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EPIDEMIOLOGY OF LEGIONNAIRES' DISEASE IN HONG KONG

Dr Sammy Ng¹ Dr Thomas Chung²

Introduction

Legionnaires' disease (LD) is an acute respiratory infection caused by *Legionella pneumophila*, commonly commences with non-specific "flu-like" symptoms and progresses to pneumonia indistinguishable from other causes of atypical pneumonia. LD was first recognized during an outbreak of pneumonia involving delegates to the 1976 American Legion Convention at a Philadelphia hotel.¹ More than 15 serogroups of *L. pneumophila* have been recognized, but serogroups 1,4 and 6 account for most of the strains implicated in human infection.² *Legionella* bacteria are relatively common water-borne organisms in the environment and usually exist at low levels in nature. As the infection is usually acquired by the inhalation of aerosols contaminated with the *Legionella* bacteria, man-made sources which generate aerosols and provide a favourable environment for bacterial growth, e.g. a temperature of 25-45°C and stagnation, are more important source of *Legionella* bacteria. These sources include air-conditioning cooling towers and evaporative condensers, potable hot water systems, whirlpool hot tubs, decorative display fountains, humidifiers, grocery store misters, industrial process equipment and respiratory therapy equipment.³⁻⁷

¹ Medical & Health Officer

² Principal Medical & Health Officer

This paper reviews the epidemiology and discusses the control measures of LD in Hong Kong.

Epidemiology

Global Situation

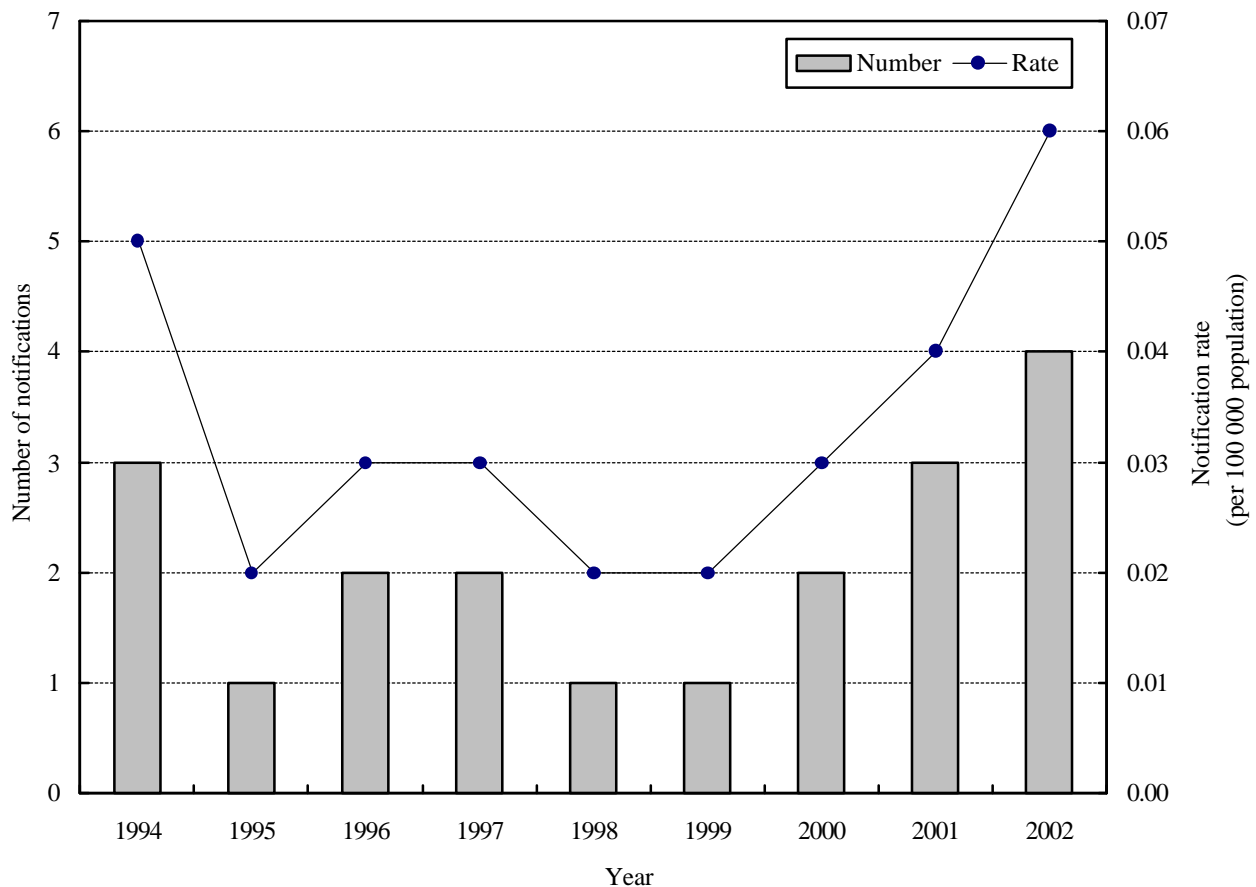
LD has a world-wide distribution. In 1999, 2 136 cases of LD were reported in European countries, with an overall incidence rate of infection of 0.54 per 100 000 population.⁸ In the United States (US), the incidence rate of legionellosis (LD plus Pontiac fever) in 2000 was 0.42 per 100 000 population (1 127 cases) while that in Australia was 2.5 per 100 000 population (472 cases).^{9,10} In Singapore,

