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Cervical Cancer Prevention in Bahrain: Review

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Cervical cancer is estimated as the second most common cause of death worldwide from cancer in women. Approximately 650 women die from this cancer every day; half-million are diagnosed each year.

Until recently, the few available reports on the prevalence of cancer from the Arabian Gulf Council States (GCC) were suggestive that the incidence of uterine cancer in general was less common compared with those reported from western country. Cancer registries in the GCC States in the last five years indicate that uterine cancer has moved to the third on the list of leading causes of cancer in the region.

Among a population of 1,025, 000 in the kingdom of Bahrain, it is estimated that 10-15 new cases of cervical cancer are diagnosed each year (2001-2007), and approximately 4-6 deaths from this disease per annum. There is an evidence of a gradual increase in the incidence of cervical cancer compared with the figures two decades ago. The ratio of endometrial compared with cervical cancer was 1:2 but the two incidences are presently reversed.

Cytology screening for uterine cancer was started in Bahrain in 1971, which soon was integrated in postnatal and in gynecological clinics. Recently successful program of public health screening was introduced against breast cancer in Bahrain; it is imperative that a similar program of national screening against uterine and cervical cancer combined with a national campaign for immunization of adolescent girls against human papilloma virus be integrated in the program and thus reducing the mortality from these two leading causes of cancer death among women.

In this article a review of definitions, prevalence and history of cervical cytology service in Bahrain will be presented. Contemporary concepts of cervical cytology, new standard of care and current practice guidelines in screening and prevention will be reviewed. Finally, a discussion on the ways and means of improving the existing cytology and prevention programs in Bahrain will be discussed.

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Historical Background

At the end of the 1880s, exfoliated cancer cells had been described in all types of specimen. In 1927 two Romanian scientist, Babes and Daniel published the technique of examining the exfoliated cells[1].

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Cytological evaluation, however, was first proposed and popularized by Papanicolaou and Traut in the 1940s as a method for the diagnosis of uterine cancer and its precursor lesion[2-3]. Other publications by Papanicolaou stimulated interest and the application of cytopathology worldwide, resulting in abundant reports on the subject[4-5.]

Since then, cervical cytopathology has been the mainstay of cervical cancer screening because of its widespread use in the 1950s. A decade later, reports have suggested that a national program for cervical screening in Canada resulted in the reduction of uterine and cervical cancers.

These screening programs soon became a standard in most developed countries[6-7]. Screening protocols remained either unchanged or did undergo little modification in the first four of the last five decades[8]. The first development was about the traditional cytological methods. Early in the1980s widespread use of brushes or aspiration cytology were introduced[9]. In 1988, standardization of cervical cytology reporting terminology was accomplished with the implementation of the Bethesda system. This system provides a uniform format and offers a standard lexicon for cervical cytology reports. This system was revised in 1991 and again in 2001[10-13].

In the 80s, there were several improvements, such as, the introduction of targeted monitoring in the UK which resulted in a steady decline in both the incidence and mortality of cervical cancer throughout the 90s[14].

The 90s witnessed the development of automation in screening and different methods of specimen collection. The adequacy of cervical cytology specimens and more accurate interpretations of cervical cancer precursors were achieved by using new liquid-based cervical smear technology (Thin-Prep®)[15-17].

Reports from the National Cancer Institute-sponsored multicentre randomized clinical trial (ALTS trial, 2001) have shown the advantage of human papilloma virus (HPV) testing in selecting women with atypical squamous cell of undetermined significance (ASC-US)[18-19]. Recently, multiple large-scale, cross-sectional studies, from many countries made the U.S Food and Drug Administration (FDA) approve the use of hybrid capture 2 test for HPV as an adjunct to the Pap test in primary screening (March 2003)[20]. A new promising advance in cervical cancer prevention is ushered by the "development of HPV-16/18/11/6 vaccine and its efficacy in the prevention HPV-16/18/11/6 associated with pre-invasive cervical lesion and with human papilloma genital infection. As a result of this study it has been shown that, for the first time, cervical cancer can be prevented by an HPV vaccine[21-22]".

Future successful development of an HPV vaccine against all oncogenic HPV strains could make the dream of cervical cancer eradication a reality. HPV-16/18/11/6 vaccine (Gardasil ®) has been approved by the FDA[23].

