CHARLES UNIVERSITY IN PRAGUE

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Department of Mother and Child Care in Prague Podoli

Mohummud Irfaan Khan Chady

Gynecology malignancy screening and prevention

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Author of diploma thesis: **Mohummud Irfaan Khan Chady**
Master's programme of study: **General Medicine**

Advisor of the thesis: **MUDr. Radovan Turyna**

Department of the advisor of the thesis: **Department for Mother and Child Care Prague Podoli**

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Written Declaration

I declare that I completed the submitted work individually and only used the mentioned sources and literature. Concurrently, I give my permission for this diploma/bachelor thesis to be used for study purposes.

In Prague on 2.9.2010 Mohummud Irfaan Khan Chady

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I would like to thank...

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Introduction

The topic of this diploma thesis, gynaecological malignancy screening and prevention, is a theme of actuality in preventive medicine. Although, gynaecological malignancy covers a wide range of cancers as breast, ovarian, endometrial and uterine; I have decided to focus on cervical cancers which is an exciting field for screening and prevention in applied medicine. Moreover, this thesis will put forward the epidemiological values and charts of the Czech Republic and the Republic of Mauritius to analyse the benefits of screening methods.

Overview of optimum screening for gynaecological malignancies

The availability of screening modalities and improvements in prevention has reduced the risk of developing some cancers over the last few decades. Methods for optimal screening of gynaecologic cancers are still being investigated. Cervical cancer is the only gynaecologic malignancy for which a screening modality is widely accepted and recommended to all women. Vaginal cancer is associated with a similar etiology, pathobiology, and symptomatology as is cervical cancer. Vaginal dysplasia and cancer can also be detected by the Pap test, but the prevalence of the disease is low. Endometrial carcinoma is the most common gynaecologic cancer. The widespread availability of outpatient biopsy devices has been the most significant advance in the early diagnosis of corpus cancers. Ovarian cancer is the gynaecologic malignancy associated with the highest death rate. No modality has been shown as an effective screening method for this cancer. Women with a family history of ovarian cancer may benefit from combined modality screening; prophylactic oophorectomy should be offered to those with hereditary ovarian cancer syndromes. A complete physical examination by the physician offers the best method for early detection of vulvar cancer. Awareness and implementation of recommended screening guidelines for gynaecologic cancers by primary care and specialty physicians can decrease the incidence and mortality of

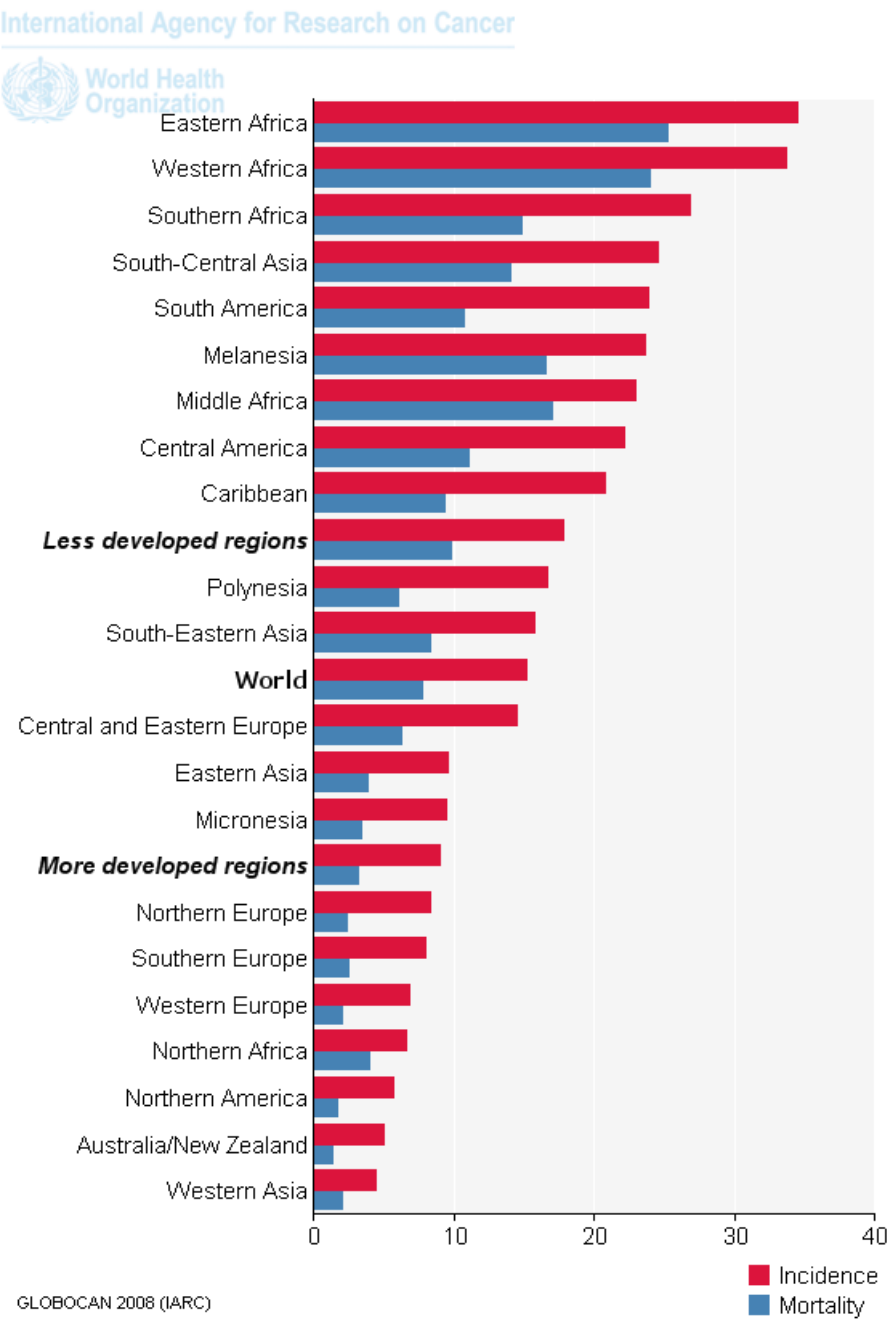
cervical cancer. Including the genital tract in the complete examination of the female patient could decrease markedly the mortality from the other gynaecologic cancers. [1]

