



Original Article

The quality of cervical smears from outreach screening services in remote areas in eastern Taiwan



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ABSTRACT

Objectives: Issues such as specimen adequacy and diagnostic yield have rarely been studied in rural regions. This study investigated specimen adequacy and the diagnostic yield of cervical smears from outreach screening services in remote regions in eastern Taiwan.

Materials and methods: There were 5670 smears from outreach screening services; 649 smears were taken in mobile screening van units or in temporary walk-in clinics. The quality, compromising factors, and positive rates of smears from mobile screening van units and temporary walk-in clinics were compared with those obtained in physician offices.

Results: The quality of smears from physician offices was better than the quality from mobile van screening units and temporary walk-in clinics; the satisfactory rates were 72%, 54%, and 53%, respectively ($\chi^2 = 109.9910$, $p < 0.0001$; $df = 4$). The most important limiting factor, absence of endocervical component (ECC), was reported in 56%, 57%, and 73% of suboptimal smears at physician offices, mobile van screening units, and temporary walk-in clinics, respectively ($\chi^2 = 25.2780$, $p < 0.001$; $df = 2$). Poor fixation compromised 18%, 18%, and 14% of smears taken at physician offices, mobile van screening units, and temporary walk-in clinics, respectively. For smears taken in physician offices, the odds ratio for positivity of suboptimal smears with ECC was nine times the odds ratio of suboptimal smears with no ECC.

Conclusion: The issue of quality of specimens from outreach services in rural areas needs to be emphasized to improve the sensitivity of the test. In future studies, the difficulties that health workers encounter when taking smears in outreach services and the underlying sociocultural and demographic barriers need to be elucidated.

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1. Introduction

In 2012, cervical cancer was the ninth most common type of cancer in women in developed countries (age-adjusted mortality rate, 3.3 per 100,000 women) [1]. By contrast, it was the third most common type of cancer in developing countries (8.3 per 100,000 women). Since the introduction of cervical smear screening by George Papanicolaou, the incidence and mortality of cervical cancer have declined in many developed countries [2–4]. In Finland,

where organized cervical screening was introduced in the 1960s, there was a decrease of 80% in the age-adjusted incidence and in the mortality of cervical cancer by the beginning of the 1990s [5]. Similar trends have been noted in developed countries with organized programs. In 2010 in Taiwan, cervical cancer had the sixth highest cancer mortality rate in females [6]. Mortality from cervical cancer in women aged > 30 years has decreased by 62.7%: the age-adjusted mortality rate was 22.0 per 100,000 women in 1997 and 8.2 per 100,000 women in 2011 [7]. This finding generally concurs with findings from developed countries that have organized screening programs in place.

Before the National Health Insurance (NHI) Program (Taipei, Taiwan) was established in 1995, cervical screening was performed opportunistically and haphazardly in Taiwan. A mass screening program was provided by the Taiwan Cancer Society from 1974 to

Conflicts of interest: none.

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1984 with service delivered by > 700 gynecological clinics throughout the country. However, only 5.3% of eligible women were covered [8]. It was not until 1996 that a centrally organized cervical screening program was initiated. The screening program was funded by the NHI Program. It covers nearly 98% of the population. This cervical screening program was a health target program. It was listed as the top priority target of the 5-year National Cancer Prevention Project. Annual cervical screening is offered free to all women older than 30 years; in addition, human papilloma virus (HPV) self-testing is offered to people older than 36 years and in disabled women older than 30 years [7].

Outreach screening services are commonly used worldwide to reach rural residents to improve access to cancer preventive services and increase screening uptake [7]. To reduce health service disparities in rural regions, the Health Promotion Administration in Taiwan has been sponsoring and promoting outreach services in remote regions to provide cervical smears for marginalized and underserved women. In routine medical practice, Pap smears are conventionally taken by physicians in hospitals or private clinics. To breach sex and sociocultural barriers in rural areas, it is a common practice to recruit female aboriginal health center nurses to take Pap smears. To further boost uptake, outreach teams working in alliance with aboriginal health services and bilingual health workers send out postcards to notify residents in villages about the dates, times, and locations of outreach services that smears will be taken. They also organize group bookings of screening services in local activity centers during special gatherings of local villagers or in local elderly unions. Mobile van screening units and temporary walk-in clinics have been utilized in rural areas for outreach purposes [7]. These temporary walk-in clinics are established in local activity centers sports centers, or local school gymnasiums and school auditoriums. Temporary walk-in clinics use ordinary tables instead of bulky gynecologic examination tables and use simple curtains for privacy. On mass screening days, the screening unit staff traveled to the designated area in the rural communities in the early morning to reach women before they went to work. These outreach screening services rotate throughout different villages annually to facilitate cervical sampling in remote regions. This project targeted women older than 30 years, although all women who were sexually active were welcome to register for the service. When abnormalities are detected, patients are tracked by public health nurses and are referred to the appropriate regional treatment centers.

