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Chapter 16

Beating Cervical Cancer in the Developed Countries: A Dream or a Reality?

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Additional information is available at the end of the chapter

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1. Introduction

Cervical cancer is the third most commonly diagnosed cancer and the fourth leading cause of cancer death in women worldwide, with an estimated 529,000 new cases and 275,000 deaths expected to occur in 2008, of which about 80% occurred in developing countries (Ferlay et al., 2010). Western countries have experienced dramatic reductions in the incidence of and mortality from invasive cervical cancer (Day, 1984; Hristova & Hakama, 1997; Duguid, Duncan, & Currie, 1985; Taylor et al., 2001). In developed countries, incidence rates of cervical cancer are generally low and accounts for only 3.6% (Bray et al., 2005). The disproportionate burden of cervical cancer in developing countries and elsewhere in medically underserved populations is mainly due to lack of effective screening program (Hristova & Hakama, 1997; Duguid, Duncan, & Currie, 1985; Taylor et al., 2001).

Cervical cancer is almost completely preventable, because unlike many cancers, which are caused by a number of physical, genetic, lifestyle and environmental factors, almost all cervical cancer is caused by a sexually transmitted virus, the human papillomavirus (HPV) (Kari & Mark, 2008). Over the past decades, scientists, public health researchers, clinicians, policymakers, women's health and cancer advocates and private sector partners have worked tirelessly to raise global awareness of cervical cancer. They have identified and developed high-impact low-cost solutions to prevent this devastating disease. Today, there are a combination of new and affordable high-tech tools and effective simple solutions.

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The purpose of this chapter is to explore the opportunities to limit the epidemic by (a) examining the causes, signs and symptoms and complications of cervical cancer (b) reviewing the epidemiology of cervical cancer in the developed region, and (c) prevention of cervical cancer strategy in the developed countries.

2. Disease issues

2.1. Risk factors of cervical cancer

Basically every woman who has ever been sexually active can develop cancer of the cervix. A vast 99% of cervical cancers are caused by HPV (Kari & Mark, 2008). Of the more than 100 types of HPV, most are benign and resolve without intervention. Visible lesions or warts, known as condylomata acuminate, may be seen. High-risk HPV types tend to persist and are associated with development of precancerous lesions and cervical cancer. Although cervical cancer is associated with about 15 high-risk HPV types, invasive cervical cancer is predominantly caused by HPV 16 and 18 (Tiffen & Mahon 2006).

2.1.1. Other factors thought to be associated with cancer of the cervix

2.1.1.1. Marital and sexual factors

The epidemiologists have noted that risk of cervical cancer is strongly influenced by sexual behavior. This has led to discovery of the role of HPV infection. Studies have shown increased risk due to marriage at young age, onset of regular sex at an early age <20yrs, multiple lifetime number of sexual partners (Karlsson et al., 1995). These risk factors remain significant especially among those women without apparent human papilloma virus infection (HPV). Frequency of intercourse has not been found to be a risk factor after accounting for the effects of number of sexual partners.

2.1.1.2. The role of the male sexual partner

In most studies, the husbands of the cervical cancer patients were found to report more sexual partners, history of various genital infections like venereal warts, gonorrhea and herpes simplex genitalis compared to husbands of control subjects. Frequent use of condoms was associated with a lower risk for cancer of the cervix (Miller, Blumenthal & Blanchard, 2004).

2.1.1.3. Gynecological and obstetric events

Multiparity with short intervals between pregnancies (<2 yrs) has been consistently shown to increase the risk of cervical cancer (Hsieh et al., 1999). There is little evidence to show that the risk of cervical cancer is affected by age at menarche and menopause, characteristics of menses or personal hygiene (Smith et al., 2003).

2.1.1.4. Contraceptive methods

Recent research is showing that long-term users of oral contraceptives are at excess risk for cervical cancer, even after adjusting for sexual and social factors. The risk may be stronger for adenocarcinoma than squamous cell neoplasm (Smith et al., 2003).

2.1.1.5. Genetic factors

Although some reports suggest that a familial tendency does exist, but there is still little attention to it (Horng et al., 2004). Whether this tendency reflects environmental or genetic factors is unknown.

2.1.1.6. Dietary factors

Micronutrients (e.g. carotenoids, vitamin C and folate) are thought to have a protective effect to cervical cancer by promoting the regression of low grade squamous intra-epithelial lesion (SIL). Some components of fruits and vegetables have been suggested to be protective too (Hermandez et al., 2003).