Cervical Cytology in Bahrain

Cervical cytology in Bahrain was launched in the Salmaniya Hospital in 1971. Two technicians trained in cytology, screened all the smears and referred the positive specimens for review by consultant pathologists.

From few cervical smears referred from the gynecological clinics, the turnover gradually increased particularly after the introduction of routine cervical smear screening in postnatal clinics. The annual number of smears reached 9200 in 2008 (85% cervical) i.e. approximately 83% of all deliveries in the SMC[24]. Gynecological screening was practiced,

but not as regular as in postnatal clinics and up to date, there is no public health supervised program for the prevention of cervical cancer.

The pattern and method of collection of cervical smears did not change until the end of the 80s, when new methods of collection were introduced. These include the use of brush and aspiration techniques. These improvements, however, were not sustained and doctors reverted to the traditional methods of collection using the Ayres spatula. No attempt has been made to train technicians or nurses to collect cervical smears. An attempt at starting a cancer registry in the SMC was also made by pathology consultants, but the momentum was not sustained until the nineties when this responsibility was allocated to the health information department[24].

In the early 90s the department of Obstetrics and Gynecology in the Salmaniya Medical Complex (SMC), the main referral hospital in Bahrain proposed the initiation of colposcopic services. This unfortunately did not materialize until the turn of the new millennium when a member of the medical staff was sent on a colposcopy training course. Later, a colposcope was installed in the outpatient department.

The Pathology department had also brought about series of changes in the cytology services, such as, the use of brush to improve the yield of cells and quality of specimen collection and the introduction of Bethesda terminology for cytology reporting. Recently they have acquired the fluid-based cytological equipments and new facilities including computerized sorting microscope will be acquired[25].

Table I: Prevalence of Cervical Cancer Worldwide During 2002

South Africa	40 percent of all cancer (HIGHEST)
Middle East	10
Bahrain	6.9
Western Asia	5.0 (LOWEST)

(In USA it is the third most common gynecological malignancy, in UK it is the second cause of death from cancer; in Australia it is the 8th most common cancer) [26].

Table 2: Incidence of Cancer among Bahraini Women in 2002*

No	Type	Percentage
1	Breast cancer	33.8
2	Lung cancer	8.1
3	Corpus uterus	6.9
4	Thyroid cancer	6.2
5	Non-Hodgkin's lymphoma	5.6

* Cancer registry – Ministry of Health – 2002

Table 3: Incidence of Cervical Cytology Screening in Bahrain between 2001-2008

Year	2001	2002	2003	2004	2005	2006	2007
No. of cytology smears*	8995	4367	9154	9400	9200	8758	9661
Positive smear	70	61	72	74	82	74	6o
Cervical Cancer	12	11	11	9	12	16	13

Endometrial Cancer	11	18	13	17	15	18	24

*The total annual number of cytological smear reported includes approximately 15-20 percent of non-gynecological specimen's e.g. peritoneal, pleural, ovarian cyst fluid etc.

The screening technique therefore continued in the traditional way. The yield of positive smear was 0.8%. The number of invasive cervical cancer is 10 new cases while those who died with carcinoma of the cervix are 2-3 cases per year.

Table 4: **Changing Prevalence of Cervical Cancer in Three Different Regions**[27-28]

Region	1970s	1990s	Percent change
USA	7.4 / 100,000	4.3 /100,000	- 70%
UK	16 / 100,000	8 /100,000	- 50%
Bahrain	1.3 / 100,000	2.6 /100,000	+ 100%

Developments of Screening Programs and Methods of Cervical Smear Collection in the Last Two Decades

There have been two major developments in the public health approach to cervical cancer screening over the past twenty years. The first development relates to the traditional cytological methods, and the second to the identification of human papilloma virus HPV as the fundamental cause of cervical cancer[29]. Twenty years ago, there was widespread, although not universal, acceptance that cervical cytological screening should reduce both the incidence and mortality from cervical cancer. There was little understanding; however, of the real quantitative benefits that could result from high-quality screening or of the factors that determine its effectiveness. There was little information on the relative effectiveness of different screening frequencies, and serious misconceptions of the most effective age groups to target. The result of this lack of understanding was well exemplified by the experience in UK. Millions of smears were being taken every year, with no discernible impact on cervical cancer incidence or mortality. The first International Agency for Research on Cancer (IARC) Workshop in 1985 established the impact on cervical cancer morbidity that could be achieved by cervical cytology screening program[30]. In UK, the effect was rapid. Reorganization of the cervical cytology program in the late 80's, with the introduction of targeted monitoring, led to a steady decline in both the incidence and the mortality of cervical cancer throughout the 90's. Total deaths from cervical cancer are now 60% lower than in the 80's, in the face of increasing rates, in younger women, of pre-invasive neoplasia. Cytology, however, has its limitations. In particular, the sensitivity of a single test for detecting early pre-invasive lesion is not very high, and the resources required for a high quality program deter its implementation in many developing countries. Some program overcome the lack of high sensitivity by repeating the test every three to five years, which, with the extended natural history of pre-invasive lesions, can provide good screening sensitivity.

