

Role of Male Behavior in Cervical Carcinogenesis among Women with One Lifetime Sexual Partner

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Background. The role of male behavior in the genesis of cervical cancer was examined. In India, where the incidence of cervical cancer is among the highest in the world, promiscuity among women is virtually unknown. In this study, the authors investigated the role of male behavior in cervical carcinogenesis among Indian women who had one lifetime sexual partner.

Methods. A case-control study was used.

Results. Premarital sexual relationships (relative risk [RR], 1.9; confidence interval, 1.2–3.2) and extramarital sexual relationships (RR, 2.7; confidence interval, 1.5–4.9) of husbands were risk factors. When husbands had sexual relationships both before and during the marriage, their wives' risk of getting cervical cancer increased by 6.9 (CI, 2.3–20.7). Risk also increased with husbands having three or more extramarital sexual partners (RR, 3.05; CI, 1.25–12.6). Sexual contact with prostitutes before or after marriage, however, did not increase the risk. History of sexually transmitted disease before marriage (RR, 2.9) or after marriage (RR, 5.9) was an important risk factor, which persisted after controlling for other factors. Sexual abstinence for 40 or more days after a wife's giving birth or having an abortion provided protection. Sex with uncircumcised men or men circumcised after age 1 year increased the risk of cervical cancer (RR, 4.1).

Bidi smoking (bidi is a cheap smoking stick of 4–8 cm, consisting of a rolled piece of dried temburni leaf [*Diospyres melanoxylon*] containing 0.15–0.25 g of coarsely ground tobacco) for more than 20 years was a significant risk factor (RR = 2.4), whereas cigarette smoking was not a risk factor.

Conclusions. Male sexual partners play a role in cervical carcinogenesis. *Cancer* 1993; 72:1666–9.

Key words: male promiscuity, cervical cancer, smoking, sexually transmitted disease.

Epidemiologic studies suggest that the risk of cervical cancer development is influenced by factors related to a woman's sexual history, specifically, her age at first sexual encounter and number of sexual partners.¹ In some societies with an extremely high incidence of cervical cancer, however, female chastity before marriage and marital fidelity are valued highly. Thus, we hypothesized that male promiscuity plays a role in the genesis of cervical cancer. In India, where the incidence of cervical cancer is among the highest in the world, promiscuity among women is virtually unknown.² In the current study, we examined the role of male factor in the development of cervical carcinogenesis.

Material and Methods

To study the history of cervical cancer and associated risk factors, we selected a cohort of 1107 women with different grades of dysplasia and 1070 age-matched and parity-matched control subjects with normal or inflammatory Pap smears. We initially screened 117,411 women attending gynecology outpatient departments of six major hospitals. These women completed a questionnaire that elicited detailed epidemiologic information. The study was initiated in 1976 and lasted until 1987. During 1986, a separate clinic was established to examine and interview the husbands of women with persistent dysplasias of different grades. Only those male partners were examined whose female partner had no history of premarital or extramarital affairs. Of the 1107 women with dysplasia, 174 had dysplasia during the follow-up. Of these 174 patients, 137 reported having sex with only one partner (i.e., with the husband only). Thus, the study consisted of 137 pa-

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tients with persistent dysplasia and 174 control subjects.

All male partners (husbands) completed a questionnaire that included details regarding their sexual behavior, contraceptive practices, reproductive history, marital history, practices pertaining to genital hygiene, and smoking history. They were asked specific questions regarding sexually transmitted disease (STD) and given a color atlas of different penile lesions. Strict confidentiality was maintained. Smoking history was elicited separately for cigarette and bidi. Bidi is a cheap smoking stick of 4–8 cm, consisting of a rolled piece of dried temburni leaf (*Diospyros melanoxylon*) containing 0.15–0.25 g of coarsely ground tobacco.

To estimate the correlation of the various factors with cervical cancer development, odds ratios were calculated as approximations of relative risks (RR). The potential confounding variables were adjusted using unconditional logistic regression analysis.³ The maximum likelihood estimates of combined RR and 95% confidence intervals were obtained. The variables that were significant in the univariate analysis were included in a logistic model, and a stepwise procedure was applied to derive final risk factors. Informed consent was obtained from the husbands for the interview and examination.

Results

Although the husbands of patients were not age matched with the husbands of control subjects, their median ages (40 years) were the same. The mean ages were 41.5 years (standard deviation, 9.3 years; range, 23–71 years) for patients' husbands and 40.4 years (standard deviation, 9.1 years; range, 22–67 years) for control subjects' husbands. A significant difference ($P < 0.05$) in literacy status was found among patients' husbands and control subjects' husbands: 22.0% of the patients' husbands, compared with 32.4% of the control subjects' husbands, had been educated beyond the high school level.