the incidence rate of legionellosis was 1.6 per 100 000 population in 2001 (52 cases).¹¹

Local Situation

In Hong Kong, LD has become a statutorily notifiable disease since March 1994. During 1994 to 2002, a total of 19 cases were notified to the Department of Health (DH). The annual notification rate, ranging from 0.02 to 0.06 per 100 000 population, remained relatively low (Figure 1), although an increasing trend is observed in the recent years. Of these cases, 17 were acquired locally while two were imported. One fatal case was reported in 1994, giving a case fatality rate of 5%.

Figure 1 Number of Notifications and Notification Rate of Legionnaires' Disease, 1994-2002



Review of Cases

The investigation reports of all LD cases notified to the DH from 1994 to 2002 were reviewed. All of them were sporadic cases with no evidence of epidemiological linkage.

Diagnostic Criteria

A clinically compatible case (fever, myalgia, cough and pneumonia) together with one or more of the following laboratory findings define a case of LD:

- Isolation of *Legionella* species from respiratory secretions, lung tissue, pleural fluid; or

- Demonstration of a four-fold or greater rise in antibody titre to $\geq 1:64$ against *L. pneumophila* serogroup 1 between paired acute and convalescent phase serum specimens; or
- Detection of *L. pneumophila* serogroup 1 antigen in respiratory secretions, lung tissue or pleural fluid by direct fluorescent antibody staining; or
- Demonstration of *L. pneumophila* serogroup 1 antigen in urine.

Clinical Presentation

All notified cases presented with fever and often with respiratory symptoms such as cough and dyspnoea (Table 1). Atypical presentations were found in two cases. One

Table 1 Clinical Presentation of 19 Cases of Legionnaires' Disease, 1994-2002

Clinical Presentation		Number of Cases	Percentage
Fever (with/without Chills and Rigor)		19	100
Respiratory Symptoms	Cough	16	84
	Dyspnoea	11	58
	Haemoptysis	5	26
	Chest Pain	2	11
Gastrointestinal Symptoms	Nausea / Vomiting	2	11
	Diarrhoea	1	5
Neurological Symptoms	Headache	3	16
	Confusion	3	16
	Limb Weakness	1	5
Urological Symptoms	Incontinence	1	5
	Dysuria	1	5
General Symptoms	Malaise	7	37
	Weight Loss	1	5

of them presented with weakness and incontinence while the other case presented with nausea, vomiting and diarrhoea. Chest radiograph of all cases showed signs of pneumonia and diagnosis of LD was confirmed by serological tests. They all received antibiotic treatment and 11 cases (58%) required intensive care during hospitalization.