Recently, a number of new technologies have been used to improve the detection of cervical cancer and its precursors. These tests include genital HPV screening using advanced techniques of female molecular genetics, such as gene chips. For the uninitiated, this is a new technique for genetic testing based on micro array technology, also known as gene chips. This system enables the rapid and simultaneous analysis of thousands of DNA sequences. In 2001, there was substantial controversy about whether the new tests offer meaningful advantages over conventional Pap smear[31]. Ideally, these new tests will increase the early detection of meaningful smear abnormalities, reduce the number of unsatisfactory smears and provide fewer ambiguous results. It is also hoped that these new screening methods will not increase the number of false-positive results, but will improve the productivity of cytology laboratories without substantially increasing costs. The new tests include liquid-based/thin

layer preparations to improve the quality and adequacy of the cytology smear; computer-assisted screening method to improve cytology smears interpretation; and new generation human papilloma virus testing methods that may be useful in triaging patient with atypical squamous cells of undetermined significance or low grade squamous intraepithelial lesions[32]. The demonstration, so far, that almost all cervical cancers are caused by HPV is in the process of transforming the outlook of cervical screening. The interval between initial HPV infection and the development of an invasive lesion is typically long. Based on the evidence available, the IARC of 2004 monograph concluded that HPV testing should be at least as effective as a screening test. The advantage for those women (found to have HPV negative) is longer inter-screening interval than is recommended[33].

Two further refinements had significant impact on the screening for cervical cancer, firstly the Bethesda System terminology which was advanced by the National Cancer Institute in USA and which has the advantages of creating uniformity in the reporting and interpretations of cervical smears. Secondly, a revised cervical cancer screening schedule and guidelines was adopted by the American College of Obstetricians and Gynecologist ACOG (2003). These recommendations largely conform to guidelines issued by the American Cancer Society and the US Preventive Services Task Force[34-36].

Changes in Screening Frequency

I. United States

In August 2003, the American College of Obstetrics and Gynecology (ACOG) issued its most comprehensive revision of cervical cancer screening guidelines in more than a decade [37]. Based on the scientific findings the new recommendations focused on age and on prior history of abnormal cytology. For many women whose age is 30 or more, cervical screening is extended from once a year to once every two or three years safely. The revised ACOG guidelines also note that screening can begin later than previously recommended. In addition to the woman's age, her previous test results and other health issues are among other factors that determine the frequency of screening[38-40].

"Screening recommendations:

1. When to start?

The guidelines published by the American Cancer Society (ACS, in Nov 2002), the US Preventive Services Taskforce (USPSTF, Jan 2003), and (ACOG, Aug 2003) are in agreement that screening should start 3 years after commencement of vaginal intercourse, but not later than age 21.

2. At what intervals?

a. For services which do only conventional Pap smear test, it should be done annually or every 2-3 years for women ≥ 30 with 3 negative cytology tests. The exception is women who are immunocompromised or who have history of exposure to diethylstilbestrol, etc.

b. If liquid based cytology is used, screening should be done every 2-3 years for a woman ≥ 30 with 3 negative cytology tests.

c. Every 3 years if HPV negative and cytology is negative.

3. When to stop?

The ACS recommends that it should stop at the age of ≥ 70 years with ≥ 3 recent, consecutive negative tests and no abnormal tests in preceding 10 years. The USPSTF advices stoppage at >65 years with negative tests in those who are not otherwise at high risk of cervical cancer.

4. In post total hysterectomy cases?

Discontinue if for benign reasons and no prior history of high-grade CIN.

5. Is liquid-based cytology essential?
It is optional as there is insufficient evidence to prove that its use is mandatory.