2.1.1.7. Smoking

Some case control studies and a cohort investigation have demonstrated increased risk of cervical cancer and SIL among smokers even after controlling for most other risk factors. However, the smoking effect is restricted to squamous cell carcinoma and not among other histological types (Clifford et al., 2005). Smoking is strongly associated with high risk of cervical HPV infection because of correlation between smoking and sexual behavior (Clifford et al., 2005).Therefore, HPV status can confound studies of smoking and cervical cancer.

2.2. Infections other than HPV

HPV may not be the only agent involved in causation of cervical cancer. Of the other agents examined, most attention has been focused on herpes simplex virus type 2 (HSV-2) and Chlamydia which have been shown to increase the risk (Smith et al., 2002). One of the studies conducted in Uganda showed an increased risk of cervical cancer with multiple and concurrent infections, thus addressing the hypothesis that chronic cervico vaginal infection may increase the risk of HPV leading to cancer of the cervix (Schmauz et al., 1989). HIV infection is another viral infection which has been found to increase the risk of high grade lesions of the cervix and thus increasing risk of cancer of the cervix too. The effect is much higher among patients with both HIV and HPV (possible interaction). This may explain why the younger women are reporting with advanced cancer of the cervix.

2.3. Signs and symptoms

Symptoms usually do not appear until abnormal cervical cells become cancerous and invade nearby tissue. When this happens, the most common symptom is abnormal vaginal bleeding. Bleeding may start and stop between regular menstrual periods, or it may occur after

sexual intercourse, douching, or a pelvic exam (Kumar et al., 2007). Menstrual bleeding may last longer and be heavier than usual. Bleeding after menopause or increased vaginal discharge may also be symptoms of cervical cancer.

2.4. Complications of cancer of the cervix

The common ones include: severe anemia as a result of severe or chronic on and off bleeding from the cervix; kidney complications and later kidney failure (renal failure with hydronephrosis) due to obstruction of the ureters by the infiltrating cancer which continues to spread to the pelvic walls; vesico vaginal fistula (communication between the urinary bladder and vagina) and rectal vaginal fistula (communication between rectum and vagina); and severe pain as a result of infiltration of the sacral nerves (Canavan & Doshi, 2000). Mortality is commonly due to anemia and Uremia (due to kidney failure).

3. Epidemiological issues

3.1. Cervical cancer: Burden of disease in the developed regions

Estimated incidence and mortality of cervical cancers in 2008 varied widely between countries in each developed regions (Table 1). Highest incidence rates for this cancer within the European region were recorded for Hungry (16.6/100, 00) followed by Czech Republic (13.8/100,000), and Poland (12.3/100,000), with lowest incidence rates in Finland, Greece, and Switzerland and Greece. Death rates due to cervical cancer are highest in Poland (6.2/100, 00) and lowest in Finland and Switzerland within the developed countries of European region (Table 1).

The lowest incidence (1.7/100,000) and mortality rate (5.7/100,000) from cervical cancer was registered in United States, while Canada had the highest incidence (6.6/100,000) and mortality rate (1.9/100,000), within the North America region (Table 1). Within the South America and Middle East region, Brazil and Israel had the highest incidence and mortality rate due to cervical cancer. A wide variation of cervical cancer incidence and mortality rate is observed among countries from the developed countries of Asia and the Pacific, whre highest incidence (10.8/100,000) and mortality rate (2.7/100,000) was registered in Republic of Korea (South Korea), while Australia had the lowest incidence (4.9/100,000) and mortality rate (1.4/100,000) (Table 1).

Region/Country	Annual incidence rates per 100,000	Annual cervical cancer deaths per 100,000
	Europe	
Belgium	9.4	2.7
Czech Republic	13.8	4.2
Denmark	11.0	2.5

