

Digital cervical cancer screening: a reliable One-Stop method ?

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Abstract

Background

Worldwide, cervical cancer (CC) is considered the fourth most common cancer in women. Globocan data stated 311,365 CC related mortalities in the world in 2018, 90% of them occurred in low-income countries. In Jordan, CC ranks as the 12th most common cancer among women. The primary aim of this report is to be able to decide if digital screening (DS) is reliable and worth using in our one stop gynecology clinics.

Materials and Methods

This study was done for all women who attended one stop out-patient gynecology services for routine CC screening between 1/1/2019 and 31/12/2019. Inclusion criteria requested women to be 18 years of age or more, healthy, and had previously normal cervical smear (conventional Pap smear (CPS) or Liquid based cytology (LBC)) i.e., all previous screening tests results were normal.

Results

A total number of 94 patients agreed to have the DS method done, mean age was 43 years. 25.5% were found to have abnormal screening results on DS. When compared to the national data of 12.5% abnormal smears in Liquid-based cytology (LBC), there was a statistically significant difference in the numbers of abnormal screening results between both methods (p value of 0.000). LBC is used in most centers for CCS in Jordan

Conclusion

The digital cervical screening method saves time and offers a one stop clinic management, therefore minimizing lost to follow up rate, and where colposcopy is indicated. Additionally, DS should be considered in low resource countries.

Keywords: Cervical cancer, cervical cancer screening, digital screening, liquid based cervical cytology.

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Background

Worldwide, cervical cancer (CC) is considered the fourth most common cancer in women after breast, colorectal and lung cancers [1]. The Globocan data showed that there were

around 569,847 new cases and 311,365 mortalities in 2018 [2]. Almost 90% of CC related mortalities occurred in low-income countries [3].

In Jordan, CC ranks as the 12th most

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common cancer among women and the 10th most common cancer among women between the age of 15 and 44 year [1]. In addition, 104 women were diagnosed with CC in 2018 [3].

The main aim of CC screening is the early detection and treatment of precancerous lesions, which was shown to reduce CC occurrence [4]. In the United Kingdom and due to the introduction of national CC screening program; there was a 21% reduction in the CC related mortality [5]. In treated women with preinvasive disease, five-year survival rate is almost 100%, and 92% if CC is diagnosed and treated at an earlier stage [6].

Currently, there are three methods for CC screening; the World Health Organization (WHO) suggested that regardless of the screening methods implemented, it is important that the screening program reaches the largest proportion of women at risk [7].

The conventional Pap smear (CPS) was introduced in 1943 [8]. It was the first method of CC screening, with a positive predictive value ranging from 80 % (9) to 88.2% [10]. Yet, interobserver variability in CPS interpretation was considerable, although variability decreases for tests with more severe abnormalities [11].

Liquid-based cytology (LBC) was first reported in 2006. Later, it was adopted and used as a screening method by the United Kingdom national CC screening program, it has a positive predictive value ranging from 81.8% (12) to 97.5% [13].

The digital screening methods (DS) and unlike the CPS and the LBC where both examine surface epithelium, and the results usually take few days to be ready; it uses light at known frequencies which is transmitted through the cervical tissue and identify changes in the basal and stromal layers.

These changes may include increase in blood circulation and in blood vessels which may occur in women with pre-cancerous changes [14]. Furthermore, they provide immediate results and allow for one stop clinic where colposcopy is required to examine women with abnormal results, and therefore minimize numbers of lost to follow up- women.

[14]. Results had shown that DS has a positive predictive values ranging from, 54.8% [15] to 60% [14].

In Jordan, the most used CC screening method is the LBC with some units still using CPS. DS was recently introduced and adopted as a screening method by few centers in Jordan. However, we still face patients' worry of its results accuracy as any new adopted method

The primary aim of this study was to look at the results of the DS value in a low-risk population. To the best of our knowledge, this is the first study on the use of the DS method in Jordan and the middle east.

