Limited Education as a Risk Factor in Cervical Cancer

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The study reported here analyzes the influence of formal education on the behavior and age at onset of carcinoma of the cervix in 2204 women in Quito, Ecuador, between 1985 and 1994. The results indicate that education had a considerable degree of influence on the behavior of this neoplasia. That is, women with primary education or less were found to have almost twice the cervical cancer incidence of those with secondary or higher education, while those who were illiterate had almost six times the incidence found among university-educated women. Overall, it seems reasonable to consider women's education a key factor in defining risk groups for cervical cancer—so much so that grouping by instructional level would make it possible to improve the effectiveness of cervical cytology-based preventive measures.

The status of women in modern society and the influence exerted by their level of formal education on a variety of sociologic phenomena relating to themselves, their children, and their families are becoming increasingly important. Among other things, this influence of education can be decisive with respect to fertility, child nutrition, child morbidity and mortality (*1*), and, of course, diseases and other health matters affecting women directly.

However, the sociologic changes affecting women are not homogeneous from one society to the next. In Third World countries, the development process and the road to gender equality are still quite slow and uncertain. This commonly leads to women becoming overburdened with tasks that prevent them from adequately addressing their own needs, as they must first fulfill their domestic commitments and those inherent in their biologic condition as mothers (*2*).

Formal education, the subject of this analysis, is a highly objective and measurable parameter. For this reason, we felt that it could serve as a useful indicator in classifying groups at risk of various neoplasias, particularly cervical cancer, which tends to occur at relatively high rates among poor women (*3*).

Over the years, a number of epidemiologic studies have shown that risk factors for cervical cancer include age, increased number of sexual partners, early initiation of sexual activity, low socioeconomic level (*4*), and (recently) cervicovaginal infection with the human papillomavirus (HPV) (*5*).

Although some studies have affirmed the association between low social class and cervical cancer incidence (*5, 6*), defining and applying the social class variable is a com-

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plex task. Moreover, since social class can be defined in various ways, it is difficult to compare research results obtained by different studies employing that variable. Specifically, some studies have combined elements involving participation in the labor force, control over the labor process, ownership of the means of production, and the source of social salary (*7, 8*). Others have included economic income, urban or rural residence, type of housing, occupation, and (customarily) level of education. Most of the time, however, social class is defined much less precisely. Overall, then, there is no standard definition that will ensure comparability of data. Worse, information compiled on the basis of variables that are so complex and personal is at once both hard to interpret and unreliable.

Invasive cervical cancer is the most commonly occurring neoplasia in Ecuador (*9*), accounting for 9% of all malignant tumors in the total population and 15% of the cancers affecting women. The comparability of this latter rate to that in other countries is suggested by a statement of Tomatis (*6*) indicating that this type of malignant tumor accounts for 15% of all neoplasias occurring in women throughout the world. It should be noted, however, that the preceding data do not include *in situ* cervical cancer, because (despite being a malignant neoplasia) the latter does not directly threaten the patient's life and is curable with proper treatment.

In Quito, the age-adjusted incidence of invasive cervical cancer for 1985–1987 was 34.0 recorded cases per 100 000 inhabitants, which ranked at an intermediate level when compared to international data (*10, 11*). With respect to other Latin American countries, these data placed Ecuador fifth—following Peru, Brazil, Paraguay, and Colombia (Table 1). More recently, in 1994, the rate of invasive cervical cancer in Ecuador was found to be 31.5 per 100 000 women.

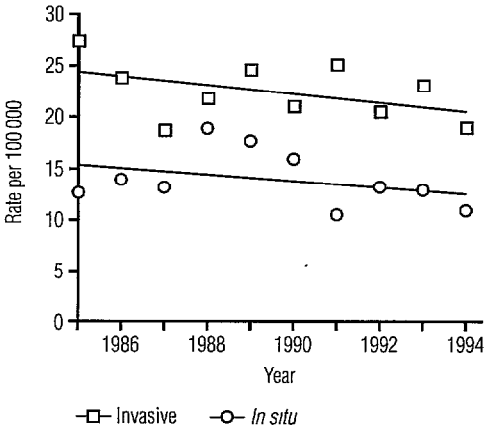
As Figure 1 indicates, annual information gathered from 1985 through 1994 by the National Tumor Registry in Quito suggests slight downward trends in both invasive and *in situ* cervical cancer. However, neither of these trends are statistically significant; nor has the ratio between invasive

Table 1. Age-adjusted incidences of invasive cervical cancer per 100 000 women in selected countries.

