

Original article

Survey of Uterine Cervix Cancer Screening by Examination Car in Niigata Prefecture from 1995 to 2009

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Key words : uterine cervix cancer, consultation rate, cancer detection rate, initial examinees, re-examinees

Abstract

Based on the results obtained from 1995 to 2009, we explored the current activity statuses of the uterine cervix cancer screening by examination car conducted in Niigata Prefecture.

A total of 318,580 women between age 20 and 85 (60,215 initial examinees including examinees who received cancer screening at interval of more than 3 or 5 years, and 258,365 re-examinees who received the screening more than twice within the past 3 or 5 years) were screened during this 15-year period. The mean consultation rate (proportion of examinees to the target population) was 4.10%, showing the highest rate 5.50% in 1996 and the lowest rate 1.98% in 2007. By the cancer screening, 255 cancer patients were detected in the 15 years (mean detection rate: 0.08%, range: 0.04% -1.30%). The mean cancer detection rate in the initial examinees (0.28%, 167 cases) was 8.1 times higher than that in the re-examinees (0.03%, 88 cases). Furthermore, the frequency of examinees diagnosed with dysplasia in the initial examinees was 5.7 times higher than that in the re-examinees (0.51% vs. 0.09%). Examinees requiring detailed examination (3.27%), or examinees diagnosed with dysplasia (0.18%), were detected at the highest rate in their twenties. However, the overall cancer detection

rate in their twenties (0.17%) was the second-highest during the study period, after that in their thirties (0.24%).

The cancer detection rate leveled off at about 0.08% during the 15 years, and higher detection rates were found in the initial examinees, especially in their twenties and thirties. We believe the increase in cancer screening examinees of these generations is related to the increase in detection rates of dysplasia or cancer, and may be implicated in the future decrease in the cervical cancer death rate.

Introduction

In recent years, the national annual average of the age-adjusted mortality rate for uterine cancer including cervical cancer and corpus cancer in Japanese women has remained flat at $4.1 \pm 0.1/100,000$ women. As shown in Fig. 1, the age-adjusted uterine cancer mortality rates in Niigata Prefecture from 1995 to 2009 were lower than the national average, but the rate increased slowly during those 15 years and recently reached the national average. Since cases of uterine cervix cancer account for 80% of the total uterine cancer cases, the increase in the mortality rate from uterine cancer may reflect the increase in the rate of uterine cervix cancer.

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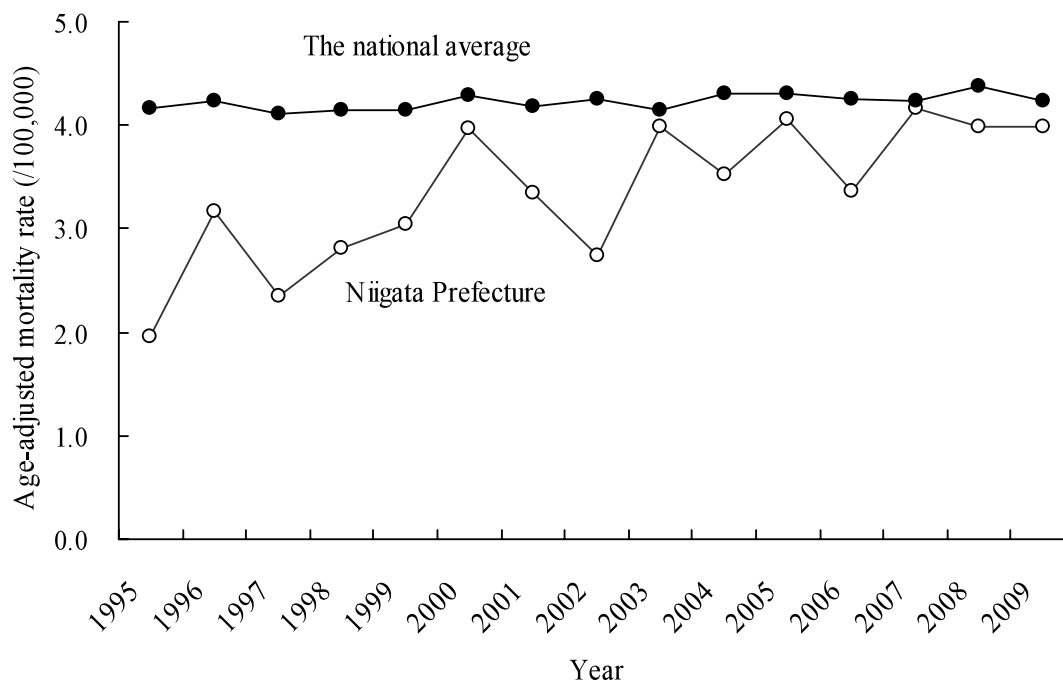