1.1. Cervical Cancer Incidence and Mortality Worldwide in 2008 Summary

Estimated numbers (thousands)	Cases	Deaths
World	529	275
More developed regions	76	33
Less developed regions	453	241
WHO Africa region (AFRO)	75	50
WHO Americas region (PAHO)	80	36
WHO East Mediterranean region (EMRO)	18	11
WHO Europe region (EURO)	60	28
WHO South-East Asia region (SEARO)	188	102
WHO Western Pacific region (WPRO)	105	46
IARC membership (21 countries)	192	96
United States of America	11	3
China	75	33
India	134	72
European Union (EU-27)	31	13

Cervical cancer is the third most common cancer in women, and the seventh overall, with an estimated 529 000 new cases in 2008. More than 85% of the global burden occurs in developing countries, where it accounts for 13% of all female cancers.High-risk regions are Eastern and Western Africa (ASR greater then 30 per 100,000), Southern Africa (26.8 per 100,000), South-Central Asia (24.6 per 100,000), South America and Middle Africa (ASRs 23.9 and 23.0 per 100,000 respectively). Rates are lowest in Western Asia, Northern America and Australia/New Zealand (ASRs less than 6 per 100,00). Cervical cancer remains the most common cancer in women only in Eastern Africa, South-Central Asia and

Melanesia. Overall, the mortality: incidence ratio is 52%, and cervical cancer is responsible for 275 000 deaths in 2008, about 88% of which occur in developing countries: 53 000 in Africa, 31 700 in Latin America and the Caribbean, and 159 800 in Asia.



Estimated age-standardised rates (World) per 100,000

1.2 Risk Factors

Human Papillomavirus (HPV) Infection

Infection of the cervix with human papillomavirus (HPV), a sexually transmitted disease, is the primary risk factor for cervical cancer. There are more than 70 types of viruses called papillomaviruses. Certain HPV types can cause warts on the female and male genital organs and anus. HPV is passed from one person to another during sexual contact. Large studies have found a particular type of HPV—called HPV C, with types HPV 16, 18, 31, and 45C— in more than 93% of cervical cancer cases.

A vaccine has recently been developed to protect against infection by the most common types of HPV associated with cervical cancer, but it must be given before infection to be effective.

Age

After the age of 25, the risk of developing cervical cancer begins to increase. But, this cancer, or its precancerous changes, can be diagnosed in young women in their early 20s and even in their teens. After age 40, the risk of developing cervical cancer stays about stable. The risk of dying from cervical cancer increases as women get older.

Sexual History

Women who had sexual intercourse at an early age or women who have had many sexual partners are at an increased risk of cervical cancer. If a woman is with a partner who has had many sexual partners, this also increases her risk.

History of Not Having Pap Tests

Women who have never had a Pap test or who have not had one for several years have a higher-than-average risk of developing cervical cancer. This screening tool is quite effective for catching abnormal cell growth early, before it progresses to cancer.

Smoking

By smoking, the body is exposed to many cancer-causing chemicals. Tobacco by-products have been found in the cervical mucus in women who smoke. The risk appears to increase with the number of cigarettes smoked per day and the number of years a woman has smoked. Smokers are about twice as likely as nonsmokers to get cervical cancer.

Diethylstilbestrol (DES)

Between 1940 and 1971, doctors prescribed DES, a hormone, to pregnant women who were thought to be at an increased risk for miscarriage. About 1 out of every 1,000 women whose mother took DES when pregnant with them will develop cancer of the cervix or vagina. Almost all of these women who go on to develop cervical cancer as a result of DES have an early cellular pattern change in the cervix that can be detected.

Weakened Immune System

Several reports have shown that women with weakened immune systems, as with human immunodeficiency virus (HIV) or from immune-suppressing drugs taken after a transplant, are more likely to develop cervical cancer. (HIV damages the body's immune system; this makes a woman more susceptible to HPV infection, which may increase the risk of cervical cancer.) In someone with a weakened immune system a cervical precancer may develop into an invasive cancer faster than it normally would in a woman without a weakened immune system.

Poor Nutrition

Diets low in fruits and vegetables are associated with an increased risk of cervical cancer.

Race and Ethnicity

In the United States, several racial and ethnic groups have higher cervical cancer death rates. Among African Americans, the death rate from cervical

cancer is more than twice the national average. Hispanics and American Indians also have death rates above the average.

Low Socioeconomic Status

Experts believe that women with low socioeconomic status are at an increased risk due to a lack of ready access to adequate healthcare services. This may keep women from getting the necessary screening needed to diagnose and treat cervical cancer in its early stages. (2,3,4)

The following *risk* factors ***may increase*** the risk of cervical cancer:

High number of full-term pregnancies

Women who have had 7 or more full-term pregnancies may have an increased risk of cervical cancer.

Long-term use of oral contraceptives

Women who have used oral contraceptives ("the Pill") for 5 years or more have a greater risk of cervical cancer than women who have never used oral contraceptives. The risk is higher after 10 years of use.

