goal of not only preventing early sexual behavior and encouraging safe sex, but also to emphasize respect for oneself and others. These attitudes and behaviors could allow students to express emotions appropriately, to communicate with sex partners, to develop appropriate values and sexual attitudes, and to learn the life skills that

lead to sexual health, meaningful sexual relationships, and, ultimately, to effective parenting. According to the World Health Organization (WHO), a life-skill-based instructional strategy aims to develop the varied abilities needed to develop positive behaviors. These abilities allow individuals to effectively deal with different situations and challenges in their daily lives [29]. Studies have indicated that life-skill training allows teenagers to make positive and healthy decisions about sex after learning the skills that reduce the frequency of dangerous behaviors [22]. Thus, sex education in schools should instruct students in the life skills needed for healthy sexual behavior that leads to meaningful sexual relationships and successful parenting. Based on the findings of this study on premarital sex and condom use among night students, future studies might do well to focus on the development and evaluation of sex education and AIDS education classes for night school students.

Limitations

We did not inquire about the age or marital status of students on the questionnaires. Many night students could have worked for years, and hence been older, or might have been married. These factors may partially explain why night school students, as compared to day students, in senior high schools and vocational schools, were more likely to be sexually experienced. An intervention study should be implemented in order to formally evaluate the efficacy of sex education on enhancing condom use when having sex.

Conclusions

The proportion of being sexually experienced was high among 10th-12th grade night school students in Taoyuan, Taiwan. The factors that were associated with sexual experience included school type, school grade, and attitudes about sexual ethics and premarital sex. The factors associated with condom use included acceptance of sex education and concern about interpersonal relationships.

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