Sexual History

The history of sexual contact with one or more women other than the wife at any time during their lives was observed in 68 of the patients' husbands (49.6%) and 57 of the control subjects' husbands (32.8%) (RR, 2.0; $P = 0.004$). The difference persisted even after controlling for education, age at consummation of marriage, and smoking history. A total of 51 cases (37.2%) and 41 controls (23.6%) gave a history of sexual contact before marriage with at least one female (RR = 1.9, $P = 0.008$). The difference persisted after controlling for age, age at

Table 1. Risk of Cervical Cancer Associated With Promiscuity of Husband*

Sexual history	Category of subjects	No. of subjects	P	RR† (CI, 95%)
Premarital	Controls	13	0.03	2.37 (1.088–2.369)
	Cases	22		
Extramarital	Controls	5	0.14	3.85 (1.251–12.594)
	Cases	14		
Premarital and extramarital	Controls	18	0.002	2.75 (1.411–5.394)
	Cases	33		

CI: confidence interval; RR: relative risk; Controls: control subjects' husbands; Cases: patients' husbands.
* > 2 partners.
† Adjusted for age, education, and age at consummation of marriage.

consummation of marriage, and smoking history. Extramarital sexual contact was reported by 36 husbands of patients (26.3%) and 20 husbands of control subjects (11.5%) (RR, 2.7; $P = 0.002$), whereas both extramarital and premarital sexual contact was reported by 19 husbands of patients (13.9%) and 4 husbands of control subjects (2.3%) (RR, 6.8; $P = 0.001$).

We analyzed the husbands' number of partners at different cutoff points. A significant difference between patients and control subjects was obtained for the development of cervical cancer among wives when husbands had three or more extramarital sexual partners (Table 1). History of premarital or extramarital sexual contact with prostitutes or both, however, did not increase the risk (Table 2).

Contraction of an STD before marriage was reported by 17 of the patients' husbands (12.4%) and by 8 of the control subjects' husbands (4.6%) (RR, 2.99; $P =$

Table 2. History of Sexual Contact With Prostitutes at Different Points in Time

Sexual history	Category of subjects	No. of subjects	P	RR* (CI 95%)
Premarital	Controls	20	0.410	1.39 (0.688–2.827)
	Cases	21		
Extramarital	Controls	11	0.096	2.1 (0.892–4.995)
	Cases	17		
Premarital and extramarital	Controls	31	0.17	1.5 (0.849–2.733)
	Cases	34		

CI: confidence interval; RR: relative risk; Controls: control subjects' husbands; Cases: patients' husbands.
* Adjusted for age, education, and age at consummation of marriage.

0.02). The difference persisted after controlling for age, education, and age at consummation of marriage. Thirteen husbands of patients (9.5%) and three husbands of control subjects (1.7%) acquired an STD after marriage (RR, 5.9; $P = 0.009$).

Thirty-seven of the patients' husbands (27%) and 29 of the control subjects' husbands (17.1%) abstained from sexual activity with the wife for fewer than 40 days of the postpartum period. This difference was statistically significant (RR, 1.8; $P = 0.04$). The difference persisted when controlled for age, education, age at consummation of marriage, and sexual history.

Genital Hygiene

Eighty-four of the patients' husbands (61.3%) and 122 of the control subjects' husbands (70.1%) washed their genitalia after retracting prepuce at least once a day, either while bathing or after intercourse. The difference was not statistically significant ($P = 0.13$). Fifty-five of the patients' husbands (40%) and 53 of the control subjects' husbands (30.5%) washed the genitalia after intercourse. The difference was not statistically significant ($\chi^2 = 3.2$, $P = 0.096$). None of the husbands reported washing their genitalia before intercourse.

Circumcision

No difference was found in the proportion of circumcised men among the patients' husbands ($n = 9$; 6.6%) and the control subjects' husbands ($n = 15$; 8.6%). However, 2 of the patients' husbands (1.5%) and 10 of the control subjects' husbands (5.7%) were circumcised within the first year of their life. The difference was statistically significant (RR, 4.1; $P = 0.045$). The difference persisted after controlling for age, education, and age at consummation of marriage.

Smoking

Current bidi smoking was reported by 47 of the patients' husbands (34.3%) and 40 of the control subjects' husbands (23.2%) (RR, 1.9; $P = 0.02$). Additionally, 25 of the patients' husbands (18.2%) and 33 of the control subjects' husbands (19.2%) reported current cigarette smoking, but the difference in the proportion was not statistically significant.

Table 3 shows the duration of the current bidi and cigarette smoking for patients' and control subjects' husbands. Significant risk was associated with husbands who smoked bidi for more than 20 years. No such association was found in current cigarette smokers.