The following protective factors may decrease the risk of cervical cancer:

Preventing HPV infection

HPV may be prevented by the following:

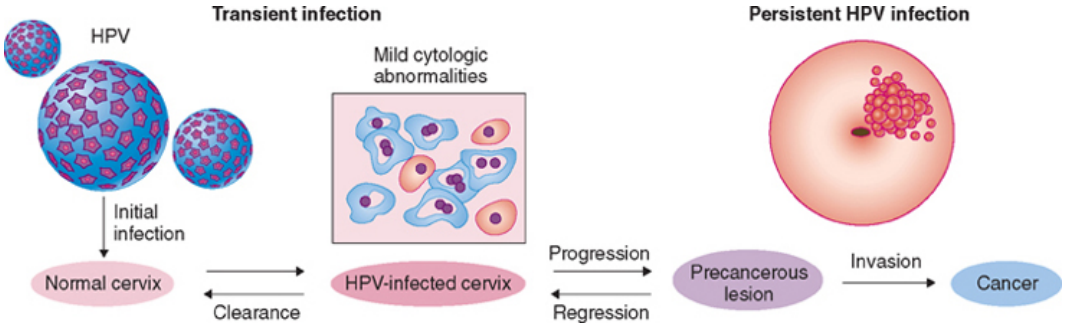
- Avoiding sexual activity: HPV infection of the cervix is the most common cause of cervical cancer. Avoiding sexual activity decreases the risk of HPV infection.
- Using barrier protection or spermicidal gels: Some methods used to prevent sexually transmitted diseases (STDs) decrease the risk of HPV infection. The use of barrier methods of birth control (such as a condom or gel that kills sperm) help protect against HPV infection.

- Getting an HPV Vaccine: An HPV vaccine has been approved by the U.S. Food and Drug Administration (FDA). The HPV vaccine has been shown to prevent infection with the two types of HPV that cause most cervical cancers. The vaccine protects against infection with these types of HPV for 6 to 8 years. It is not known if the protection lasts longer. The vaccine does not protect women who are already infected with HPV.

1.3 Pathophysiology

Invasive cervical cancer develops from a preinvasive state termed *cervical intraepithelial neoplasia* (CIN). CIN 1 represents mild dysplasia and is now classified as low-grade squamous intraepithelial lesions (LSILs), CINs 2 and 3 encompass moderate-to-severe dysplasia and are classified as high-grade squamous intraepithelial lesions (HSILs) based on the Bethesda cervical cytology reporting system.[5] Most LSILs spontaneously resolve, whereas high-grade squamous intraepithelial lesions (HSILs) are more likely to progress to invasive cervical cancer. HSILs are typically detected at an average of 10 to 15 years younger than for invasive cervical cancer. For example, the typical age range for diagnosis of carcinoma in situ is 25 to 35 years, whereas that for invasive cancer is older than 40 years.[6]

Infection of the cervical epithelium with oncogenic types of human papillomavirus (HPV) is essential to the development of cervical cancer and its precursor lesions.[7,8] Early epidemiologic studies found that at least 76% of cases of CIN could be attributed to HPV infection.[9] Women with CIN lesions in the study exhibited the typical epidemiologic profile of sexually transmitted infection: more sexual partners, earlier age at first sexual intercourse, and lower socioeconomic status.



Evidence supporting the association between infection by carcinogenic HPVs and the subsequent development of virtually all cervical cancer is conclusive. Cervical squamous intraepithelial lesions demonstrate the classic morphologic changes of HPV infection, such as epithelial hyperplasia (acanthosis) and degenerative cytoplasmic vacuolization (koilocytosis) in terminally differentiated keratinocytes with atypical nuclei.[10] HPV has been observed in these lesions using electron microscopy.[11] In addition, HPV structural proteins have been detected in surgical specimens using immunohistochemical staining with antibodies that specifically detect HPV viral antigens.[12] Large serial studies from 22 countries have shown that more than 90% of cervical squamous cell carcinomas contain DNA from high-risk HPV types, presumably transmitted during sexual activity.[7] A more recent study[13] indicated the worldwide HPV prevalence in cervical cancer is as high as 99.7%. Furthermore, HPV DNA has been extracted from metastatic cervical cancer tissues and cervical cancer tumor cell lines in culture.[14,15]

Eighty types of HPV have been sequenced, and approximately 30 of these infect the female and male genital tracts.[16] Eighteen genital HPV subtypes (16, 18, 26, 31, 33, 35, 39, 45, 51, 52, 53, 56, 58, 59, 66, 68, 73, and 82) are classified as high risk because of their close causative association with cervical cancer.[17]

Research in the last decade has provided a better understanding of the molecular carcinogenesis of HPV. In vitro infection of human epithelial cells by carcinogenic HPV subtypes induces indefinite cell growth, or cell

immortalization.[18,19] Two HPV viral proteins, E6 and E7 proteins, are required for cell immortalization.[20–22]

Further studies[23–25] revealed that E6 proteins from high-risk HPV interact with the cellular tumor suppressor protein p53. The p53 suppresses cell proliferation by arresting growth in the G1 phase of the cell cycle. E6 proteins from high-risk HPV complexes with p53 and results in the rapid proteolytic degradation of p53 proteins.[23,24] The decreased level of p53 protein abolishes the cell's ability to suppress uncontrolled cell proliferation.[25] On the other hand, E7 proteins from high-risk HPV bind to another cellular tumor suppressor, the retinoblastoma protein (pRB), and disrupt the complex between the cellular transcription factors E2F-1 and pRB. The free E2F-1 stimulates cellular DNA synthesis and uncontrolled cell proliferation.[26] E6 and E7 proteins from HPV-16 can also cooperate to induce centrosome-related mitotic defects and genomic instability.[27] It is clear that persistent infection by oncogenic HPVs is a prerequisite for the development of cervical cancer and its precursor lesions, although only a few women infected with HPV eventually develop cervical cancer.