6. What about HPV testing?
It is recommended only by the American Society for Colposcopy and Cervical Patology (ASCCP, April 2002) and the ACS, for women with ASC-US (reflex testing) and women ≥ 30 years (adjunct to Pap test).**"**

II. Screening Intervals in UK[41]

"The National Health Service Cervical Screening programme issues guidelines every three years on the cervical screening methods and screening intervals[39]. It recommends that all women between the age of 25 and 64 are eligible for a free cervical screening test every three to five years. In the light of evidence published in 2003 the NHS Screening Program now offers screening at new and different intervals depending on age. The new intervals are:

1. The first invitation is at the age of 25
2. Between 25-49 years it is done 8 times, every 3 years
3. From the age of 50-64 years it is done every 5 years
4. After 65 years to screen only those who have not been screened since the age 50 or had recently abnormal tests

The NHS computerized calls and recalls system invites women who are registered with a general practitioner. It keeps track of any follow-up investigation, and if all is well, recalls the women for screening in three to five years. Women who have not had recent test may be offered one when they attend their GP or their family planning clinic.

The latest advances in methods of collection of cervical smears in the UK, is the introduction of the Liquid Based Cytology (LBC) technique in 2005. Future developments being presently discussed is computer assisted detection of cervical abnormalities.

III. Screening Intervals in Bahrain

Ever since the inception of cervical cytology service in the Salmaniya Hospital in 1971, it has been done initially on individual gynecological cases. Gradually it was extended to include all postnatal patients who visited the hospital. By the end of the 70s, antenatal and postnatal clinics became available in all the health centers. Numbers of cytology smears has increased correspondingly and the staff in the cytology section of the pathology department has increased. Currently, over 9000 smears are processed every year (approximately 69% of all postnatal and gynecological patients who attend government medical services. There is yet no 'call-recall system' and no health policy guidelines on screening intervals or public health national screening program. There is also some other determinants that play an important role in women compliance with screening program such as culture, age, and level of education[42].

Major Developments in Cervical Cytology

The Bethesda System Terminology

Initially, the terminology used in interpreting cervical cytology began with the identification of any malignant cells in the smear. This was refined in order to standardize reporting to four grades beginning with the normal cells up to frankly malignant cells. Stages in between were named as: inflammatory, metaplasia, dysplasia and dyskariosis. Because of the confusion, errors and omissions which surrounded this terminology and the variation in interpretations, another system was described which used the CIN three grades[43].

"The Bethesda System (BS) for reporting the results of cervical cytology was developed as a uniform system terminology that would provide clear guidance for clinical management".

The most important contribution of the BS was to standardize Pap smear reports that include a descriptive diagnosis and an assessment of the specimen adequacy. Currently, 90% of US and UK laboratories use some form of the 1991 BS in reporting cervical cytology. In Bahrain, the Pathology laboratory changed the cytology smear request forms to conform to the BS reporting[44].

The rise in the use of the new cytological technologies added to recent findings from research studies have resulted in the third review of the BS terminology of 2001. This latest review, have resulted in more than 20 national and international societies endorsing the 2001 BS[45].

The 2001 BS Summary Modifications[45-46]

"Specimen adequacy divided into: satisfactory and unsatisfactory (either rejected or reported but unsatisfactory).

1. General categorization: Negative or show epithelial cell abnormality
2. Interpretation/result:

a. Negative.

- *Trichomonas vaginalis*
- Fungal organism morphologically consistent with *Candida species*
- Shift in flora suggestive of bacterial vaginosis
- Bacteria morphologically consistent with actinomyces species
- Cellular changes consistent with herpes simplex virus

b. Other non-neoplastic findings (optional to report)

- Reactive cellular changes associated with: inflammation (includes typical repair), radiation, intrauterine contraceptive device, glandular cells status, post-hysterectomy and atrophy.

3. Epithelial Cell Abnormalities: squamous cells, atypical squamous cells (ASC), of unknown significance (ASC-US), cannot exclude HSIL (ASC-H), low squamous grade intraepithelial lesion (LSIL), encompassing human papilloma virus/mild dysplasia/cervical, intraepithelial neoplasia (CIN1), high-grade squamous intraepithelial lesion (HSIL), encompassing moderate and severe dysplasia, carcinoma in situ (CIN 2 and CIN 3), squamous cell carcinoma, atypical glandular cells (AGC), endocervical adenocarcinoma in situ (AIS) and adenocarcinoma.