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Region/Country	Annual incidence rates per 100,000	Annual cervical cancer deaths per 100,000
Finland	3.7	0.9
France	7.1	1.8
Germany	6.9	2.3
Hungry	16.6	5.8
Iceland	6.3	1.6
Ireland	10.9	3.1
Italy	6.7	1.5
Luxemburg	6.3	1.9
Netherlands	5.4	1.5
Norway	9.3	2.3
Poland	12.3	6.2
Portugal	12.2	3.6
Spain	6.3	1.9
Sweden	7.4	1.8
Switzerland	4.0	0.9
United kingdom	7.2	2.0
	North America	
Canada	6.6	1.9
United States	5.7	1.7
	South America	
Brazil	24.5	10.9
Uruguay	16.5	6.8
	Middle East	
Israel	5.6	2.1
Saudi Arabia	2.1	0.8
Turkey	4.2	1.6
	Asia/Pacific	
Australia	4.9	1.4
Japan	9.8+	2.6
Republic of Korea	10.8	2.7
New Zealand	5.5	1.6

Source: Globocan 2008, International Agency for Research on Cancer

Table 1. Age-adjusted cervical cancer incidence and mortality rates for 2008 for 31 developed countries

3.2. Cervical cancer incidence in United Kingdom

Cervical cancer is the 9th most common cancer in the UK in 2009, accounting for 1% of all new cases and it is the11th most common cancer among women in the UK, accounting for around 2% of all new cases of cancer in females (Cancer Statistics Registrations, England, 2011). In 2009, there were 3,378 new cases of cervical cancer in the UK (Table 2). The crude incidence rate shows that there are around 11 new cervical cancer cases for every 100,000 females in the UK. The European age-standardized incidence rates (AS rates) of cervical cancer are significantly higher in Northern Ireland compared with England (Table 2). However, the rates do not differ significantly between the other countries.

	England	Wales	Scotland	Northern Ireland	United Kingdom
Cases	2,747	186	326	119	3,378
Crude rate	10.4	12.1	12.2	13.1	10.8
AS rate	9.8	11.4	11.2	12.9	10.1
AS rate-95% LCL*	9.4	9.8	10.0	10.6	9.8
AS rate-95% UCL**	10.2	13.0	12.4	15.2	10.5

** 95% LCL and 95% UCL are the 95% lower and upper confidence limits around the age standardized rate (AS rate)

Source: Cancer Research, United Kingdom

Table 2. Cervical Cancer, Number of New Cases, Crude and European Age-Standardized (AS) Incidence Rates per 100,000 Population, Females, UK, 2009

3.2.1. Trends of cervical cancer incidence in the United Kingdom over time

Cervical cancer incidence rates decreased dramatically since the late 1980s following the introduction of the national NHS cervical screening programs around the UK in 1988. Rates then reached a plateau in the early 2000s (shown for Great Britain in Figure 1). Rates decreased by 49% in Great Britain from their peak in 1985-1987 (at 16.3 per 100,000 women) to the lowest rate in 2002-2004 (at 8.4 per 100,000 women). This is because cervical screening detects and treats abnormal cells, and so can help prevent many cases of cervical cancer from ever developing (Thompson et al., 2010).

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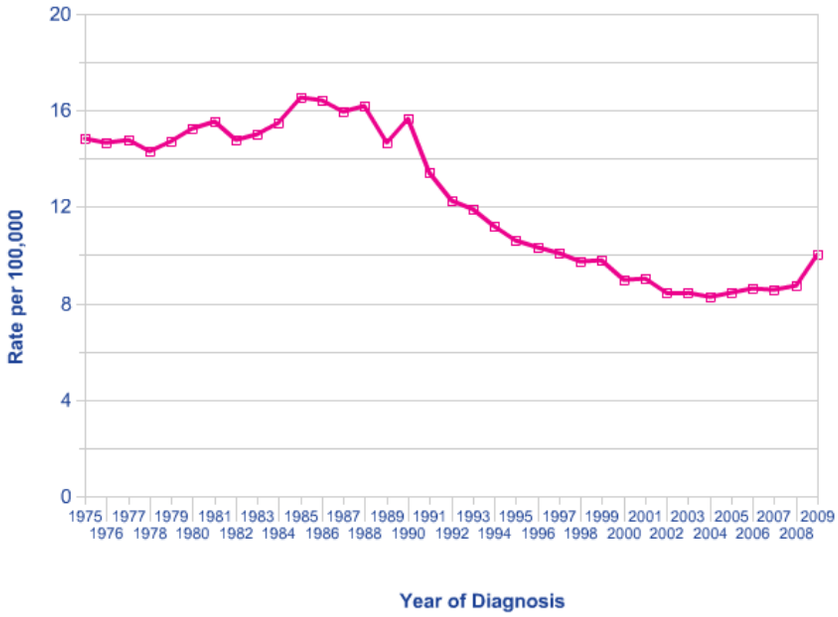


Figure 1. Cervical cancer: European age-standardized incidence rates, females, Great Britain, 1975-2009. Source: Cancer Research, UK

The age-standardized incidence rate for the UK initially shows a similar downward trend from 1993 onwards (Figure 2). However, since 2002-2004, the incidence rate has been increasing by more than 9% (from 8.4 in 2002-2004 to 9.2 in 2007-2009). Between 2008 and 2009 there was an increase in the age specific incidence rate of 14% for all ages in the UK (Figure 2).