1.4 Classification

Cervical precancer: different terminologies used for cytological and histological Reporting

Cytological classification (used for screening)	**Histological classification (used for diagnosis)**

Pap	**Bethesda system**	**CIN**	**WHO descriptive classifications**
Class I	Normal	Normal	Normal
Class II	ASC-US ASC-H	Atypia	Atypia
Class III	LSIL	CIN 1 including flat condyloma	Koilocytosis
Class III	HSIL	CIN 2	Moderate dysplasia
Class III	HSIL	CIN 3	Severe dysplasia

Class IV	HSIL	CIN 3	Carcinoma in situ
Class V	Invasive carcinoma	Invasive carcinoma	Invasive carcinoma

CIN: cervical intraepithelial neoplasia; LSIL: low-grade squamous intraepithelial lesion; HSIL: high-grade squamous intraepithelial lesion; ASC-US: atypical squamous cells of undetermined significance; ASC-H: atypical squamous cells: cannot exclude a high-grade squamous epithelial lesion.

2. Screening

The conventional Pap test has been the mainstay of cervical cancer screening since its inception in the 1950s. Screening protocols remained unchanged for the first four of the last five decades. Standardization of cervical cytology and reporting terminology was accomplished in 1988 with the implementation of the Bethesda system.

Remarkable new advances in the last decade have transformed our screening protocol. Cervical cytology specimen adequacy and more accurate interpretations of cervical cancer precursors have been achieved by using new liquid-based cervical cytologic smear technology (ThinPrep).[28–30] Using the revised Bethesda cytology reporting system (2001), clinicians can better triage patients with abnormal cervical cytology based on less ambiguous terminology.[31,32] Data from the National Cancer Institute–sponsored multicenter randomized clinical trial (ALTS trial, 2001) have demonstrated the clinical value of HPV testing in triaging women with atypical squamous cells of undetermined significance (ASC-US).[31–33] After a diagnosis of ASC-US, clinicians can determine on the basis of HPV testing results whether a woman requires colposcopic examination or

needs only to repeat Pap tests 1 year later. More recently, multiple large-scale, cross-sectional studies from several countries have compelled the U.S. Food and Drug Administration (FDA) to approve the hybrid capture 2 test for HPV as an adjunct to the Pap test in primary screening (March, 2003).[34–38] It is now evident that virtually all squamous-cell cervical cancers are caused by one of the 18 types of oncogenic HPV.[39]

Adding HPV DNA Testing to Screening

HPV DNA testing is now included in screening as an adjunct to the Pap test for women 30 years and older. This new screening protocol takes advantage of the high sensitivity and high negative predictive value of HPV DNA testing and the high specificity of cervical cytology. Multiple large-scale studies from several countries, evaluating the role of HPV testing in primary screening, have shown that the combination of a negative Pap test and a negative HPV DNA test indicates the absence of CIN 3 or cancer with almost 100% certainty.[39–43] These studies demonstrate that 80% to 100% of cases of histologically confirmed CIN 2 or cancer were found to be positive for high-risk HPV. The sensitivity of HPV DNA testing to detect CIN 2 or a higher-grade lesion is higher than that of a single Pap test. The sensitivity is even higher than that of HPV DNA testing alone, when HPV DNA testing is combined with Pap testing.

The rationale for recommending HPV testing in women 30 years and older is based on the finding that the prevalence of high-risk HPV infection declines with age. Among women older than 29 years who have ASC-US, only 31.2% have a high risk for HPV positivity, whereas in women age 28 or younger, high-risk HPV positivity rises to 65%.[44] Although HPV infections are extremely common in sexually active younger women, most of these infections will resolve spontaneously or cause only transient, minor lesions. It is very likely that HPV DNA positivity with increased age may reflect the persistence of HPV. This group of older women is at increased risk for development of cervical cancer. Therefore, the

specificity and the positive predictive value of an HPV DNA test increases with the age of the woman.

Liquid based cytology

Liquid based cytology (LBC) involves an altered slide preparation technique, by not making a smear of the material obtained on the spatula/collection device, but placing it in a preservative fluid in order to generate a suspension of cells that is subsequently used to deposit a thin layer of cells on the slide. The technique is believed to produce a more representative sample of the specimen and to reduce contamination by blood cells, pus and mucus. Research evidence has suggested that the use of LBC could provide significant and important benefits over existing technology.

A review carried out for the HTA in 1999/2000 concluded that it is likely that the technique will reduce the number of false-negative test results, reduce the number of unsatisfactory specimens and may decrease the time needed for examination of specimens by cytologists.2