Fig. 1 Age-adjusted uterine cancer mortality rate in Niigata Prefecture compared with the national average

Data are shown as the mortality rate per 100,000 women between 1995 and 2009.

The uterine cervix cancer screening in Niigata Prefecture started in 1968 as part of a program of cancer prevention measures. As a result, cancer screening is now firmly entrenched as one of the health services provided to residents of Niigata Prefecture. The screening has been conducted in two ways; one is by examination car, and the other is by a visit to a medical office. In 1982, the Health and Medical Service Act for the Aged was enacted in Japan, and the responsibilities of the nation's healthcare system were stipulated explicitly. This ensured that cancer screening would become pervasive throughout the country¹⁾. However, the consultation rate (proportion of examinees to the target population) began to decline in 1995 as examinees aged and became less mobile²⁾. This tendency was shown even more clearly after 1998 because the government changed the nation's measures and policies for

cancer screening³⁾.

On the other hand, the government took responsibility for examining women more than 20 years old in 2004 because the development of cervix cancer has increased in younger generation⁴⁾. At about the same time, the Japan Society of Obstetrics and Gynecology introduced the Bethesda System for reporting the results of cervical cytology, to improve cancer detection rates⁵⁾. The government started the Fundamental Plan for Cancer Control to increase the consultation rate, and a cancer screening free coupon was distributed in 2009⁶⁾.

Uterine cervix cancer screening by cytological examination is an appropriate program that lends itself to statistical evaluation. Previous studies reported that the uterine cervix cancer mortality rate can be decreased when examinees receive regular screening. However, reports on the current

status of cancer screening in Niigata Prefecture or on the issues related to cancer screening are very few. We therefore explored the current status of the consultation rates and cancer detection rate based on the uterine cervix cancer screening results by year and age group obtained from 1995 to 2009. In addition to examining the current status of cancer screening, we considered the problems in cancer screening and propose the necessary measures to increase the consultation rate.

Subjects and methods

1. Subjects

The study subjects were 318,580 women who received cancer screening by examination car from 1995 to 2009. Of the total examinees, 60,215 (18.9%) was initial examinees including examinees who received cancer screening at interval of more than 3 or 5 years, and 258,365 (81.1%) was re-examinees who received the cancer screening more than twice within the past 3 or 5 years. The cancer screening was carried out for residents of Niigata Prefecture by the Niigata Health Service Center.

2. Screening

Both history taking and cytological examination of the uterine cervix were conducted for each examinee. History taking included the following items: age, history of pregnancy and childbirth, menstrual status and menstrual cycle, presence or absence of hormone treatment, presence of symptoms such as irregular vaginal bleeding within 6 months, and history and results of previous medical examination.

The collection and preparation of smears for cytological examination was conducted as follows: the specimen cells were scraped from the cervix and vaginal surface and then fixed to a slide, stained with Papanicolaou stain, and examined under a microscope. All smears were classified by the Nichibo classification (class I, II,

IIIa, IIIb, IV, and V)⁷⁾. When a smear of class IIIb, IV, or V was found, the examinee received a detailed examination.

Results

Table 1 shows the true state of the cancer screening by examination car in Niigata Prefecture from 1995 to 2009. Of the target population of 7,764,880 in the 15 years, 318,580 women participated in the screening. The mean consultation rate in the 15 years was 4.10%. The highest number of examinees, 26,820, was found in 1996, and after that the number decreased until 2007. The number of examinees requiring detailed examination by cytological examination was 68 in 1995, and it increased to 193 in 2009. The number of examinees diagnosed with dysplasia was 546 (0.17%) in the 15 years, with a detection rate of more than 0.30% since 2006. A total of 255 cancer patients were detected in the 15 years, showing a mean detection rate of 0.08%, and a range from 0.04% in 1996 to 0.13% in 2008. The cancer detection rate remained flat at about 0.08% during the 15 years.