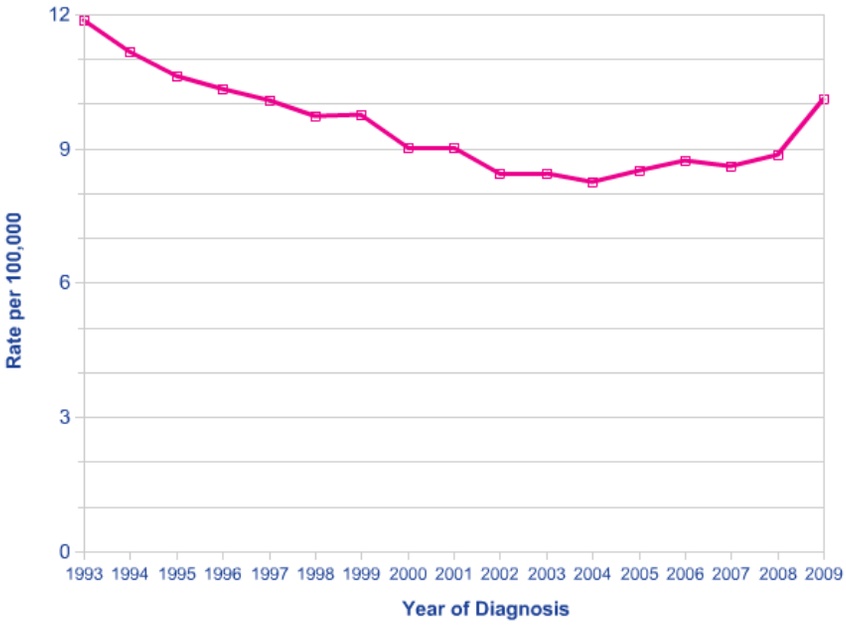


Figure 2. Cervical cancer: European age-standardized incidence rates, females, UK, 1993-2009. Source: Cancer Research, UK

3.3. Cervical cancer incidence in United States

Cervical cancer used to be the leading cause of cancer death for women in the United States. However, in the past 40 years, the number of cases of cervical cancer and the number of deaths from cervical cancer have decreased significantly. This decline largely is the result of many women getting regular Pap tests, which can find cervical pre cancer before it turns into cancer. It is estimated that 12,170 women will be diagnosed with and 4,220 women will die of cancer of the cervix uteri in 2012.

Although cervical cancer incidence and mortality rates have declined approximately 50% in the United States over the past three decades, the disease remains a serious health threat. There are large differences in the rates of new cases of and deaths from cervical cancer among women from different racial and ethnic groups in the United States. Death rates of cervical cancer for older Black women are nearly three times greater than those for White women of the same age group (Figure 3). Older Hispanic women, Asian women and American Indian/Alaska Native women also have much higher death rates from cervical cancer than do White women.

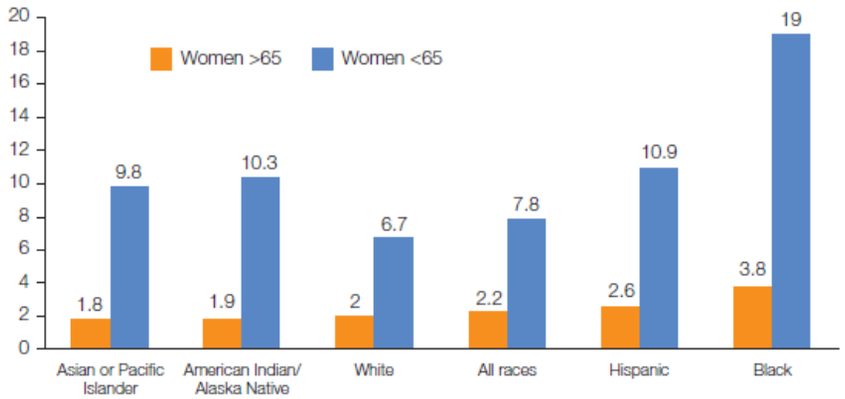


Figure 3. Mortality rate due to cervical cancer by race and age in United States. Source: National Cancer Institute, SEER data: Cancer Statistics Branch, released April 2006.