4. Other: Endometrial cells in a woman ≥ 40 years of age**"**.

1. **The Liquid Based Cytology (LBC)**[47-49]

Since the introduction of cervical cytology screening in the 1940's in USA, the test has reduced mortality from cervical cancer by approximately 70 percent. Today in USA, more than 50 million women receive an annual Pap test to screen for cervical cancer. The situation is almost similar in Canada and UK with an overall coverage of 80 percent in 2004-2005. In Bahrain, it is estimated that between 20-35% of the eligible women are screened. In the West, from the mid eighties, the incidence of cervical cancer has been increasing at a rate of 3% a year. Similar trend, but in much less proportion have been in observed in Bahrain.

Among the factors that have contributed to the rise of cervical cancer is the limitations of the traditional Pap test itself which is associated with 20-40% "false negative" rate. This high incidence of false negatives is looked at to be the leading cause for late-stage which requires radical treatment to avoid terminal illness.

In the mid nineties, the (FDA) approved 'ThinPrep®' Pap test as a replacement for the conventional Pap smear method; later in the same year granted the company the approval to claim that the ThinPrep 2000 system is much more accurate than conventional Pap smear for detecting Low-grade Squamous Intraepithelial lesions (LSIL) and more severe cervical lesions in a variety of patient population. They were allowed to claim that the specimen quality with ThinPrep 2000 System is significantly superior over that of conventional Pap smear preparation.

The differences between the conventional smear and the LBC consist of the following: ***"****in the 'Thin Prep' the cervical transformation zone is sampled by a broom-type sampler specified by the manufacturer. It is pushed gently into the endocervical canal until it reaches deep enough for the short bristles to contact the ectocervix. It is then rotated in clockwise direction five times to obtain the sample. After the sampler is removed, it is then pushed into the bottom of the appropriate vial forcing the bristles to spread apart for about 10 times. Finally, the broom is swirled vigorously to further release material into the preservation solution. The broom is then discarded (not into the vial). The vial is then capped, labeled and with appropriate request form to the laboratory***"*.

The process used to prepare a ThinPrep helped in avoiding pitfalls associated with the conventional specimen. To prepare a conventional Pap smear slide in which the clinician scrapes the cervix with a spatula and mounts a portion of the patient's sample on the slide. The problems with the conventional Pap specimens, they frequently contaminated with debris such as blood or mucus, which cloud cell viability. Moreover, after the smears is mounted the sample onto a slide, the spatula is discarded, often with more than 80% of the patient's sample still on the device. Although, in the conventional Pap method the clinician has no control on which cells make it to the slide, while with ThinPrep test the clinician collect the specimen using broom spatula in the same manner. However, instead of smearing a potion of sample on the slide, the collection device is rinsed in a vial of proprietary preservative solution, capturing virtually the entire sample.

According to the company instruction manual the fluid transport medium is employed "to preserve cells and special processor to eliminates debris and distribute a representative portion of cells on a slide in a uniform even layer. LBC prepared slide is clear, easier to-read and free of obscuring blood, mucus and non-diagnostic debris, enabling increased accuracy for both manual and potential computerized assessment. The specimen is then sent to the laboratory where the ThinPrep® 2000 Processor, an automated slide preparation unit, disperses and filters the sample and then prepares a microscope slide."

LBC validation in US, Canada, UK and Australia suggest that with LBC, there is 55% increase in the detection of high grade cervical lesions; that it reduces the percentage of ambiguous or border line cases diagnosed as ASCUS/AGUS by 27%. Other studies gave even a better yield[48-49].

The transformation from Pap smear collection system to LBC was carried out initially in the US but later in Canada, UK, Australia, Hong Kong, and Singapore. In the Gulf Region, it has or will be introduced in Kuwait, Saudi Arabia and from next year in Bahrain[50-53].

Human Papillomavirus and Cervical Cancer[54]

It has been known for a long time that coitus and sexually transmitted diseases have a vital role in the etiology of cervical cancer, but the mechanism was uncertain. Initially the research concentrated on the role of the semen DNA on the cells in the transformation zone, but later the attention shifted to study the oncogenic effect of sexually transmitted viral infections. Candidates for this research were cytomegalovirus (CMV) virus, herpes virus (HV) and

human papilloma virus (HPV). After nearly three decades of research, it has been concluded that HPV infection can lead to a spectrum of diseases such as genital warts, precancerous lesions of cervical and anal cancer.