Table 2 shows the results of the uterine cervix cancer screening by year. The mean frequencies of examinees requiring detailed examination, examinees diagnosed with dysplasia, and examinees diagnosed with cancer were higher in the initial examinees than in the re-examinees (1.25% vs. 0.24%, 0.51% vs. 0.24%, 0.09%, and 0.28% vs. 0.03%, respectively). In the initial examinees, the frequency of examinees requiring detailed examination in 2009 (2.42%) was about 4.5 times higher than that in 1995 (0.54%). In the re-examinees, the frequency increased about twice, from 0.21% to 0.45%, during the same period. The number of examinees diagnosed with dysplasia in the initial examinees and the re-examinees were 310 (0.51%) and 236 (0.09%), respectively. The mean cancer detection rate in the initial examinees (0.28%) was about 8.1 times higher than that in the re-examinees (0.03%).

Table 1 Uterine cervix cancer screening practice in Niigata Prefecture from 1995 to 2009

Year	Target population	Number of examinees (%)	Examinees requiring detailed examination (%)	Examinees diagnosed with dysplasia (%)	Examinees diagnosed with cancer (%)
1995	484,406	26,131 (5.39)	68 (0.26)	20 (0.08)	14 (0.05)
1996	487,551	26,820 (5.50)	42 (0.16)	18 (0.07)	12 (0.04)
1997	479,663	25,039 (5.22)	69 (0.28)	30 (0.12)	19 (0.08)
1998	484,706	23,495 (4.85)	53 (0.23)	17 (0.07)	19 (0.07)
1999	488,633	21,935 (4.49)	55 (0.25)	15 (0.07)	15 (0.07)
2000	492,205	22,295 (4.53)	74 (0.33)	34 (0.15)	13 (0.06)
2001	495,644	24,014 (4.85)	63 (0.26)	34 (0.14)	17 (0.07)
2002	499,575	23,210 (4.65)	83 (0.36)	28 (0.12)	22 (0.09)
2003	513,940	24,406 (4.75)	135 (0.55)	44 (0.18)	33 (0.12)
2004	516,802	23,450 (4.54)	103 (0.44)	42 (0.18)	17 (0.07)
2005	658,100	16,751 (2.55)	88 (0.53)	46 (0.27)	16 (0.10)
2006	742,260	16,354 (2.20)	114 (0.70)	54 (0.33)	12 (0.07)
2007	694,157	13,758 (1.98)	109 (0.79)	56 (0.41)	13 (0.09)
2008	364,366	14,335 (3.93)	132 (0.92)	56 (0.39)	19 (0.13)
2009	362,872	16,587 (4.57)	193 (1.16)	52 (0.31)	14 (0.08)
Total (%)	7,764,880	318,580 (4.10) ^a	1,381 (0.43) ^b	546 (0.17) ^c	255 (0.08) ^d

a: Consultation rate (Percentage of the target population).

b: Rate of examinees requiring detailed examination (Percentage of the examinees).

c: Rate of examinees diagnosed with dysplasia (Percentage of the examinees).

d: Cancer detection rate (Percentage of the examinees).