4. Prevention of cervical cancer

Cervical cancer is one of the most preventable types of cancer. The following preventive measures can be undertaken to help cross- out the cervical cancer: primary prevention and secondary prevention

4.1. Vaccines as primary prevention

By 2007 two prophylactic vaccines, both highly effective against oncogenic HPV types 16 and 18, available in industrialized countries. Between June and October 2006, a quadrivalent

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HPV vaccine protective against HPV types 6, 11, 16 and 18 (Gardasil®, Merck) was licensed for use first by the US regulatory authorities and then by the European Commission (EC). EC approval for a bivalent vaccine protective against HPV types 16 and 18 (Cervarix®, GlaxoSmithKline Biologicals) is expected to follow (Harper et al., 2004; Villar et al., 2005) Clinical trial data to date suggest a minimum of four to five years' efficacy of close to 100% in preventing persistent infection and precancerous cervical abnormalities (cervical dysplasia) caused by type-specific disease. However, the vaccines are given in a series of three 0.5 ml intramuscular injections over a six month period, and duration of response is only available for the complete series (Harper et al., 2006).

In addition, women vaccinated with the bivalent vaccine had a 94% reduction in new infections with two other oncogenic HPV types, while those vaccinated with the quadrivalent formulation showed a measurable antibody response to those same additional types, giving evidence of cross-protection (Harper et al., 2006; Smith et al., 2006). One model suggests that a vaccine with 98% efficacy against HPV-16 and 18 could, within 40 to 50 years, reduce cervical cancer incidence by 51% if all adolescent girls were vaccinated before initiation of sexual activity (Goldie et al., 2003). The actual impact of the vaccine will be highly dependent on country-specific parameters, including the capacity to deliver current vaccines that require three consecutive doses, cold chain management and a possible booster dose year later (Lowndes, & Gill, 2005).

The new vaccine is designed to prevent cervical cancer by stimulating the body's immune system to make antibodies that will prevent the virus from infecting the woman. Unlike many vaccines that may contain live or killed virus particles, the HPV vaccine does not contain any genetic material responsible for creating warts, dysplasia or cancer (Anne-Sophie et al., 2011). Instead, the HPV virus is made up of the outer protein coat (cover) of the HPV virus. This cover tricks the immune system and causes it to make antibodies that protect the patient from infection. Because the vaccine contains none of the harmful viral genetic material, the vaccine is quite safe to administer to patients. While the vaccine is a huge step in fighting a preventable and treatable cancer, it is not the end-all be-all in cervical cancer care. There are over 30 types of HPV and the vaccines only protect against two or four strains, respectively. There are still other strains of HPV that cause cancer, and it is possible that a woman could already be infected by HPV when she was vaccinated. As a result, even with vaccination routine Pap tests or other cervical cancer screening tests are still necessary.

4.1.1. Vaccine implementation in the developed countries

In developed countries, the widespread use of cervical "Pap smear" screening programs has reduced the incidence of invasive cervical cancer by 50% or more. Current preventive vaccines reduce, but do not eliminate the chance of getting cervical cancer. Therefore, experts recommend that women combine the benefits of both programs by seeking regular Pap smear screening, even after vaccination.