Risk Factors

Older age group, male sex, cigarette smoking, chronic lung disease and immunosuppression have been consistently implicated as risk factors of acquiring LD.¹²

Of the notified cases, all were male and their ages ranged from 39 to 85 years with median at 65. Thirteen of them were retired persons while the occupations of the remaining six were foreman, godown worker, driver, network engineer, manager and dental prosthesis technician. Sixteen of them (84%) were current or past smokers. Six (32%) of the cases had diabetes, three (16%) had chronic lung diseases and three (16%) had other medical conditions e.g. chronic renal function impairment, which might have compromised the patients' immunity. Two of the 19 had neither a smoking history nor concurrent chronic lung disease or immunosuppressive conditions.

Environmental Sampling

A total of 64 environmental water sources were surveyed during epidemiological investigation of the notified cases. They included cooling towers of air-conditioning systems,

water fountains, household water supply systems, water tanks of residential buildings, fish tanks, domestic air conditioners, and other outdoor and indoor sources. Of these, water samples from 18 water sources were positive for *L. pneumophila* serogroup 1. However, as is the case in other countries, a definite linkage between positive environmental samples and sporadic LD cases could not be established. Nonetheless, advice on decontamination was given to owners of the contaminated facilities and follow-up water samples were taken to monitor the effectiveness of the decontamination.

Discussion

The clue to successful control of LD rests on effective prevention, early diagnosis and initiation of treatment, and prompt source control upon identification.

Prevention

LD can be prevented by reducing the exposure to contaminated water droplets and preventing conditions which allows the proliferation of *Legionella* bacteria in water. In Hong Kong, the Prevention of Legionnaires' Disease Committee, comprising members from the medical and engineering fields, has published the *Prevention of Legionnaires' Disease Code of Practice* to provide practical guidelines for the building owners and building services practitioners in the proper design, operation and maintenance of the related facilities for preventing LD. The document can be accessed at the website: http://www.emsd.gov.hk/emsd/eng/pps/oa_ld_pub.shtml.

Source Control

Upon receipt of notifications, the DH will initiate immediate epidemiological investigation including tracing the source of infection and coordinating with other departments, notably the Electrical and Mechanical Services Department to implement proper control measures. Successful source control relies heavily on the prompt diagnosis of LD and the early initiation of epidemiological investigation.

Diagnosis / Case Ascertainment

LD has been described as a disease that is overtreated and underdiagnosed.¹³ One study in the US suggested that only 3% of sporadic cases of LD were correctly diagnosed.¹⁴ A high index of suspicion is warranted in the differential diagnoses for elderly male smokers presenting with clinical picture of atypical pneumonia.

Currently the serological test, which requires paired acute and convalescent phase serum samples, is most commonly used in the diagnosis of LD in Hong Kong. Another test is the *Legionella* urinary antigen test which allows the rapid detection of antigens of *L. pneumophila* serogroup 1 which is responsible for the majority of LD cases. This test has a sensitivity of over 70 percent and a specificity that approaches 100 percent and has been proved useful to establish early diagnosis of LD.¹⁵

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CERVICAL CANCER AND CERVICAL SCREENING IN HONG KONG

Dr Mabel Yeung¹ Mr KF Cheung²

Cervical cancer is the fifth most common cancer and the eighth leading cause of cancer deaths among women in Hong Kong.¹ While cervical cancer is undergoing a declining trend in incidence and mortality, many cases of invasive cervical cancer are preventable with cervical smears. This article describes the epidemiology of cervical cancer and cervical screening in Hong Kong.