Method

This was a retrospective study of medical records of all women who attended out-patient Gynaecology services for routine CC screening between 1/1/2019 and 31/12/2019.

Inclusion criteria required women to be 18 years of age or more, healthy, had attended for routine CC screening and all prior CC screening results were normal.

Prior to performing the CC screening test, women were informed about the method used, consent to perform the test was obtained. Further management plans were suggested according to the results of the test. Demographic data obtained included age, parity, and menopausal status.

The DS method, the machine was the (TruScreen™ (Polarprobe; Polartechnics, Sydney, Australia). The device tests 16-21 points from the endocervical and ectocervical areas in a procedure that takes around two-three minutes. In addition, the results were available immediately and reported as either normal or abnormal.

While women with normal results were advised to have a routine recall screening test, women whose test showed abnormal results were offered colposcopic examination where cervical biopsies were then obtained for histopathological assessment. Further management was planned according to biopsy results.

In traditional smears usually, the results are reported as either normal or abnormal. The

results would be considered normal if the cytology report showed “normal, inflammatory, infection or atrophic”. The abnormal results were either abnormal low-grade lesions which included Atypical Squamous cells of Undetermined Significance (ASCUS), Atypical Squamous cells – High Grade (ASC-H) and Low-grade squamous intraepithelial lesion (LSIL), or abnormal high-grade lesion which included atypical glandular cells of Undetermined Significance (AGUS), Squamous cell carcinoma (SCS) or Adenocarcinoma. [14]. Abnormal results would then be referred for another colposcopic examination appointment and cervical biopsy which in our one stop Gynaecology clinic would be done on immediate basis. DS would save time, effort and worry as a lot of patients would be missed in between abnormal results and new appointments for colposcopy and possible biopsy if screened by the traditional methods.

Descriptive statistics were performed for normally distributed data using mean and range. The detection rate of abnormal cervical

biopsy results, (PPV), sensitivity and specificity were reported. Ethical approval was granted locally by the Institutional Review Boards of the AL Balqa Applied University

Results

A total of 94 women had DS. The results showed that the mean age was 43 years, (Range: 25 to 78 years). 74 women (79%), and 20 women (21%) were premenopausal and postmenopausal, respectively. The mean number of deliveries was 3.3. (Table 1).

Data analysis of the results showed that 24 women (25.5%) had abnormal screening result on DS, (Table 2).

In our study Women who had abnormal screening results subsequently had colposcopy and cervical biopsy (24 women) of those who had cervical biopsy; 13 women (54.2%) were found to have normal cervical biopsy results, 5 women (20.8%) had low grade results and 2 women (8.3%) had high grade results, furthermore, 4 women (16.7%) declined colposcopy. (Table 3).

True positive	True negative	False positive	False negative	Prevalence of abnormal smear in Jordan	
7	70	13	0	3.8%	
Sensitivity	Specificity	Positive likelihood ratio	Negative likelihood ratio	PPV	Accuracy
100%	84.34%	6.385%	0%	20.14%	85.56%

The conventional Pap smear method had a sensitivity 51%, specificity 66.6%, PPV 96%, NPV was 8% and accuracy was 92%, about the liquid base Pap smear method, sensitivity was 55.3%, specificity was 77.7%, PPV was 97.5%, NPV was 10% and accuracy was 56/6%. [15].

LBC was also reported to show 12.5% abnormal screening result by the national data published earlier [16]. This showed a statistically significant difference, as DS method was more likely to report abnormal screening results (p value of 0.000)

Discussion

The WHO recommendations for CC Screening is every 3 years for women between the age of 25 to 49 years, thereafter every 5 years for

women between the age of 50 to 64 years. After the age of 65 years, CC screening is recommended only if women have not been screened in the past or they have had recent abnormal screening results. Furthermore, after the age of 65 years, women whose last three consecutive adequate screening tests were negative are removed from the screening program [17]. Currently in Jordan, women will be offered CC screening every three years once they are 21 years age or older and sexually active.