Country	Vaccine implementation
Australia	Commencing in 2007 The Australian federal government began funding a voluntary program to make Gardasil available free of charge to women aged 12–26 for a period of two years, with an ongoing vaccination program for 12- and 13-year-olds as part of the pre-existing high school vaccination program. The Australian government and the Pharmaceutical Benefits Scheme (PBS) have approved the vaccine for use, and in 2007 began a nationwide vaccination program free of charge to schoolgirls in years 7 to 12. Australia also approved Gardasil for boys 9–15 years old, but Australia is not providing government funding for vaccinating boys.
Canada	Canada has approved use of Gardasil. Free vaccinations to protect women against HPV were slated to begin in September 2007 and will be offered to girls ages 11–14.
Denmark	Introduced in Denmark from 1 January 2009 as part of the Danish Childhood Vaccination program.
France	On July 17, 2007, France issued a directive authorizing state-aided voluntary vaccination for girls aged 14–23 years who have not yet become sexually active, or have been sexually active for less than a year.
Germany and Italy	On March 26, 2007, early approval for Gardasil vaccinations was granted in both Germany and Italy.
Greece	On February 12, 2007, Greece made HPV vaccination mandatory for girls entering gymnasion (7th grade). All vaccines including hepatitis B are mandatory and are supplied free to everyone in Greece, with parents being allowed to opt out of vaccinating their kids. Cervarix and Gardasil are supplied free to all girls and women between the ages of 12 and 26.
Norway	In Norway, starting from the fall of 2009, HPV vaccination was introduced into the national immunization program, for girls aged 12–13. In March 2010, 57% of all girls born in 1997 had received the first dose of the vaccine
South Korea	On July 27, 2007, South Korean government approved Gardasil for use in girls and women aged 9 to 26 and boys aged 9 to 15.Approval for use in boys was based on safety and immunogenicity but not efficacy.
Sweden	In Sweden, starting January 1, 2010, girls born in 1999 or later and in the ages 10 to 12 can receive a free HPV vaccine.
United Kingdom	In the UK the vaccine is licensed for girls aged 9 to 15, for women aged 16 to 26, and for boys aged 9–15.HPV vaccination with cervarix was introduced into the national immunization program in September 2008, for girls aged 12–13 across the UK. A two-year catch up campaign started in Autumn 2009 to vaccinate all girls up to 18 years of age. Catch up vaccination will be offered to: girls aged between 16 and 18 from autumn 2009, and girls aged between 15 and 17 from autumn 2010.By the end of the catch up campaign, all girls under 18 will have been offered the HPV vaccine.
United States	According to the US Centers for Disease Control and Prevention (CDC), getting as many girls vaccinated as early and as quickly as possible will reduce the cases of cervical cancer among middle-aged women in 30 to 40 years and reduce the transmission of this highly communicable infection.

Source: European Cervical Cancer Association; American Cancer Society

Table 3. Vaccine implementation by various developed countries

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4.2. Cervical cancer screening: Secondary prevention

The objective of cervical cancer screening is to reduce both incidence and mortality. A successful screening program detects early, pre invasive lesions during the preclinical detectable phase and is able to reduce deaths by preventing the occurrence of invasive cancer. Diagnostic assessment requires colposcopy examination, with assessment of morphological features of the cervix as well as histological evaluation. Over the past five decades, widespread access to cervical screening and early treatment has been a cornerstone of basic reproductive health services for women in wealthy countries. The Papanicolaou test or "Pap smear" has significantly reduced the burden of cervical cancer in developed countries program (Hristova & Hakama, 1997; Duguid, Duncan, & Currie, 1985; Taylor et al., 2001).

In resource-rich settings, women are usually able to make repeated visits to seek screening, diagnosis and treatment in clinics. The health system is equipped with skilled lab technicians, referral systems and clinicians capable of effectively managing this disease. It is estimated that regular screening reduces the risk of cancer by 80% to 98% (Olesen, 1988; WHO 1986). Organized screening programs for cervical cancer using Pap smears have been shown to be more effective than opportunistic or non-organized screening. Opportunistic screening typically misses the women at greatest risk (Anttila et al., 2004). Studies show that if a woman is screened only once in her lifetime between the ages of 30 to 40 it would reduce her lifetime risk of cervical cancer between 25-36%.

In Finland, the population-based cervical cancer screening program which began in 1963 achieved a 60% reduction in the incidence of cancer at 10 years (Nieminen, Kallio & Hakama, 1995). In Norway, a population-based nationwide cervical cancer screening program was introduced in 1995. Two years later the incidence of invasive cancer was 22% lower (Nygard, Skare & Thoresen, 2002). In the United Kingdom the incidence of cervical cancer in women aged 20-69 years fell by 33% between 1991-1993 and 1998-2000; mortality fell by 36% over the same period (Canfell, Sitas & Beral, 2006). In Sweden, for example, the overall incidence of cervical cancer declined by 67% over a 40-year period, from 20 cases per 100 000 women (world standard rate) in 1965 to 6.6 cases per 100 000 women in 2005. Conversely, the incidence of invasive cancer increased in an area of Denmark where organized screening had been discontinued (Lynge, 1998). Other screening methods include direct visualization of the cervix, liquidbased cytology and HPV screening.