Table 2 Results of uterine cervix cancer screening by year

Year	Initial examinees				Re-examinees			
	Number of examinees	Number of examinees by result (%)			Number of examinees	Number of examinees by result (%)		
		Examinees requiring detailed examination	Examinees diagnosed with dysplasia	Examinees diagnosed with cancer		Examinees requiring detailed examination	Examinees diagnosed with dysplasia	Examinees diagnosed with cancer
1995	3,902	21 (0.54)	6 (0.15)	6 (0.15)	22,229	47 (0.21)	14 (0.06)	8 (0.04)
1996	4,570	21 (0.46)	7 (0.15)	7 (0.15)	22,250	21 (0.09)	11 (0.05)	5 (0.02)
1997	4,084	23 (0.56)	10 (0.24)	9 (0.22)	20,955	46 (0.22)	20 (0.10)	10 (0.05)
1998	3,578	27 (0.75)	7 (0.20)	12 (0.34)	19,917	26 (0.13)	10 (0.05)	7 (0.04)
1999	3,051	23 (0.75)	6 (0.20)	11 (0.36)	18,884	32 (0.17)	9 (0.05)	4 (0.02)
2000	3,501	35 (1.00)	17 (0.49)	10 (0.29)	18,794	39 (0.21)	17 (0.09)	3 (0.02)
2001	4,748	33 (0.70)	19 (0.40)	9 (0.19)	19,266	30 (0.16)	15 (0.08)	8 (0.04)
2002	4,160	43 (1.03)	14 (0.34)	18 (0.43)	19,050	40 (0.21)	14 (0.07)	4 (0.02)
2003	4,613	67 (1.45)	21 (0.46)	24 (0.52)	19,793	68 (0.34)	23 (0.12)	9 (0.05)
2004	4,108	39 (0.95)	19 (0.46)	10 (0.24)	19,342	64 (0.33)	23 (0.12)	7 (0.04)
2005	3,341	55 (1.65)	31 (0.93)	10 (0.30)	13,410	33 (0.25)	15 (0.11)	6 (0.04)
2006	3,810	69 (1.81)	34 (0.89)	9 (0.24)	12,544	45 (0.36)	20 (0.16)	3 (0.02)
2007	3,307	72 (2.18)	37 (1.12)	9 (0.27)	10,451	37 (0.35)	19 (0.18)	4 (0.04)
2008	3,415	77 (2.25)	41 (1.20)	10 (0.29)	10,920	55 (0.50)	15 (0.14)	9 (0.08)
2009	6,027	146 (2.42)	41 (0.68)	13 (0.22)	10,560	47 (0.45)	11 (0.10)	1 (0.01)
Total	60,215	751 (1.25)	310 (0.51)	167 (0.28)	258,365	630 (0.24)	236 (0.09)	88 (0.03)

Table 3 shows the change in the cytological classification by year. Of all the examinees, 317,199 women (99.57%) were classified as class I (240,630 women, 75.53%) or II (76,569 women, 24.03%). The number of examinees classified as class IIIa or higher were as follows: IIIa: 895 (0.28%), IIIb: 220 (0.07%), IV: 170 (0.05%), V: 96 (0.03%). The frequency of the examinees classified as class IIIa or higher showed an increasing trend from 0.70% of 2006.

Table 4 shows the results of the cytological classification by age. The frequency of the examinees classified as class IIIa or higher was as follows: 77 (3.27%) in their twenties, 361 (1.06%) in their thirties, 354 (0.61%) in their forties, 219 (0.28%) in their fifties, 232 (0.24%) in their sixties, and 126 (0.28%) in their seventies. The frequency of the examinees classified as class IIIa or higher decreased with increasing age, and the highest rate was found in their twenties.

Table 3 Change in the cytological classification by year

Year	I (%)	II (%)	IIIa (%)	IIIb (%)	IV (%)	V (%)	Total
1995	21,193 (81.10)	4,870 (18.64)	40 (0.15)	14 (0.05)	10 (0.04)	4 (0.02)	26,131
1996	21,557 (80.38)	5,221 (19.47)	23 (0.09)	12 (0.04)	5 (0.02)	2 (0.01)	26,820
1997	19,774 (78.97)	5,196 (20.75)	31 (0.12)	15 (0.06)	20 (0.08)	3 (0.01)	25,039
1998	17,887 (76.13)	5,555 (23.64)	28 (0.12)	14 (0.06)	5 (0.02)	6 (0.03)	23,495
1999	16,785 (76.52)	5,095 (23.23)	33 (0.15)	13 (0.06)	6 (0.03)	3 (0.01)	21,935
2000	16,740 (75.08)	5,481 (24.58)	41 (0.18)	12 (0.05)	10 (0.04)	11 (0.05)	22,295
2001	17,344 (72.22)	6,607 (27.51)	34 (0.14)	11 (0.05)	7 (0.03)	11 (0.05)	24,014
2002	16,660 (71.78)	6,467 (27.86)	56 (0.24)	11 (0.05)	14 (0.06)	2 (0.01)	23,210
2003	17,058 (69.89)	7,213 (29.55)	95 (0.39)	14 (0.06)	19 (0.08)	7 (0.03)	24,406
2004	16,759 (71.47)	6,588 (28.09)	63 (0.27)	21 (0.09)	12 (0.05)	7 (0.03)	23,450
2005	11,963 (71.42)	4,700 (28.06)	65 (0.39)	9 (0.05)	7 (0.04)	7 (0.04)	16,751
2006	12,228 (74.77)	4,012 (24.53)	82 (0.50)	16 (0.10)	5 (0.03)	11 (0.07)	16,354
2007	11,074 (80.49)	2,575 (18.72)	75 (0.55)	13 (0.09)	12 (0.09)	9 (0.07)	13,758
2008	11,044 (77.04)	3,159 (22.04)	84 (0.59)	28 (0.20)	16 (0.11)	4 (0.03)	14,335
2009	12,564 (75.75)	3,830 (23.09)	145 (0.87)	17 (0.10)	22 (0.13)	9 (0.05)	16,587
Total	240,630 (75.53)	76,569 (24.03)	895 (0.28)	220 (0.07)	170 (0.05)	96 (0.03)	318,580