Natural History of Disease

Cervical cancer is a common female cancer worldwide. Invasive cancer is usually preceded by an asymptomatic pre-invasive stage where precancerous cells are confined to the surface of the cervix. The progression of squamous intraepithelial lesions (SIL) or cervical intraepithelial neoplasia (CIN) to invasive cancer is slow and may take many years. The risk of CIN III progressing to an invasive lesion is about 12% over a period of ten years.² In Hong Kong, the majority of cervical cancer cases are squamous cell carcinoma and about 20% are adenocarcinoma.¹

Risk Factors for Cervical Cancer

Epidemiological studies have identified certain risk factors for cervical cancer. These include infection with human papilloma virus, sexual activity at an early age, multiple sexual partners, partner who has had multiple sexual partners, smoking and low socio-economic status.³

Burden of Disease

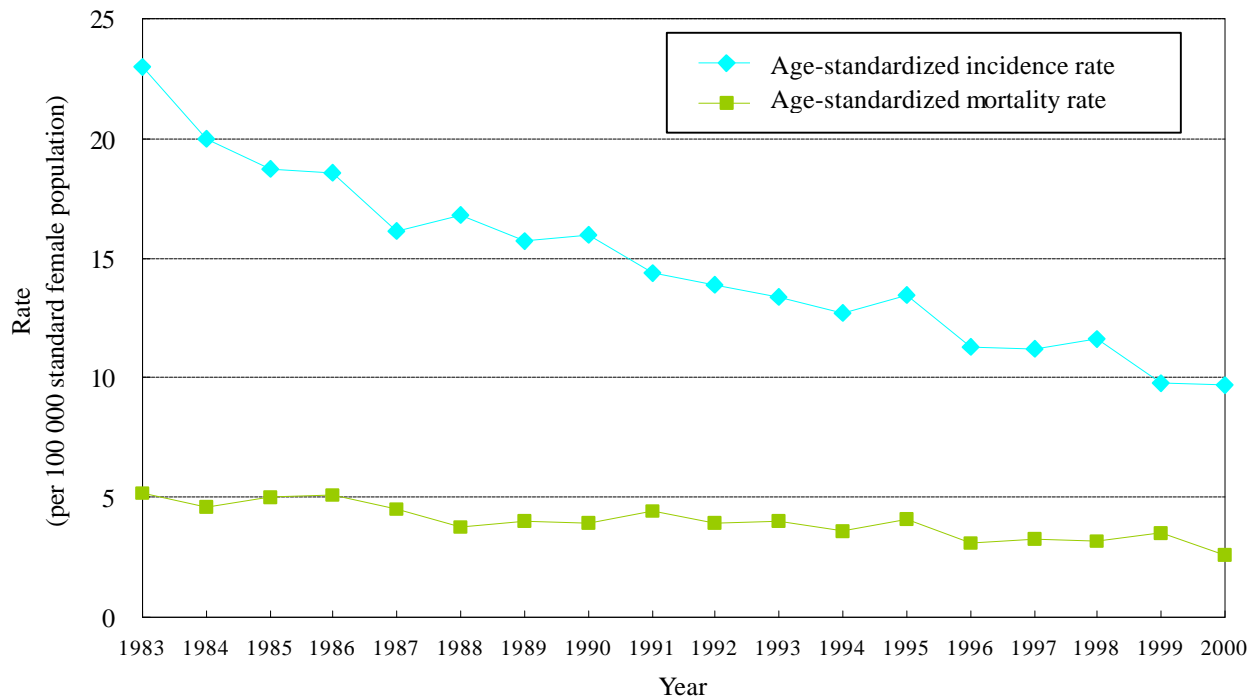
In 2000, there were 444 new cases of cervical cancer in Hong Kong, representing 4.6% of all cancers in females. The median age at diagnosis was 53 years. The cumulative lifetime risk of developing cervical cancer was one in 94. A total of 128 women died from cervical cancer, or 3.0% of all female cancer deaths. In 2000, there were 2 041 in-patient discharges from the Hospital Authority and private hospitals for cervical cancer.