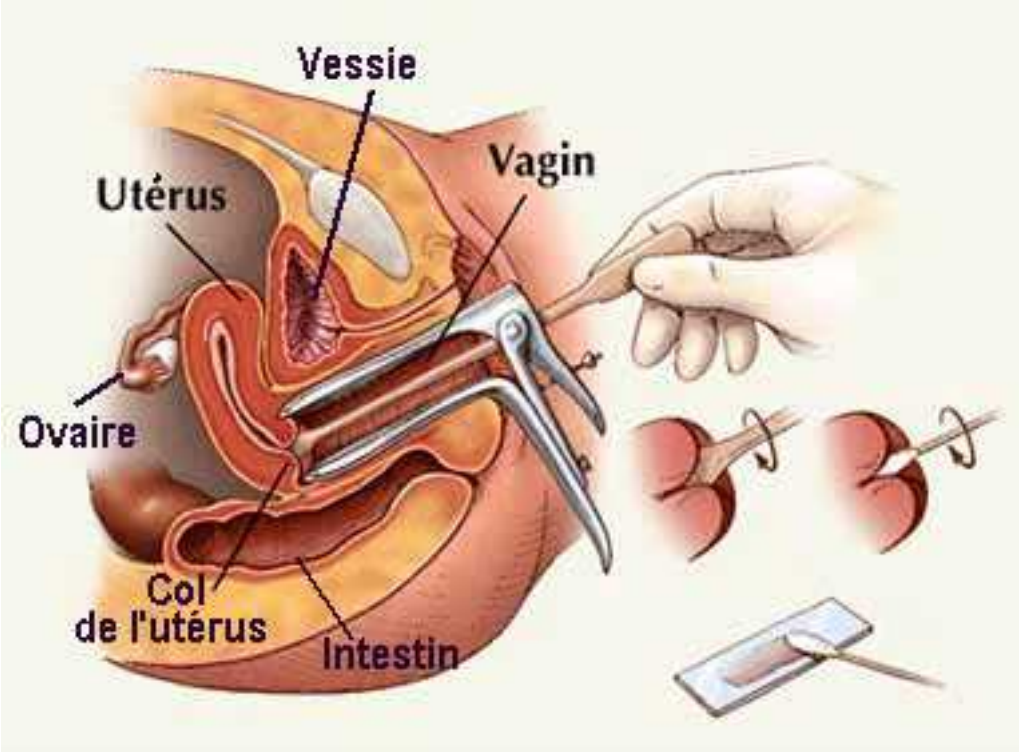
Guidance issued by NICE in June 2000 recommended that pilot projects of LBC should be undertaken and evaluated before national implementation is considered. In particular, it considered there was a lack of knowledge on the costs and cost effectiveness of the techniques.

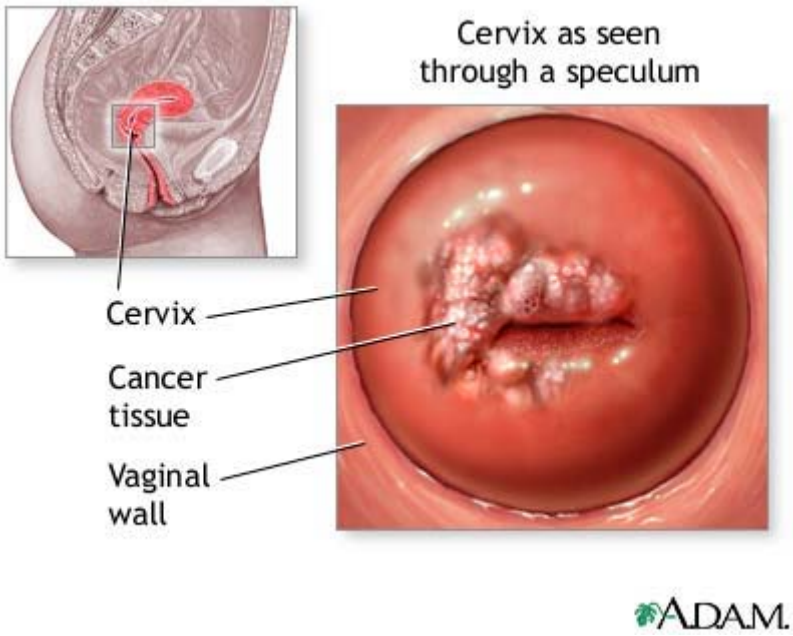
The two most widely studied technologies for LBC preparation are SurePath™ (formally Autocyte®), (TriPath Imaging Inc.) and ThinPrep™ (Cytyc UK). It is understood both technologies have FDA approval. By comparison, the New Zealand NSCP has recently decided not to purchase or endorse liquid-based cytology for its population-based screening programme in the light of a report by New Zealand Health Technology Assessment.3

This report was a systematic review of the literature on2effectiveness and cost effectiveness of automated and semi-automated cervical screening devices. The review of LBC concluded that the lack of verification of test

results meant that clinical effectiveness for detection of high-grade abnormalities could not be reliably determined.(45)