All smears were classified by the Nichibo classification (class I, II, IIIa, IIIb, IV, and V).

Table 4 Results of the cytological classification by age

Age	I (%)	II (%)	IIIa (%)	IIIb (%)	IV (%)	V (%)	Total
20-29	2,070 (87.82)	210 (8.91)	64 (2.72)	8 (0.34)	5 (0.21)	0 (0.00)	2,357
30-39	31,976 (94.07)	1,653 (4.86)	228 (0.67)	64 (0.19)	51 (0.15)	18 (0.05)	33,990
40-49	53,980 (92.74)	3,872 (6.65)	231 (0.40)	61 (0.10)	38 (0.07)	24 (0.04)	58,206
50-59	56,744 (72.63)	21,163 (27.09)	134 (0.17)	32 (0.04)	36 (0.05)	17 (0.02)	78,126
60-69	64,152 (65.57)	33,459 (34.20)	151 (0.15)	31 (0.03)	26 (0.03)	24 (0.02)	97,843
70-79	29,736 (65.82)	15,314 (33.90)	81 (0.18)	21 (0.05)	14 (0.03)	10 (0.02)	45,176
80-	1,972 (68.42)	898 (31.16)	6 (0.21)	3 (0.10)	0 (0.00)	3 (0.01)	2,882
Total	240,630 (75.53)	76,569 (24.03)	895 (0.28)	220 (0.07)	170 (0.05)	96 (0.03)	318,580

All smears were classified by the Nichibo classification (class I, II, IIIa, IIIb, IV, and V).

However, none of the women in their twenties were classified as class V.

Table 5 shows the cancers detected by cytological examination by age. The frequency of carcinoma in situ accounted for 75.69% of all 255 detected cancers. The frequency of squamous cell carcinoma was 11.37%. Adenocarcinoma of the cervix (14 cases, 5.49%), endometrial carcinoma (10 cases, 0.07%), adenosquamous carcinoma (2 cases, 0.05%), ovarian cancer (1 case, 0.39%), vaginal cancer (1 case, 0.39%), metastatic cancer (1 case, 0.39%), and other cancers (4 cases, 1.57%) were detected by the screening during the 15 years surveyed. Four cases detected in their twenties were all carcinoma in situ. Carcinoma in situ or squamous cell carcinoma was detected with a high frequency in their thirties (27.84%) and forties (21.96%), or in their sixties (3.53%), respectively.

Discussion

The cancer detection rate revealed by the screening in Niigata Prefecture maintained almost the same value of 0.08% on average for the 15 years surveyed, although the consultation rate for uterine cervix cancer screening decreased every year from 1996 to 2007. The cancer detection rate in the initial examinees was 8.1 times higher than that in the re-examinees. The similarity of the cancer detection rate from 1995 to 2009 may

result mainly from the detection of the examinees diagnosed with cancer from the initial examinees.

The age-adjusted uterine cervix cancer mortality rate in Japan has remained at $4.1 \pm 0.1/100,000$ women since 1995. Although the rate in Niigata Prefecture was only 2.0/100,000 women in 1995, it increased after that, and reached to the national average in 2007. Recently, it has continued to be flat at a level of 4.0/100,000 women. In Niigata Prefecture, as part of the cancer prevention program, screening for uterine cervix cancer has been conducted since 1968, but the increase in the uterine cervix cancer mortality rate of recent years may be ineffective in preventing the cancer by the screening. Therefore, we analyzed the results obtained by the screening from 1995 through 2009, and examined the fluctuations of the consultation rate and the cancer mortality rate.