Country (location)	Period	Annual incidence per 100 000 women
Peru (Trujillo)	1984–1987	54.6
Brazil (Goiania)	1988–1989	48.9
Paraguay (Asunción)	1988–1989	47.1
Colombia (Cali)	1982–1986	42.2
Ecuador (Quito)	1985–1987	34.0
Brazil (Porto Alegre)	1987	31.2
Costa Rica	1984–1987	26.1
Cuba	1986	20.0
Puerto Rico	1983–1987	11.5
Spain (Granada)	1985–1987	5.8
Israel	1982–1986	4.2
United States (Hawaii)*	1983–1987	3.6

Source: Parkin et al., Vol. 6 (*10*).
*Japanese.

Figure 1. Incidences of *in situ* and invasive cervical cancers per 100 000 women. Quito, Ecuador, 1985–1994.



Source: National Tumor Registry

and *in situ* tumors undergone any significant change, remaining stable at about 1.8:1 over the 1985–1994 period.

Much more discouraging is cervical cancer mortality in Ecuador over the past 17 years, which has appeared to increase slowly from 3.04 deaths per 100 000 women in 1987 to 4.2 in 1993, when 226 women died of the disease (*12*). These figures do not reflect underrecording resulting from the practice of classifying death from cervicouterine cancer as having been caused by unspecified uterine cancer. In Quito, for example, we know that examination of a group of unspecified uterine cancer diagnoses in conformity with the International Classification of Oncological Diseases (category 179) indicated that half of the cases were actually cases of cervical cancer (*13*).

Cervical cancer screening in Ecuador has been carried out since the 1960s in response to spontaneous demand by the general public. A significant increase in the number of cervicovaginal cytology slides read at the cytology laboratory of the Society for the Struggle against Cancer (*Sociedad de Lucha Contra el Cáncer*—SOLCA) in Quito, which is the most important local referral center, and an apparent increase in the popularity of this test over the years had seemed to suggest that the status of the disease was changing.

However, information provided by the Quito Office of the National Tumor Registry, together with data derived from the experience of Costa Rica (*14*), indicates that the death rates have not changed over the past 20 years despite existence in the latter country of a National Cervical Cancer Detection and Control Program. One of the factors held to be responsible for the apparent failure of the screening programs is the fact that low-risk population groups receive the greatest coverage, while those where the disease's prevalence is greatest receive minimal coverage—a phenomenon that noticeably decreases the predictive value of screening (*15*).

Against this backdrop, we set out to analyze the relationship between women's education and cervical cancer, specifically regarding the incidence of this neoplasia and its various clinical stages. We began with the assumption that illiteracy or low levels of schooling tended to prevent women from acquiring a knowledge of cervical neoplasia. This theory suggested that poorly educated or illiterate women would be unaware of the need to submit to Pap testing or even of the very existence of Pap tests; they would experience difficulties in overcoming the various taboos surrounding the gynecologic exam; they would fail to understand the need for proper genital hygiene; and they would tend to be unaware of, and have no access to, health services. The purpose of the study reported here was to test this idea; and, if lack of formal education were found a risk factor for cervical cancer, to focus attention on the importance of such education in combating the disease.

MATERIALS AND METHODS

A total of 2204 cervical cancer cases recorded by the Quito Office of SOLCA's National Tumor Registry in the period 1985–1994 were analyzed. This information is published annually in a series of publications entitled *Cáncer en Quito* (see reference *9*). In addition, a review was conducted of the forms on file for each case in the Registry, which gathers information on all cancer cases occurring among the general population of Quito, as well as those originating in people from other parts of the country who seek medical care in the capital city. The data come from all public and private health care units, the clinics of all physicians providing treatment for neoplasias, and pathology and hematology laboratories. In addition, for recording purposes, the Registry reviews and records cases reported in a survey of hospital discharges and on the death certificates com-

piled and managed by the National Statistical and Census Institute (*Instituto Nacional de Estadísticas y Censos*—INEC).

The data used in this analysis are exclusively from Quito. Some of the tables exclude data for women whose level of formal education was unknown. We also analyzed education data for females age six and older residing in Quito that was collected during the 1990 Census and published by INEC. This demographic information, arranged by level of education, was used as the denominator in calculating age-specific rates of cervical cancer incidence. Cases for the ten-year 1985–1994 period were classified in accord with the patients' level of education to construct a numerator, while the denominator consisted of the population figures determined by the 1990 Census multiplied by a factor of 10.

RESULTS

The study showed that the incidence of cervical cancer (*in situ* plus invasive) per 100 000 was almost twice as great among women with no education or only primary education as compared to those with secondary or higher education (Table 2). In addition, it found that the crude incidence of cervical cancer cases per 100 000 was almost six times greater among illiterate women than among university-educated women.