The pap smear test

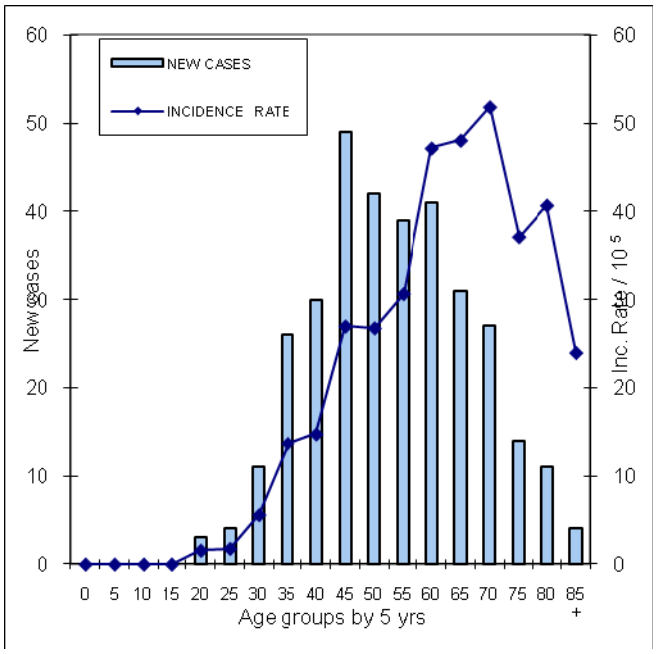


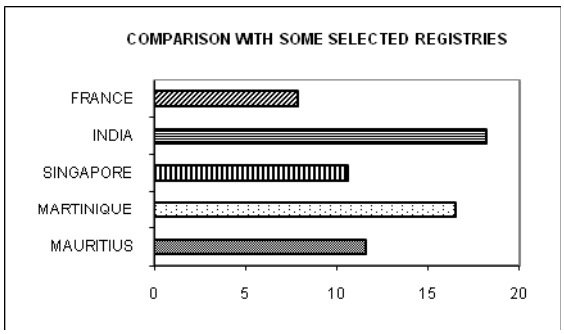


3. HPV prevalence

In Mauritius in the year 2005, a private entity carried a survey on prevalence of HPV in cervical patients and most of them had HPV 18 (80%). At the moment, the government is conducting a study on the prevalence of HPV on control and CIN patients by the LBC method. The routine screening method remains the Pap smear for the time being.

Number of new cases and mean annual age-specific incidence rates per 10^5 by age group of 5 years.





An organised screening campaign started only, as from the year 2000 in Mauritius. The defined age group to be screened will be between 30 and 60 years of age. Before, the mortality from cervical cancer was more than 13 per 100 000 women per year.

Mortality rate of Cervical cancer *(year 2000)*

2.4 women per 100,000 population in Australia

3.3 women per 100,000 population in the U.S

3.9 women per 100,000 population in the U.K

3.5 women per 100,000 population in France 2000

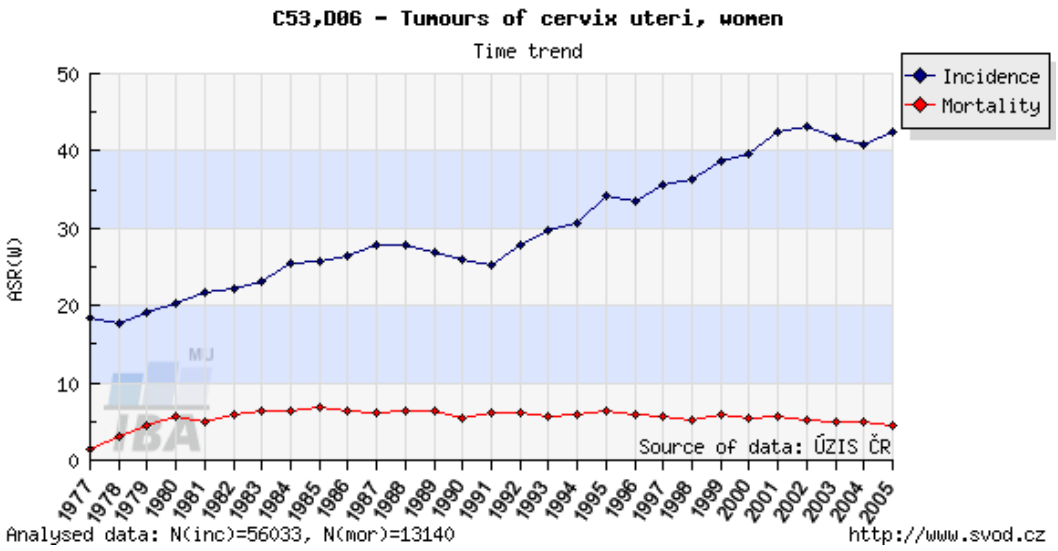
4.2 women per 100,000 population in Germany

15.0 women per 100,000 population in Trinidad and Tobago.

13.6 women per 100,000 population in Mauritius

(Cancer Incidence, Mortality, and Prevalence Worldwide, GLOBOCAN, 2000 American Cancer Society)

Each year, 1050 to 1100 new cases of cervical cancer are diagnosed in the Czech Republic and 350 to 400 Czech women die of this disease. In the long term, the annual incidence rate of cervical cancer in the Czech Republic is about 20 per 100,000 women. There are significant differences between the East and West of the European Union as cervical cancer is much more prevalent in post-communist countries.Cervical cancer screening programmes have been running for decades in Western European countries, while they have been only recently established in Eastern Europe.



Basic epidemiological characteristics of cervical cancer in the Czech Republic (source of data: Czech National Cancer Registry, year 2005).

Incidence	
Number of cases per 100,000 women	19.1
Absolute number of new cases	1003
Proportion of all malignancies in women	3.1 %
Typical age of patients: median (25%–75% quantile)	51 (40–63) years
Mortality	
Number of deaths per 100,000 women	8.2
Absolute number of deaths	407
Proportion of overall mortality	0,8 %

International comparison of cervical cancer epidemiology (GLOBOCAN study, 2002).