The age-standardized incidence rate of cervical cancer in Hong Kong was 9.7 per 100 000 women in 2000. During 1990-1999, the average annual percent change in age-standardized incidence and mortality rates of cervical cancer, adjusted to the 1991 Hong Kong population, was -4.1% and -2.5% respectively.⁴ (Figure 1) Despite the declining trend, they remained relatively high compared with countries that have organized population-based cervical screening programmes. For example, the age-standardized incidence rate per 100 000 women, adjusted to the World Standard Population, for Finland and England was 3.8 and 7.5 respectively. (Figure 2)

The incidence of cervical cancer increases with age. During 1983-2000, age-specific incidence rates of cervical cancer decreased in women aged 35 and above. (Figure 3) The incidence of cervical cancer among women aged 25 and below is very low. In 2000, only two of the 444 (0.5%) cases were below 25 years of age.

¹ Senior Medical & Health Officer ² Research Officer

Figure 1 Age-standardized Incidence and Mortality Rates* of Cervical Cancer in Hong Kong, 1983-2000



Note : * According to the World Standard Population (Doll et al 1966). The world age-standardized rate is calculated by summing up the products of the age-specific rates and the World Standard Population of the same age subgroup and expressed per 100 000 population.

Source : Hong Kong Cancer Registry

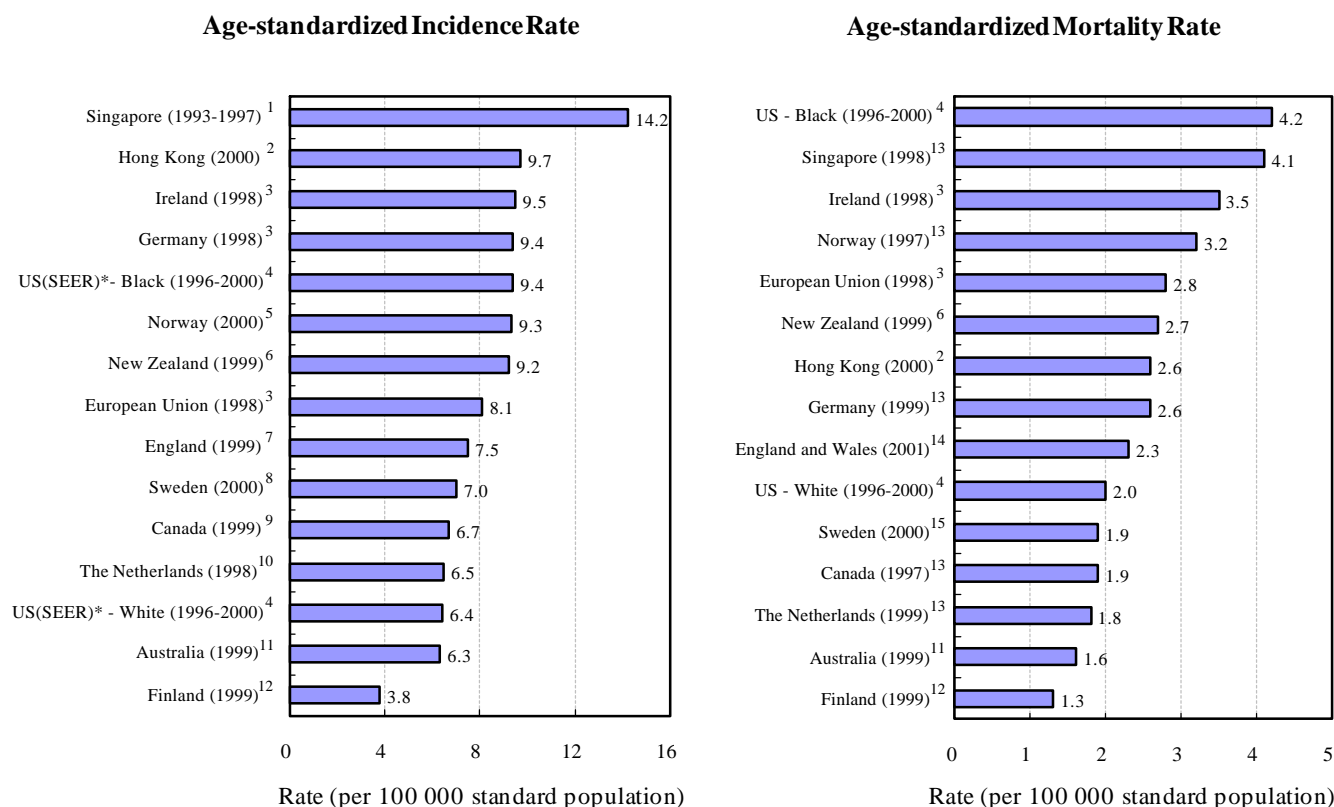
Screening and Early Detection