To the best of our knowledge, however, issues such as specimen adequacy and diagnostic yield have rarely been investigated in remote regions. In this study, we evaluated the specimen adequacy and diagnostic yield of smears that were taken in outreach screening programs in rural eastern Taiwan, and explored the most likely causes that compromise specimen quality.

2. Materials and methods

The data used for analysis was based on the screening results reported by a pathology laboratory at a university-affiliated hospital in eastern Taiwan between January 2006 and March 2011. This laboratory handles approximately one-third of all smear readings in eastern Taiwan. The catchment area of the source laboratory included the area stretching along the Hua-Tung Rift Valley, which is approximately 8044 square kilometers, and covers approximately 22.5% of the surface area of Taiwan [9–11]. It is sparsely populated with inhabitants accounting for only 2.38% of the total population of Taiwan [10–12]. The geography features mountains, hills, and the valley where aboriginals account for approximately 31% of the inhabitants [9,12–14]. Outreach screening services took

5670 smears; of these, 649 smears were from mobile screening van units or from temporary walk-in clinics.

The specimen adequacy was rated as “satisfactory”, “suboptimal”, or “unsatisfactory”, based on the consensus reached by the National Health Research Institutes (Taipei, Taiwan) and Taiwan Cooperative Oncology Group (Taipei, Taiwan). Reporting was based on a modification of the Bethesda System [15,16]. For each suboptimal smear, the cytopathologist was allowed to list two factors that compromised the smear quality such as poor fixation, too few cells, thick or bloody consistency, lack of endocervical component (ECC), inflammation, foreign bodies, and lysis. The variables we collected included specimen adequacy, descriptive diagnosis, the clinic, the type of professional taking the smear, and limiting factors that compromised specimen quality. Eighteen different interpretation results are listed in the descriptive diagnosis in the cancer registry [17]. In this study, no smears were diagnosed as “adenocarcinoma *in situ*” or “other malignant neoplasms.” For data visualization purposes, the remaining 16 cytopathology descriptive diagnosis results were grouped into four major categories: (1) “negative”; (2) “atypical”; (3) “atypical favoring dysplasia”; and (4) “dysplasia or malignancy” (Table 1). The quality, compromising factors, and positive rates of smears from remote outreach services were compared with smears from physician offices using the Chi-square test. A p value < 0.01 was regarded as significant. Data analysis was performed using the statistical package STATA version 11 software (StataCorp, College Station, TX, USA).

3. Results

Table 1 shows the cytological interpretation and specimen quality of the smears in this study. The positive rate of smears in remote regions was 2.98%, which included all categories, except the “negative” category (Table 1; $n = 169$). The satisfactory rate of the smears overall was 70%, and the suboptimal rate was 26%. The positive rates of the satisfactory smears and suboptimal smears were 3.31% and 2.55% respectively.

Table 2 shows the distribution of the sampling sites and the specimen adequacy. Eleven percent of smears were from mobile van screening units or temporary walk-in clinics. The quality of smears from physician offices was better than the quality from mobile van screening units and temporary walk-in clinics. The satisfactory rates were 72% (physician offices), 54% (mobile van screening units), and 53% (temporary walk-in clinics) ($\chi^2 = 109.9910$, $p < 0.001$; $df = 4$).

Table 3 lists the major limiting factors for suboptimal smears. The most important limiting factor was absence of ECC. Suboptimal smears from 56% of physician offices, 57% of mobile van screening units, and 73% of temporary walk-in clinics lacked ECC ($\chi^2 = 25.2780$, $p < 0.001$; $df = 2$). Furthermore, the suboptimal smears were compromised by poor fixation in physician offices (18% of smears), mobile van screening units (18% of smears), and temporary walk-in clinics (14% of smears), although the difference was not significant ($p = 0.324$).

The positive rates of smears from physician offices, mobile van screening units, and temporary walk-in clinics were 3.26%, 4.05%, and 1.51%, respectively (Table 4). The odds ratio of positivity for suboptimal smears containing ECC from physician offices was 9.06 times that of suboptimal smears containing no ECC ($p < 0.001$). The odds ratio of positivity for suboptimal smears containing ECC from temporary walk-in clinics was 2.74 times that of suboptimal smears containing no ECC ($p = 0.29$).

4. Discussion

Four characteristics of failed cervical screening programs have been identified: (1) failure to reach at-risk women, (2) inadequate

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