The consultation rate of cancer screening by examination car in Niigata Prefecture exhibited a declining trend until 2007. Because the lowest mortality rate of uterine cervix cancer (4.2/100,000 women) was shown in 2007, the decrease in the consultation rate may be related to the increase in the mortality rate.

In the initial examinees, the number of women requiring detailed examination was 5.1 times higher than that in the re-examinees. Moreover, the dysplasia and cancer detection rates in the

Table 5 Cancers detected by histopathological diagnosis by age

Age	Carcinoma in situ	Squamous cell carcinoma	Adenocarcinoma (Cervix)	Endometrial carcinoma	Adenosquamous carcinoma	Ovarian cancer	Vaginal cancer	Metastatic cancer	Others	Total
20-29	4 (1.57)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	4
30-39	71 (27.84)	6 (2.35)	2 (0.78)	0 (0.00)	1 (0.39)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.39)	81
40-49	56 (21.96)	7 (2.75)	4 (1.57)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.39)	68
50-59	21 (8.24)	5 (1.96)	3 (1.18)	5 (1.96)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.78)	36
60-69	26 (10.20)	9 (3.53)	4 (1.57)	5 (1.96)	1 (0.39)	1 (0.39)	1 (0.39)	1 (0.39)	0 (0.00)	48
70-79	14 (5.49)	1 (0.39)	1 (0.39)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	16
80-	1 (0.39)	1 (0.39)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2
Total (%)	193 (75.69)	29 (11.37)	14 (5.49)	10 (0.07)	2 (0.05)	1 (0.39)	1 (0.39)	1 (0.39)	4 (1.57)	255

Percentages of all 255 detected cancers are shown in parentheses.

initial examinees were 8.1 and 5.1 times higher, respectively, than those in the re-examinees. The progression of cervix tumor is relatively slow⁸⁾. The examinees requiring detailed initial examination after the screening were professionally managed in a medical facility. For this reason, patients with cancer are usually detected during the initial screening or are patients who stopped being managed at a medical facility. As shown in the results obtained for the 15 years surveyed, the examinees requiring detailed examination and the examinees diagnosed with dysplasia were detected at the highest rates among initial examinees in their twenties. The consultation rate of the cancer screening in young people has increased in recent years since the Ministry of Health decided to change the fiscal target screening age from “30 years old and over” to “20 years old and over” in 2004. This trend also gained momentum because a free coupon for cervical cancer screening was distributed to women who reached 20, 25, 30, 35, and 40 years old⁹⁾. However, the consultation rate in young people is still low. In Niigata Prefecture, the highest number of cancer screenings for women in their twenties was 622 in 2009, and was only 4.0% of all the examinees¹⁰⁾.

Since a decrease in age at first sexual intercourse has occurred in recent years, uterine cervix cancer is likely to appear more commonly among increasingly younger people. However, three researchers have pointed out that the diffusion of the right knowledge about cervical cancer is still not promoted to young people¹¹⁻¹³⁾. An increase in the consultation rate among young people will enhance the preventive effect of cancer screening in the future.

Uterine cervix cancer screening is a secondary preventive measure aimed at the early detection and rapid cure of this cancer. However, people's attention is currently focused on the primary preventive measure, vaccination. The association between human papillomavirus (HPV) infection

and the development of uterine cervix cancer was reported in 1974¹⁴⁾, and the anticancer effect of the vaccination has been demonstrated¹⁵⁾. The administration of the vaccine against HPV has already started in more than 80 countries¹⁶⁾. The vaccination was approved by the Japanese Government in Oct. 2009, and vaccinations were started in general healthcare facilities in Dec. 2009¹⁷⁾. As the primary measure for uterine cervix cancer prevention, the vaccination may be helpful to decrease the mortality rate.

In summary, the consultation rate of uterine cervix cancer screening in Niigata Prefecture has decreased since 1996, but it has been increasing recently because of the increase in the number of young women who are initial examinees. The rate of examinees requiring detailed examination and the dysplasia and cancer detection rates were higher in the initial examinees compared with the re-examinees. Promoting the diffusion of knowledge about uterine cervix cancer to adolescents and increasing the number of initial examinees may contribute to decreasing the mortality rate of cervical cancer in the future.

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