George Papanicolaou introduced cervical cytology into clinical practice in 1940. For conventional cervical smear, estimates of sensitivity and specificity vary greatly. Depending on the study design, sensitivity of 20-99% has been reported, with a range of 55-80% most frequently quoted. Specificity of cervical smear has been reported at higher than 90%, and up to 99%.⁵

The quality of cervical smear has a major influence on its sensitivity. The presence

of inflammatory cells, blood or debris, the type of cell collector used and the skill of the operator will affect the quality of the smear. Acceptable smear collection instruments include the wooden/plastic Ayre's spatula and the broom type. Both the conventional and the liquid-based cytology methods for smear examination are deemed acceptable. Liquid-based cytology has equal or better results in terms of quality of smears, improved diagnostic sensitivity, and saving of screening time than the conventional method but at a greater cost.

Figure 2 International Comparison of Age-standardized Incidence and Mortality Rates of Cancer of Cervix Uteri (ICD9: 180)



- Notes :
1. All age-standardized incidence and mortality rates were standardized directly to the World Standard Population published in the 1996 World Health Statistics Annual.
 - 2.* Incidence rates under US(SEER) represented the rates reported by the US Surveillance, Epidemiology and End Results (SEER) Program, based within the Cancer Surveillance Research Program at the National Cancer Institute (NCI).

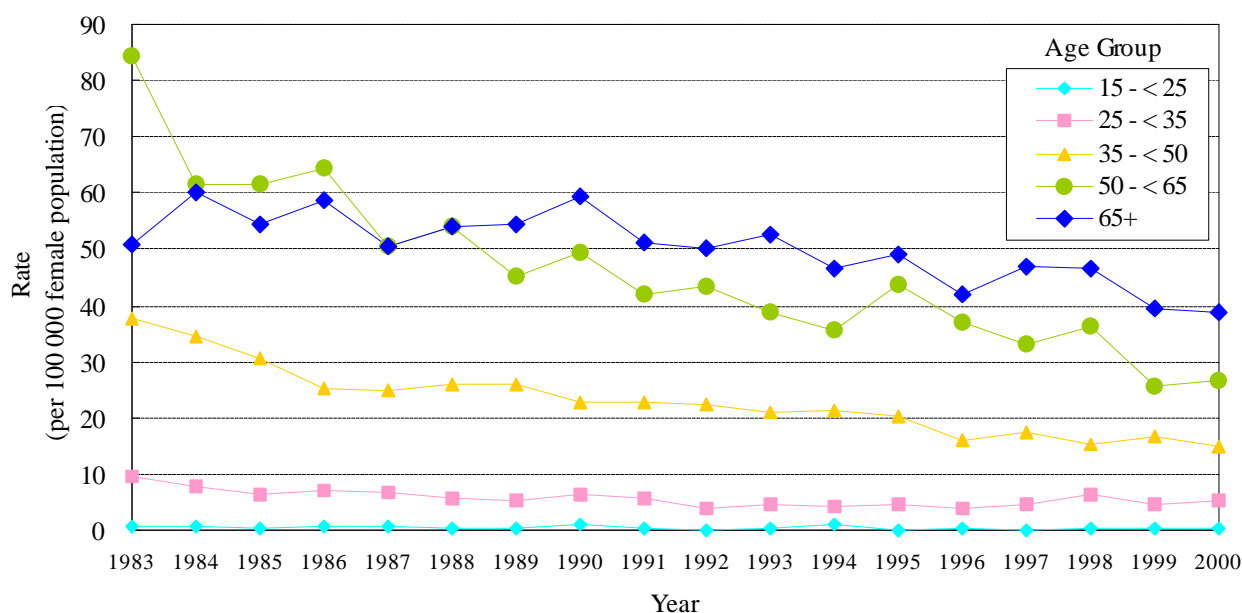
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Figure 2 International Comparison of Age-standardized Incidence and Mortality Rates of Cancer of Cervix Uteri (ICD9: 180) (Continued)