The rationale for CC screening is the early detection of precancerous lesion to facilitate timed intervention [14]. Considering that 30% of untreated high-grade lesions may progress to cancer within 10 years [18], the CC screening

method would be expected to be effective in detecting precancerous lesions

The digital screening is the most recent CC screening method, it takes advantage of the different optical and di-electrical properties of different tissues [19]. While the handheld machine does not provide specification of the degree of tissue abnormalities, it only tells us if an abnormality exists [20].

DS methods is portable, easy to use and offers an instant reporting of cervical screening abnormalities which will enable the healthcare worker who performs the screening to immediately act upon the results and provide further management, which may include colposcopy and cervical biopsy; all in a one stop clinic. In Jordan, a low resources country, there is no structured national CC screening program, therefore the DS method would be helpful as one stop clinic where fewer women will miss the follow up appointment to discuss the results of either the CPS or the LBC [21] and proceed to further assessment i.e., colposcopy and possibly biopsy.

Digital screening provides immediate and professional independent result for CC screening, therefore avoids the subjectivity of interpretation of both the conventional and LBC methods. In addition, in countries with limited resources where there are no national cervical cancer screening programs, DS as part of one stop clinic should be considered.

In this study, we evaluated 94 women who had DS. When compared to published Jordanian reference data regarding LBC The overall detection rate of abnormal cervical biopsy results was 13%, the detection rates for low and high-grade lesions were 0% and 13% respectively .

Abnormal screening results in DS were reported in 25.5% On subsequent colposcopic examination and cervical biopsy results; The overall detection rate of abnormal cervical biopsy results following DS was 7.4%, the detection rates for low and high-grade lesions were 5.3% and 2.1% of the total .

The positive predictive value of DS in our study was 20.14%, which is comparable to an earlier published report, where the PPV was

reported to be 28.1% [21].

In this report, DS did not miss any case of HGSIL or invasive cervical cancer.

Positive Predictive Value definition is similar to the sensitivity of a test and the two are often confused. However, PPV is useful for the patient, while sensitivity is more useful for the physician. the *sensitivity* of a test is very useful to physicians when deciding which test to use. For us as gynecologists having a sensitive and a specific test is a must when deciding which test to use and we had to see for ourselves if digital screening is worth adopting for our patients

The number of women who had DS was limited as DS is a new idea for the patients to trust as it has recently been introduced to the CC screening methods in Jordan, which in its turn may have affected recruitment. The health practitioners would be cautious as well until more robust data is available.

DS showed 100% sensitivity and 84.34% Specificity in our report. And when compared to either the CPS or the LBC it showed better results than obtained in some reports.

One study reported that 32 patients were included in the paper who met the inclusion criteria. The average age of the patients was 40 years (range, 23-61 years) [21]. For the diagnosis of high-grade intraepithelial lesions, the TruScreen™ device showed a 43% sensitivity, a 92% specificity, a PPV of 60%, and a NPV of 85%, whereas evaluation via cervical biopsy exhibited a 33% sensitivity, an 86% specificity, a 33% PPV, and an 86% NPV. Those results are similar to our report and findings .

A report of 95 patients, 31 positive and 64 negative cases were in the colposcopy procedure. The sensitivity, specificity, positive and negative predictive values of digital cervicography were calculated as 89.47%, 81.57%, 54.83%, and 96.87%, respectively. [22].

While another reported the sensitivity and specificity of LBC vs CPS was 100% vs 88% and 81.8% vs 99% respectively[23]. The positive predictive and negative predictive value of LBC vs CPS was 81.8% vs 88% and 100% vs 99% respectively [23].

Conclusion

The digital screening method though

showed a positive predictive value of 20.14%, a sensitivity of 100% and a specificity of 84.34% which makes it a reliable screening method in clinical practice. In addition, it saves time and offers a one stop clinic management, therefore minimizing lost to follow up rate, and

where colposcopy is indicated. Additionally, DS should be considered in low resource countries.