In this same vein, an inverse percentage relationship was found between education and cervical cancer. That is, relative to their percentage share of the population, illiterate women accounted for more than twice as great a share of all cervical cancers, while those with primary education accounted for considerably more than their proportional share and those with secondary or higher education accounted for considerably less.

Age-specific incidences of *in situ* and invasive cervical cancer in Quito, shown in Figure 2, indicate that *in situ* cancer begins to show up in the 20–24 year group, increases steadily to an incidence of 45 cases per 100 000 in the 40–44 year group, and thereafter declines gradually. The incidence of invasive cervical cancer follows roughly the same pattern through the 40–44 year group. However, it then continues strongly upward, exceeding 100 cases per 100 000 in the 55–59 year group, declining briefly, and then increasing to 130 cases per 100 000 in the 65–69 year group.

Table 2. Number of cases and incidence of *in situ* and invasive cervical cancer (combined) per 100 000 women, by level of education. Quito, Ecuador, 1985–1994.

Level of education	Number of cases	Annual incidence per 100 000 women
None	228	88.3
Primary	972	52.6
Secondary	564	28.8
Higher	120	14.9

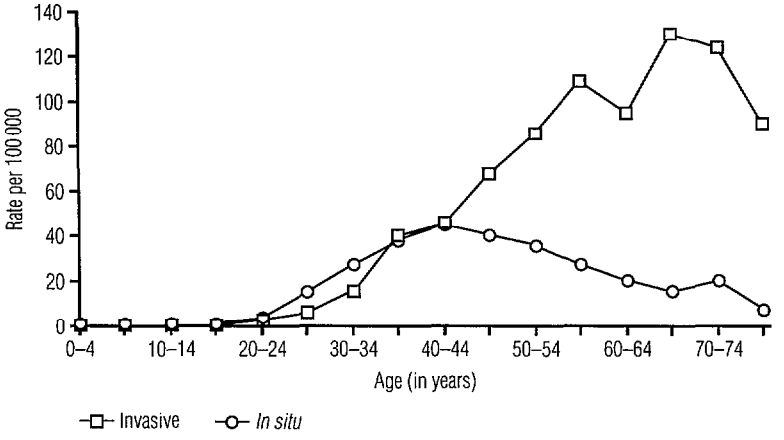
Source: National Tumor Registry, Quito.

Incidence by level of education (Figure 3) reveals significant differences in differently educated groups. Invasive cervical cancer among women with no more than primary education traces a sharply rising curve from the 20–24 year group to the 55–59 group that declines only slightly in the 60–64 group before rising to a peak of 123 cases per 100 000 women in the group 65 and over.

The incidence of invasive cervical cancer among women with secondary education is generally lower, peaking at a rate of 72.5 cases per 100 000 women in the 55–59 year age group. In addition, the incidence tends to be much lower among women with higher education, reaching no higher than 8.6 cases per 100 000 women through the 40–44 age group, and remaining below 30 cases per 100 000 in the 45–49 and 50–54 groups before finally peaking at 44 cases per 100 000 in the group 65 and over.

Age-specific incidences of cervical carcinoma *in situ*, by level of education, fol-

Figure 2. Age-specific incidences of *in situ* and invasive cervical cancers per 100 000 women. Quito, Ecuador, 1985–1994.

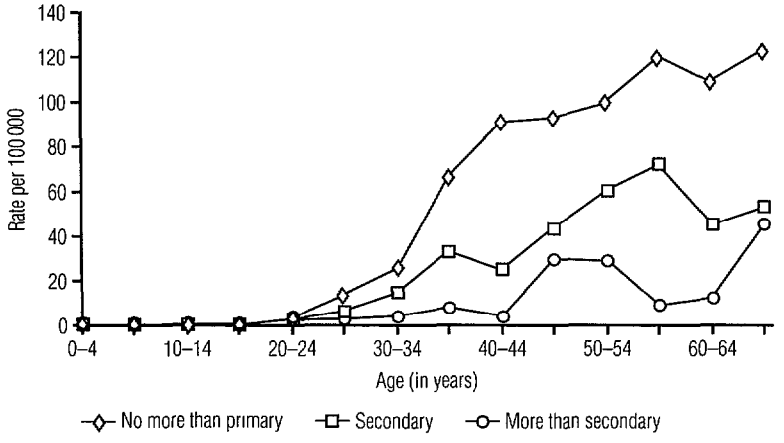


Source: National Tumor Registry.

low a similar pattern, being highest among women with no more than primary schooling. However, viewing the cases of *in situ* and invasive cancer together shows that carcinoma *in situ* accounted for only 31% (372) of the 1200 cervical cancer cases in this least educated group, as compared to 49% (278) of the 564 cases in women with secondary education and 68% (82) of the 120 cases in women with higher education.