International comparison – incidence	
Highest incidence worldwide	ASR (World) > 50 cases per 100,000 women: Haiti, Tanzania, Lesotho, Swaziland, Bolivia, Zambia, Paraguay, Belize, Zimbabwe, Guinea
Highest incidence in Europe	ASR (World) > 18 cases per 100,000 women: Serbia and Montenegro, Albania, Romania, Bosnia-Herzegovina, Bulgaria, Slovakia, Poland
Lowest incidence in Europe	ASR (World) < 10 cases per 100,000 women: France, Belgium, Luxembourg, Iceland, United Kingdom, Sweden, Switzerland, Italy, Greece, Spain, The Netherlands, Ireland, Malta, Finland
Position of Czech Rep. on world rank / in Europe	106th / 10th
International comparison – mortality	
Highest mortality worldwide	ASR (World) > 40 deaths per 100,000 women: Tanzania, Lesotho, Haiti, Swaziland, Zambia, Zimbabwe, Guinea, Rwanda
Highest mortality in Europe	ASR (World) > 7,5 deaths per 100,000 women: Romania, Serbia and Montenegro, Albania, Lithuania, Bulgaria, Bosnia-Herzegovina, Moldova, Poland, Macedonia

Lowest mortality in Europe	ASR (World) < 3 deaths per 100,000 women: Luxembourg, Germany, Ireland, Norway, Belgium, France, Switzerland, United Kingdom, Greece, The Netherlands, Spain, Italy, Finland, Sweden, Malta
Position of Czech Rep. on world rank / in Europe	120th / 16th

4. Screening programme

Guideline to cervical cancer screening programme in Mauritius

The screen age is between 30- 60 years.

If a women was screened only once in her lifetime then, the best age is between 35 – 45 years.

Normal smear is to be repeated every 3 years.

In high risk cases, the normal smear is repeated at less than 1 year interval.

In women above 65 years, screening is not necessary if the last two previous smears were negative.

MANAGEMENT OF CERVICAL SCREENING		
RESULT	Negative	RE –SCREEN AFTER 3 YEARS
RESULT	Positive	COLPOSCOPY & BIOPSY
RESULT	Suspicious of Cancer	COLPOSCOPY & BIOPSY

If biopsy or colposcopy reveals findings of precancer and cancer, appropriate treatment must be started.

SCREENING TEST

SMEAR	MANAGEMENT	
Normal	Repeat in 3 years if no previous abnormality	Routine Recall
Inflammatory	Repeat in 3 years if no previous abnormality. Treat any current infection	Routine Recall
Borderline	Repeat in 6 months. If persists 2 occasions, refer to Colposcopy	Repeat in 1 year, then 2 years then routine recall
MILD Dyskaryosis	Repeat in 3 months If persists refer to Colposcopyand and Biopsy	Repeat in 1 year, then 2 years then routine recall
MODERATE Dyskaryosis	Colposcopy/ Biopsy	Repeat at the follow up
SEVERE Dyskaryosis	Urgent Colposcopy	Repeat at the follow up
Invasion Suspected	Urgent Colposcopy	

AIM of Cervical Screening program:

•The goal is to screen at least 80% of the female population between 30-60 years in Mauritius & Rodrigues in 10 years span.

•To ensure that all patients with abnormal smears are treated and have a proper follow-up. *This will definitely help in reducing the rate of mortality and morbidity from Cancer of cervix in Mauritius.*

•To maintain computerized records of all the positive cases and their follow-up.

Cervical Cancer Control

An adequate control can only be achieved if there is a national policy on cervical control. This policy has to be supported by financial and techincal resources.

Furthermore, the national policies must be accompanied by programs of public education and advocacy.

The methods of screening must be organised and follow-up and quality control assured, rather than random or oppurtunistic. The screening must cover the largest possible of women in the target group. This must be linked to treatment of pre-cancer and invasive cancer.

The correct application of policies, people's education, screening methods and results has to be monitored to assess achievements and identify possible gaps.

HEALTH PROMOTION

Promoting health at the personal and societal levels, by helping people to understand and reduce their personal risk of illness, avoid harmful behaviors and adopt healthier lifestyles, is a key role of health programmes at all levels. In many countries, prevention has traditionally taken a secondary role to curative care, but is gradually becoming more evident; continuing efforts in this direction are needed. Health promotion can be implemented in multiple ways. Three strategies are particularly useful in relation to cervical cancer: primary prevention (of HPV infection), health education, and counselling.

To change behavior, knowledge is necessary but is not sufficient. Behaviour change will be more likely if providers assist women to assess their own risk of disease and empower them to reduce this risk. Communication skills are required for educating and counselling women, and for helping those in the target group to understand their need for screening, follow-up and treatment. If cancer is discovered, the women need to be told about the nature and prognosis of their disease. Once clear messages have been developed in simple language, health

education in the clinic setting should not take much time, and can be done in group settings as well as in private consultations.[46]

Avoiding risk factors

The main risk factor for cervical cancer has proven to be human papillomavirus infection. The human papillomavirus (HPV) is a group of sexually transmitted viruses. The risk for getting infected with these viruses can be controlled and reduced by conducting several types of sexually safe behaviors:

- Delay sexual intercourse, especially if you are a young girl. HPV is more common among young women than in women over the age of 30.
- Limit the number of sexual partners.
- Avoid sexual contact with partners that are themselves engaged in sexual activities with multiple partners.
- Do not trust condoms to protect you from HPV. Recent studies have proven that condoms do not protect against HPV infection, because the virus can be contacted through a skin-to-skin contact with a HPV infected area (such as skin of the genitals or anal area).

The same caution should be taken regarding those infections caused by other cervical cancers risk viruses such as HIV and Chlamydia, which can be contacted during promiscuous sexual behaviors.

A routine screening

A second option available to prevent cervical cancer is being constantly tested for cervical precancerous changes. The screening test, used to detect precancerous changes of the cervix cells or even the cervical cancer itself, is PAP or Papanicolau smear test. This test involves scraping a sample of cells within the junction area of the cervix where endocervix

meets the ectocervix. This sample of tissue is examined under a microscope. Each woman should have a PAP tested yearly or at every two years. Most invasive forms of cervical cancer are found in women who were not a regular PAP test.