Twenty-six of the patients' husbands (19%) and 21 of the control subjects' husbands (12.1%) reported past bidi smoking (RR, 1.9; $P = 0.07$). Thirty-five of the patients' husbands (25.5%) and 42 of the control subjects' husbands (24.1%) were past cigarette smokers (RR, 1.3, $P = 0.45$).

Discussion

There is increasing evidence that cervical cancer is an STD⁴ and that men play an important role in the etiology of this disease. In the current study, by involving monogamous women only, we removed the confounding factor of promiscuity among women. We found that attributes of the sexual behavior of husbands increased the risk of cervical dysplasia and carcinoma in situ of their wives.

Extramarital sexual relationships were found to be a greater risk factor than premarital sexual relationships (Table 4). A possible reason for this is that men infected before marriage were no longer infectious at the time of marriage, whereas married men who contract an STD can transmit the recently acquired infection to their wives. The literature suggests that repeated sexual contact increases the risk of acquiring and transmitting the infection.⁵ Therefore, infections acquired after marriage have a greater chance for transmission because of repeated contact with the wife. This is supported by the findings of studies examining persons in Nordic countries, in which the risk of cervical cancer was increased significantly for women whose husbands contracted gonorrhea during World War II and were married at that time, compared with women whose husbands contracted gonorrhea but were not married at the time of infection.⁶ In the current study, we also observed an RR of 5.9 with postmarital STD compared with an RR of 2.9 with premarital STD. A British study⁷ reported an association between contact with prostitutes and cervical cancer, but this finding was not confirmed in a Latin American study.⁷ Similarly, in the current study, no correlation was found between sexual contact with prostitutes and cervical cancer, perhaps because such contact tended to be premarital and occasional.

We found it interesting that control subjects' husbands observed a longer period of sexual abstinence after their wives gave birth or had an abortion than did the patients' husbands. Perhaps this is because the epithelium is regenerated after 40 days of the postpartum period. This is substantiated by the fact that orthodox Jewish women who abstain from sexual activity for at least 60 days after giving birth have a lower incidence of cervical cancer.⁸

Genital hygiene, especially washing practices before and after intercourse, was not related to increased

Table 3. Duration of Current Smoking

Duration (yr)	Bidi					Cigarette				
	Cases	Controls	X ²	P	RR	Cases	Controls	X ²	P	RR
1-9	6	4	1.9	0.14	2.5	5	6	0.03	0.9	1.4
10-19	9	14	0.01	0.91	1.1	7	11	0.03	0.9	1.1
20+	32	22	6.7	0.01	2.4	13	16	0.25	0.6	1.3
Nonsmokers	59	97	—	—	1.0	59	97	—	—	1.0

RR: relative risk; Cases: patients' husbands; Controls: control subjects' husbands.

or decreased risk of preneoplasia. The role of circumcision could not be investigated in detail because only a small proportion of the men studied were circumcised. Most of the circumcisions were restricted to the Moslem population and were done for religious reasons. None of the subjects had undergone circumcision for medical or hygienic reasons. The age at circumcision (within the first year of life) was significantly younger in patients' husbands compared with control subjects' husbands. This finding is similar to that found in men with penile cancer.⁹

A large proportion of the control subjects' husbands (55.7%) were current nonsmokers, compared with 43.1% of the patients' husbands. This difference was due mainly to the difference in bidi smokers (34.3% of patients' husbands versus 23.2% of control subjects' husbands). No such difference was obtained

among cigarette smokers. This difference may be due to the higher socioeconomic status of the control subjects' husbands, who could afford to smoke cigarettes, compared with the patients' husbands, who could afford only bidi. After adjustments for socioeconomic status, however, the difference for bidi smokers persisted. The analysis according to the duration of bidi smoking revealed that risk increases after 20 years of smoking rather than demonstrating a dose-response relationship.

In conclusion, we found that male sexual partners play a role in cervical carcinogenesis.

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Table 4. Risk of Cervical Cancer Associated With Sexual Activity of Husband

Parameters	Premarital		Postmarital	
	Adjusted RR* (CI, 95%)	P	Adjusted RR* (CI, 95%)	P
Positive history of extramarital sexual activity	1.8 (1.08-3.03)	0.196	2.5 (1.33-4.66)	0.0037
No. of partners (>3)	2.3 (1.06-4.96)	0.0326	3.8 (1.16-12.47)	0.0238
Relations with prostitutes	1.4 (0.714-2.76)	0.3182	2.0 (0.87-4.49)	0.0945
History of STD	1.8 (0.68-4.93)	0.0212	NC (1.00-16.47)	

RR: relative risk; CI: confidence interval; NC: not calculated; STD: sexually transmitted disease.

* Premarital sexual activity is adjusted with postmarital sexual activity and vice versa.