Exclusive to HPV/neoplasia, the presence of specific viral antigens such as the L1 capsid structural protein and the oncoproteins E6 and E7, which provide specific targets for giving the vaccination[50]. The sustained efficacy represents 4.5 years of bivalent L1 virus like particle reactive against HPV type 16 and 18 has been confirmed in a randomized controlled trial.

The safety trials of preliminary studies in humans so far proved that all the vaccines are safe and a 'decision-model analysis concluded that this vaccination has the potential advantage to minimize the total burden of cervical cancer by 51 percent over 40- to 50-year[52-55].

Newly developed vaccine candidates have recently been produced to protect against HPV type 16 and 18, the oncogenic types which are responsible for 70 percent of cervical cancer. One of the vaccines protects against HPV type 6 and 11, which cause genital warts. There are still problems to solve, such as, the fact that approximately 30 percent of cervical cancers are caused by other types of HPV and women can still be infected with those types, even if the vaccines are completely effective[53.] Furthermore, the impact of mass vaccination on reducing cervical cancer mortality, particularly if administered to young adolescents, will not be measurable for decades to come. Therefore, these new vaccines will require to be introduced along with other preventive measures, such as, screening and treatment of precancer[56].

In addition to the introduction of vaccination for girls in the US and other European countries, there has been a coordinated approach to facilitate access in the developing countries. A combined plan by PATH in USA, Harvard University, and the International Agency for Research (IARC) on Cancer and the World Health Organization (WHO) are considering the introduction of HPV vaccine in poor and developing countries[57-58].

Status of First Generation Vaccines

Manufacturer	Vaccine type	HPV types	Status	Study Characteristics
Merck & Co	L1 VLP based on recombinant yeast technology	16, 18, 6,11	Phase III is complete	Enrolled 23000 women and children from all over the world
GlaxoSmithKline	L1 VLP (Cervatrix) based on rec. baculovirus technology	16,18	Phase III complete	15000 women aged 18-25 in Costa Rica and 13000 women added of15-25 years; "multi centric study"

In Bahrain, the Department of Obstetrics and Gynecology, and the Pathology Department of the SMC have considered the introduction of the vaccine. There is, however no feasibility study made to consider the introduction of this vaccine to all girls in Bahrain.

Commentary

Cervical cancer is one of the common cancers in females in the world with approximately 450,000 cases reported every year. Cervical cancer is curable if detected early. Unfortunately, one-third of those diagnosed with the disease will die from it. The remainder

two-thirds will undergo invasive treatment to avert terminal illness. The cost of late-stage treatment of cervical cancer results in additional burden of on the patient and services[59].

Similar to other GCC States, Cancer of the cervix had a low incidence, in Bahrain; however, it has been slowly increasing over the past decade. It has reached the third rank order of death from cancer in women. We should therefore address this preventive health issue at the planning level. Since we already have a successful national campaign for breast cancer screening it will be imperative that we introduce it with a national screening for cervical cancer. There are several similar 'combined programmes' in the US and Europe to emulate as a model[60-61].

Analysis of the exfoliative cytology of the cervix has been perhaps the most successful preventive technique in the 20th centaury[56]. Developing practice guidelines for the participants of the cervical screening programme are also vital to regulate and to determine the important preventative standards of performance. Such guidelines are usually made by cytologists who perform cervical cytology analysis and make reports for the clinicians. The screening guidelines aim to set achievable standard for laboratory practice and to improve the quality of cervical cytology service. The emphasis of these guidelines is on the practical issues of specimen collection, analyses, reporting, as well as, laboratory management. In view of the changes in science and technical methods, these guidelines will require regular update and revision.

The place for administering a Joint National Program for Cervical and Breast Cancer Screening is the Public Health Department. It would be necessary to train hospital and health centers nurses on taking Pap smears in order to facilitate the running of this program.

The introduction of HPV vaccine is a dramatic improvement in the prevention of genital cancer, but we need to study the feasibility of the introduction of vaccination for women in Bahrain.

CONCLUSION

Bahrain has gone a long way in developing its cytology screening services since it was first started in 1971. With the development of knowledge and technology in this field, we need now to move a step further towards a preventive combined national program against breast and cervical cancers.

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