Women should also test themselves for the HPV (human papillomavirus). This test is highly sensitive to detect precancerous changes with the cervix cells.

Vaccines

Thanks to new research, the medial community offers several vaccines that can prevent cervical cancer. These vaccines prevent women from getting the human papillomavirus (HPV). There are two vaccines available:

1. Gardasil: This vaccine protects against infections of HPV 6,11, 16, and 18. The purpose of this vaccine is to prevent cervix cell changes caused by HPV 16 and 18, and genital warts caused by HPV 6 and 11. This vaccine PREVENTS infection with HPV and cannot be used to treat an existing infection. This vaccine requires a series of 3 injections over a 6 months period, where the second injection is administrated two months after the first one and the third one after four months from the second administration. The most common side effects of this vaccine are: short-term redness, swelling, and soreness in the area where the injection is administrated. In order to be more effective, the vaccine should be administered before the young woman becomes sexually active. The Federal Advisory Committee on Immunization Practices (ACIP) recommends that the vaccine to be administrated to girls between the age of 11 or 12. For women between the ages of 13 to 26 who did not receive this vaccine between the ages of 11 to 12, it is recommended they receive what is called a “catch-up vaccination”.

2. Cevarix: This vaccine protects against infections with HPV 16 and 18.

Since the vaccine only covers some high-risk types of HPV, experts still recommend regular Pap smear screening even after vaccination.[47]
Gardasil has been shown to also be effective in preventing genital warts in males, and use for men and boys was approved by the U.S. Food and Drug Administration (FDA) on October 16, 2009.[48]

Cervical cancer vaccines was authorised in the year 2006 in the US and has only been started recently in Mauritius. They were available first in the private clinics in the year 2008. It has yet to be introduced in the cervical cancer program.

HEALTH EDUCATION

Health education involves communicating up-to-date general information and messages about changing behavior in simple, understandable language, to individuals or groups. Messages should use locally and culturally appropriate terms, and should be developed in collaboration with the community and in accordance with national guidelines. It is important that the core of the messages is always the same, regardless of where, by whom and to whom they are given. Health education is not an isolated event; it should be a continuous activity and requires constant effort from managers and providers to maintain their knowledge up to date.

In cervical cancer control programmes, health education includes:

- informing people about cervical cancer, its causes and natural history;
- promoting screening for women in the target group;
- increasing awareness of signs and symptoms of cervical cancer, and encouraging women to seek care if they have them;

- reducing ignorance, fear, embarrassment and stigma related to cervical cancer.

How to provide health education

Messages should be developed to address common fears and misconceptions, as well as the stigma attached to STIs.
Providers should make efforts to overcome their own discomfort in talking about sexual matters and diseases that affect the genital organs.
Providers should give accurate information in an acceptable and non-judgmental manner.
Answers to frequently asked questions need to be developed locally, in consultation with the community and in harmony with local beliefs and practices.
The fact that cervical cancer is linked to HPV, a sexually transmitted infection, raises some difficult questions that providers need to be prepared to answer.

Counselling

An important part of prevention is to be available to the patient's request and provide him with the basic principals involved.

In that sense, the community health workers and other health care providers can talk to individual women who consult them about:

- the target group for cervical cancer screening;
- the screening test that is used, how it is done and what it can tell about the cervix;
- what is involved in a pelvic examination and screening test, and where and when screening is available.

They can also:

- help overcome women's reluctance to have a pelvic examination;

- stress the need to follow advice regarding return to the health centre for results or

follow-up;

- explain that she will be given a thorough explanation of the clinic procedures and
- she can accept or decline to have any of them (informed consent);
- tell her that she may bring someone with her if she wishes.

Summary

Throughout this discussion different aspects of screening and preventing cervical cancer were considered. Screening, in terms of the methods used, comparing them and also including innovative methods such as LBC. The use use of screening in Czech Republic and Mauritius and how it can affect the prevalence and mortality rate.

At this primary stage of the screening programme in both countries, changes will take some time to be seen. So, at this point it is not possible to provide an exact analysis of the benefits of screening according to the prevalence of cervical cancers. In other countries, screening and prevention methods has already proven to be effective.

As discussed in the prevention part of this thesis; to assure that a decrease in prevalence and mortality are seen, a systematic programme supported by policies should be in place. These policies then can be applied by medical professionals in their duties together with the education of the presenting women.

Here follows two graphs representing the demographic changes in a time span of 10 years.

Czech Republic - Cervix uteri

Year	Estimated number of new cancers (all ages)	Male	Female	Both sexes
2008		-	990	-
	ages < 65	-	755	-
	ages >= 65	-	235	-
2020		-	1041	-
	ages < 65	-	731	-
	ages >= 65	-	310	-
	Demographic change	-	51	-
	ages < 65	-	-24	-
	ages >= 65	-	75	-

GLOBOCAN 2008 (IARC) - 22.8.2010

Population forecasts were extracted from the *United Nations, World Population prospects, the 2008 revision*.
Numbers are computed using age-specific rates and corresponding populations for 10 age-groups.

Mauritius -Cervix uteri

Year	Estimated number of new cancers (all ages)	Male	Female	Both sexes
2008		-	98	-
	ages < 65	-	67	-
	ages >= 65	-	31	-
2020		-	132	-
	ages < 65	-	83	-
	ages >= 65	-	49	-
	Demographic change	-	34	-
	ages < 65	-	16	-
	ages >= 65	-	18	-

GLOBOCAN 2008 (IARC) - 22.8.2010

Population forecasts were extracted from the *United Nations, World Population prospects, the 2008 revision*.
Numbers are computed using age-specific rates and corresponding populations for 10 age-groups.

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