Similarly, an association was found between level of education and the clinical stages of invasive cervical cancer at which the disease was detected. The data in Table 3, from which cases whose clinical stage

Figure 3. Age-specific incidences of invasive cervical cancer per 100 000 women, by level of education. Quito, Ecuador, 1985–1994.



Source: National Tumor Registry

Table 3. Invasive cervical cancer in Quito, 1985–1994, by stage of the cancer at the time of its detection and the patients' educational status.

Stages	Education			
	No formal education	Primary education	Secondary and higher	Total
I	13.1	32.9	48.5	32.5
II	35.2	36.6	29.7	34.6
III and IV	51.7	30.5	21.8	32.9
Total	100	100	100	100

Source: National Tumor Registry, Quito.

was unknown have been removed, indicate that among illiterate patients only 13.1% of the cancers were detected at stage I, whereas 48.5% were detected at stage I among women with secondary or higher education. Conversely, among illiterate patients 51.7% of the cancers detected were in the advanced stages III or IV, while among those with secondary or higher education this share dropped to 21.8%.

DISCUSSION

In the 10 years during which case data have been recorded by the National Tumor Registry in Quito, it has been possible to gather information on a significant number of malignant neoplasias—among which cervical cancer stands out by virtue of its high incidence.

Keeping in mind, as various works have pointed out (*5, 6*), that low social status is a risk factor influencing the frequency of cervical cancer, and that this variable is hard to standardize and apply, we proposed to determine the influence of education on the behavior of this neoplasia.

In our first analysis we compared women residing in Quito with cervical cancer patients by level of education. This indicated that women with no more than primary education had a much higher incidence of cervical cancer than those with secondary or higher education. Indeed, the figures indicated that cervical cancer was occurring with twice the frequency among illiterate women as it was in the general population; and, conversely, it was occurring with only one-third the frequency among women with higher education as it was in the general population.

In addition, we have published in some of the annual reports of the National Tumor Registry (*9*) a figure charting the curves for *in situ* and invasive cervical cancer by patient age. Although education is not assessed, the data show that women over 45 years old have progressively increasing rates of invasive cancer and progressively decreasing rates of *in situ* cancer. This appears to reflect an abandonment of postmenopausal women with regard to cervical cancer prevention, as it is generally at that time (around age 45) that these women drop out of official maternal and child health care programs that include cervical cancer screening. This finding is also consistent with cervical cancer being more common among those with limited education, as women over age 45 tend to have received a lower average level of schooling than younger women (*16*).

The analysis presented here of age-specific rates for invasive cervical cancer by level of education shows a strong relationship between education and this neoplasia.

As Figure 3 indicates, women with no more than primary schooling were found to have an invasive cervical cancer incidence of 13 cases per 100 000 in the 20–24 age group and of 91 per 100 000 in the 40–44 age group. In contrast, very little invasive cervical cancer was detected among women under 45 with university education, nearly all cases occurring in older age groups.

The data even suggest that neoplasias occurring in women with no more than primary schooling may be more aggressive (i.e., may develop faster) than those affecting other groups, since in order to attain an incidence of 13 cases per 100 000 in the 20–24 group, some of these neoplasias would need to have begun at a very young age or to have evolved faster than usual.

Finally, the influence of education is clearly evident in data on the clinical stages at which invasive cervical cancer was detected in different groups. These data indicate that such cancer is typically detected at a less advanced stage of development in women with secondary or higher education, suggesting that the latter tend to seek medical care at an earlier stage of the disease than do those with little or no education.

Overall, the strength of the associations found between level of education and the incidence and evolution of cervical cancer was surprising. These associations make it reasonable to think that a low level of education should definitely be considered a significant risk factor for cervical cancer.

Of course, illiteracy and poor education are clearly parameters characterizing poverty, a condition that is witness to a confluence of numerous social disadvantages capable of involving other cervical cancer risk factors whose importance and relative influence have yet to be determined.

CONCLUSIONS

If level of schooling were accepted as an easily measurable parameter, one with a low rate of error, for assessing cervical cancer risk, it would be possible to define various cervical cancer risk groups much more clearly and to modify secondary prevention programs (including health education activities) in such a way as to make Pap testing more available to those women who need it most.

In the light of the findings of this study, we feel that Pap testing should begin being provided prior to age 20 for selected groups of uneducated women.

In addition, a number of associations requiring more in-depth analysis have been identified. Among other things, there appears a need to study variations in the natural course of the disease in accordance with level of schooling, together with the various factors underlying education.

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Manuscript received 6 May 1996. Accepted for publication (following revision) in Spanish in the *Boletín de la Oficina Sanitaria Panamericana* and in English in the *Bulletin of the Pan American Health Organization* on 2 August 1996.