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Figure 3 Age-specific Incidence Rate of Cervical Cancer in Hong Kong, 1983-2000



- Notes :
1. Age-specific incidence rate is the number of new cases in specific age group per 100 000 women in that age group. The graph excludes age group of '0-14'.
 2. The denominator population from 1996 onwards was compiled based on the population estimates under the "resident population" approach, while those before 1996 used the "extended de facto" approach. The March 2001 Population Census provided a benchmark for revising the population estimates compiled since the 1996 Population By-census.

Sources : Hong Kong Cancer Registry
Census and Statistics Department

Effectiveness of Early Detection

Cervical cancer is one of the few cancers where precancerous lesions are detectable and treatable. At the moment, cervical cytology remains the standard method for cervical cancer screening.² Cervical smear is the screening test widely used to detect precancerous abnormalities of the cervix in population-based screening programmes worldwide. There is substantial evidence from observational studies that mortality from cervical cancer can be reduced by early detection through routine cervical smear screening.⁵

Results of case control studies revealed that the risk of developing invasive cervical cancer is three to ten times higher in women who have not been screened.⁶ Half of the cervical cancers diagnosed in the United States are in women who have never been screened and an additional ten percent of cancers occur in women who have not been screened within the past five years.⁷

Cervical Screening

A number of surveys conducted in Hong Kong during the past ten years showed that a substantial proportion of women were not receiving cervical smear screening. A face-to-face interview survey by the Family Planning Association of Hong Kong in 1997 on 1 511 women found that 52% of women aged 15-49 years had taken cervical smears in the past three years.⁸ A telephone survey by the University of Hong Kong during 1997-1998 on 1 826 women aged 20-77 years showed that 43% of respondents with a sexual history ever had a cervical smear.⁹ These coverage rates are far below those in countries with population-based cervical screening programmes, which range from 70-85%.

There is indication that older women who are at high risk of cervical cancer have particularly low coverage rate. The survey by the University of Hong Kong showed that 79% of women above age 60 never had a cervical smear.⁹ This mismatch between risk of cervical cancer and screening coverage is an important issue to address to reduce the incidence rate of cervical cancer in Hong Kong.

Women's knowledge about cervical cancer influences their screening practice. Research findings indicated that women need greater knowledge about the screening procedure, risk factors associated with cervical cancer and the preventive nature of cervical screening.¹⁰ Barriers to cervical screening include lack of knowledge, cost of screening and pain.¹¹ The caring attitude and communication skills of practitioners are considered important by the women. Women value the skill of the practitioners in minimizing the pain and discomfort associated with the procedure.¹² Providing information, education, support and reassurance to the women undergoing cervical smear screening can reduce outcome and procedure anxiety. Written patient education materials have been found to be cost-effective in reducing anxiety and to encourage positive attitudes.¹³

Cervical Screening Programme

Many overseas countries experienced a marked decrease in incidence and mortality of cervical cancer after the introduction of national cervical screening programmes. In Finland, by early 1990s, both age-adjusted incidence and mortality rates had dropped by 80% since its cervical smear programme was introduced in the early 1960s.¹⁴ Similar declines were recorded in Iceland, where incidence and mortality rates had been decreased by 70% and 62% respectively over 15 years.¹⁵

A population-based cervical screening programme will be launched by the Department of Health in collaboration with other health services providers in late 2003/early 2004. In December 2001, a Cervical Screening Task Force chaired by the Director of Health was established, drawing membership from the academic sector, professional organizations, public and private health service providers, non-government organizations and women groups. This Task Force was to oversee the planning, implementation and evaluation of the cervical screening programme.