A number of National guidelines are currently moving towards less frequent smear tests (once every 3-5 years) since the cervical lesions develop fairly slowly after several years. Women with high grade lesions of the cervix are further evaluated using colposcopy, biopsy and subsequent treatment of confirmed lesions. The women with low grade lesions are generally advised to return for routine follow up smears. Organized programs with systematic call recall and follow up showed greatest effect in Finland and Iceland using fewer resources compared to USA where they are successful but more resources used (Sankaranarayanan, Budukh, & Rajkumar, 2001). Since progression to cervical cancer occurs after several years and the low grade lesions tend to regress spontaneously or may not progress, high frequency of screening would help in detection of previously missed high-grade lesion of the cervix.

Current procedures that involve screening women once every 1-5yrs have considerable cost and resource implications.

4.2.1. Status of cervical screening in the European Union

Almost all EU countries have a screening policy for cervical cancer. However, there are major variations in how the screening is organized, the type of screening activities, the targeted age range and the recommended screening interval, as well as payment strategies. A review in 2004 (Mackay et al, 2006) showed that national screening programs were in place in the Nordic countries, the United Kingdom, Latvia, Slovenia, the Netherlands and Hungary. Regional screening programs were operational in Spain, Portugal, Italy, Romania, Czech Republic, Austria and Belgium. Pilot programs existed in France, Greece, Ireland and Estonia. No population-based screening program was in place in Germany, although there was a screening policy.

The recommended screening interval ranges between three and five years in most EU countries for which information is available. Some countries or regions recommend an excessive number of smears, with consequent potential for over diagnosis and overtreatment. Similarly, the population covered by the screening programs varied between 30% in Slovenia and 100% in the Nordic countries and Italy (Anttila et al., 2004).EU recommendations state that cervical cancer screening should be offered on a population basis in organized screening programs. Pap smear screening for cervical abnormalities should start by the age of 30 (at the latest) and definitely not before the age of 20 (Council of the European Union, 2003). Detailed European guidelines on quality assurance screening programmes have been developed (European Cancer Network, 2007). Centralized data systems are essential for monitoring and evaluating the effectiveness of such programs.

4.2.2. Status of cervical screening in the US

The United States Preventive Services Task Force supports screening every 5 years in those who are between 30 and 65 years when cytology is used in combination with HPV testing. The American Cancer Society recommends these screening guidelines for most adults: (i) cervical cancer screening (testing) should begin at age 21; (ii) women under age 21 should not be tested;(iii) women between ages 21 and 29 should have a Pap test every 3 years. Now there is also a test called the HPV test. HPV testing should not be used in this age group unless it is needed after an abnormal Pap test result; (iv) women between the ages of 30 and 65 should have a Pap test plus an HPV test (called "co-testing") every 5 years; (v) women over age 65 who have had regular cervical cancer testing with normal results should not be tested for cervical cancer. Once testing is stopped, it should not be started again; (vi) women with a history of a serious cervical pre-cancer should continue to be tested for at least 20 years after that diagnosis, even if testing continues past age 65; (vii) a woman who has had her uterus removed (and also her cervix) for reasons not related to cervical cancer and who has no history of cervical cancer or serious pre-cancer should not be tested; (viii) a woman who has been vaccinated against HPV should still follow the screening recommendations

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for her age group. Some women – because of their history – may need to have a different screening schedule for cervical cancer.

5. Conclusions

Cervical cancer is a unique public health challenge. It is gender-specific, caused by a sexually transmitted virus, and its primary and secondary prevention strategies target opposite ends of a wide age spectrum. The natural history of cervical cancer is well studied, and screening programs that identify pre-cancers early have been successful at significantly reducing disease, albeit at significant financial cost. Primary prevention through HPV vaccination will most likely be one of the most remarkable medical advances of this century. Together, secondary prevention through screening and early treatment and primary prevention through early adolescent vaccination could provide a comprehensive strategy for a long-term vision to eliminate cervical cancer. Thanks to the effectiveness of national screening programs, the incidence and mortality rates for cervical cancer have declined dramatically in developed countries. Vaccination against HPV infection could reduce the risk of infection and, most importantly, decrease the incidence of cervical cancer. Therefore, beating cervical cancer in the developed countries is not a dream in the far future, it is happening today.

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