Acknowledgments

We thank all of our patients who agreed to enter the study

Tables

Table 1: Summary of the demographics of the DS screening methods

Variable	Digital screening
Number (%)	94 (100%)
Mean age in years (range)	43(25 to 78)
Mean number of deliveries	3.3
Menopausal status	
• Premenopausal	74 (79)
• Postmenopausal	20 (21)

Table 2: Summary of the Findings of the DS screening methods

Digital screening	94 (100%)
Results	
Normal result	70 (74.5%)
Abnormal result	24 (25.5%)

Table 3: Histopathological findings of cervical biopsies in women who had abnormal screening results

Normal	13 (54.2%)	8 (88.9%)
Low grade histopathology	5 (20.8%)	0 (0)
High grade histopathology	2 (8.3%)	1(11.1%)
Declined colposcopy and biopsy	4 (16.7%)	0%

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سرطان عنق الرحم، مسحة عنق الرحم الإلكترونية، مسحة عنق الرحم التقليدية عيادات النسائية

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الملخص

يعتبر سرطان عنق الرحم رابع أكثر أنواع السرطانات شيوعاً بين النساء في جميع أنحاء العالم، وذكرت البيانات (311,365) حالة وفاة مرتبطة بسرطان عنق الرحم في العالم في عام (2018)، (90%) منها حدثت في البلدان منخفضة الدخل، وفي الأردن، يصنف سرطان عنق الرحم في المرتبة (12) من بين السرطانات الأكثر شيوعاً بين النساء؛ لذا فإن الهدف الأساسي من هذه الدراسة هو تحديد فاعلية مسحة عنق الرحم الإلكترونية مقارنة بالمسحات التقليدية وإمكانية استخدامها في عيادات النسائية.

أسلوب الدراسة:

تم إجراء هذه الدراسة لجميع النساء اللواتي راجعن عيادات النسائية الخارجية من أجل مسحة عنق الرحم الروتينية بين (2019/1/1) و (2019/12/31)، حيث تم إجراء الدراسة على النساء اللواتي تجاوزن الثمانية عشر عاماً، واللواتي يتمتعن بصحة جيدة، ولديهن لطاخة عنق الرحم الطبيعية سابقاً؛ مسحة عنق الرحم التقليدية (CPS)، أو علم الخلايا السائل (LBC)، أي أن جميع نتائج اختبارات الفحص السابقة كانت طبيعية.

نتائج الدراسة:

أجريت مسحة عنق الرحم الإلكترونية لأربع وتسعين مريضة، وكان متوسط العمر (43) عاماً، وظهر أن (25.5%) من نتائج مسحة عنق الرحم الإلكترونية كانت غير طبيعية عند مقارنتها بالبيانات الوطنية لـ (12.5%) مسحات غير طبيعية في علم الخلايا السائل، وكان هناك فرق ذو دلالة إحصائية في أعداد نتائج الفحص غير الطبيعية بين الطريقتين، (قيمة P=0.000) يستخدم في معظم المراكز لمسح سرطان عنق الرحم في الأردن.

الاستنتاج من الدراسة

تُوفّر مسحة عنق الرحم الإلكترونية لعنق الرحم الوقت، وتُوفّر إدارة أفضل للعيادة، وتقلل معدل الضياع للمتابعة، بالإضافة إلى ذلك يقلل من التوتر الذي تعانيه السيدة بانتظار التنظير المهبلي، وبناء على كل ذلك ينبغي النظر في مسحة عنق الرحم الإلكترونية، والتوصية باستخدامها في البلدان منخفضة الموارد.

الكلمات الدالة: سرطان عنق الرحم، الكشف المبكر عن سرطان عنق الرحم، مسحة عنق الرحم الرقمية.