The target population of the cervical screening programme will cover women aged 25-64 years and regular triennial screening following two yearly negative smears is recommended. Women aged 65 years and above who have never had cervical smear should be screened, and women who have never had sex or who have hysterectomy performed need not receive cervical screening. Quality assurance indicators for the programme have been drawn up by various local professional organizations. Women will be recruited into the programme through invitation letters, publicity campaigns, community outreach and other channels. Service providers who join the programme are eligible to receive information kits on smear taking, reminder letters to recall clients due for screening, educational materials about cervical screening for their clients, statistical reports and other materials. Training courses on smear taking are being organized by local professional groups. A central registry of cervical smears will be set up to keep track of smear records, perform cytology-biopsy correlation, issue reminders, monitor quality and evaluate the performance of the programme.

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Number of Notifications of Infectious Diseases*

Disease	Feb 2003	Mar 2003	Jan - Mar 2002	Jan - Mar 2003
1) Cholera	-	-	-	-
2) Plague	-	-	-	-
3) Yellow Fever	-	-	-	-
4) Acute Poliomyelitis	-	-	-	-
5) Amoebic Dysentery	3	-	-	3
6) Bacillary Dysentery	12	8	32	28
7) Chickenpox	1 086	792	6 264	3 258
8) Dengue Fever	5	-	2	10
9) Diphtheria	-	-	-	-
10) Food Poisoning : <i>Outbreak</i>	38	12	107	92
<i>Persons Affected</i>	198	123	404	467
11) Legionnaires' Disease	-	1	1	1
12) Leprosy	-	-	2	2
13) Malaria	2	3	8	7
14) Measles	8	2	15	13
15) Meningococcal Infections	-	-	3	1
16) Mumps	7	14	16	30
17) Paratyphoid Fever	2	3	-	8
18) Rabies : <i>Human / Animal</i>	-/-	-/-	-/-	-/-
19) Relapsing Fever	-	-	-	-
20) Rubella	2	1	14	6
21) Scarlet Fever	12	12	33	39
22) Severe Acute Respiratory Syndrome†	-	592	-	592
23) Tetanus	1	1	-	2
24) Tuberculosis	460	634	1 497	1547
25) Typhoid Fever	5	7	5	22
26) Typhus Fever	-	-	-	-
27) Viral Hepatitis :	18	29	190	68
- A	9	15	154	27
- B	4	4	28	22
- C	-	-	-	-
- E	1	4	6	6
- <i>Unclassified</i>	4	6	2	13
28) Whooping Cough	-	4	3	4

* The first two columns are numbers of two latest months whilst the other two columns are cumulative totals of the current and previous years.

† Notifiable since 27 March 2003

AIDS/HIV Surveillance

Cumulative Number of Cases	as at 31.12.2002	as at 31.3.2003
AIDS	613	627
HIV	2 015	2 067

Contact Numbers for Prompt Notification

Infectious Diseases other than Tuberculosis	Fax No. (FormDH1(s))	Tel.No.	Tuberculosis	Fax No. (FormDH1A(s))
Hong Kong Regional Office	25727582	29618791	Tuberculosis and Chest Service	28346627
Kowloon Regional Office	23758451	21999149		
New Territories East Regional Office	26997691	21585107		
New Territories West Regional Office	24399622	26158571		
Duty Medical Control Officer, Department of Health (for urgent notification during weekends, public holidays or after office hours.)	-	71163300 call 9179		