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considerable evidence exists for its effectiveness when measured by falls in the incidence of cancer of the cervix. This reduction is most marked in areas with comprehensive and usually systematic screening programmes such as British Columbia [1], Iceland [2], Denmark [3], Sweden [4] and Finland [5]. On the contrary, invasive cancer of the cervix remains the commonest female genital cancer in Nigeria (and probably most developing countries) with a very poor 5-year survival rate [6,7].

Cancer of the cervix has of recent been described by some workers as a sexually transmitted disease and various studies have confirmed its close association with coitus. Cervical cytology has not only served the purpose of screening for cervical cancer, but has been useful in the characterization of cytological features pathognomic of infections which are oncogenic. Many cytopathologists in addition have been able to diagnose other infections of the lower genital tract from cytology, such as infections including *Gardnerella vaginalis*, *Trichomonas vaginalis* and *Candida albicans*. Most of these infections are more common in sexually promiscuous women. The prevalence of these infections in any community may therefore indirectly reflect the potential for the development of pre-cancerous lesions of the cervix in that environment. Very few studies have attempted to estimate the rates of these important infective epidemiological factors in different environments. A few studies from the developed countries have estimated these rates [8-10]. In our environment no such study has been carried out.

This study is therefore aimed at evaluating the pattern and prevalence of the common lower genital tract infections as identified from routine cervical screening, at the clinics in Ibadan.

### Subjects and methods

The Department of Obstetrics and Gynaecology, University College Hospital (UCH) Ibadan, Nigeria started offering cervical cytology services in October, 1986. Most patients who have cervical cytology are referred from the gynaecology clinic, family planning clinic or sexually transmitted disease clinic. A few others, however, (mostly the educated ones)

request for the service without passing through any of the clinics above. Such requests and those patients found asymptomatic are classified as routine. Each smear costs US\$1.50 (minimum national wage is US\$33 per month).

Two thousand, two hundred and twenty-four women aged 20 years and above, who had cervical cytology at UCH, Ibadan, Nigeria between 1 October 1986 and 30 April 1989, were studied. Their ages, parity and indications for cytology were recorded before the smear was collected. The smears were collected by the scrape method using an Ayre's spatula. They were spread on glass slides, fixed in 95% alcohol and transferred to the laboratory where they were stained using a modification of Papanicolaou's method [11] and read by one of us (J.O.O.). Those patients whose smears were noted to have 'specific vaginal infections' (*Gardnerella vaginalis*, *Trichomonas vaginalis* and *Candida albicans*) were identified and analysed.

*Gardnerella vaginalis* was diagnosed when 'clue cells' were identified; *Candida albicans* on the identification of either yeast forms or hyphae; and *Trichomonas vaginalis* in the presence of the ovoid trichomal organism and/or prominent perinuclear halo. These infections were also associated with background inflammatory and cellular degenerative changes.

### Results

The age distribution of the patients is shown in Table 1 and varied from 20 to 65 years with a mean of 36.8. Most of the women were of parity 3 and above, as shown in Table 2.

The indications for cervical cytology are shown in Table 3. About 50.3% were routine, while 49.7% were for indications that varied from cervical erosion to 'cervicitis'. Post-menopausal bleeding was the least common indication.

Twenty-eight percent of the smears were 'abnormal'. The abnormalities included inflammatory smears with no dyskaryosis (7.6%), various stages of cervical intra-epithelial neoplasia — CIN (6.9%) and 'specific vaginal infections' (14.5%). The prevalence of *Gardnerella vaginalis*, *Trichomonas vaginalis* and *Candida albicans* infections was therefore 14.5%. *G. vaginalis* was the most common

## The prevalence of *Gardnerella vaginalis*, *Trichomonas vaginalis* and *Candida albicans* in the cytology clinic at Ibadan, Nigeria

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### Summary

In a study of 2224 adult women from the cytology clinic of the University College Hospital, Ibadan, Nigeria, the prevalence of 'specific vaginal infection' (i.e. *Gardnerella vaginalis*, *Trichomonas vaginalis* and *Candida albicans*) was 14.5%. For individual organisms, the rates were 9.76% for *G. vaginalis*, 2.52% for *T. vaginalis* and 2.20% for *C. albicans*. About half of the patients were asymptomatic while others were referred from other clinics with vaginal discharge, cervical erosion, post-coital bleeding, intermenstrual bleeding and various other symptoms and signs. The infections were almost uniformly distributed in all age groups studied. Increasing promiscuity either as a result of increased mobility of husbands (due to economic depression) or increased use of contraception by older women was thought to be responsible for the persistence of these infections in those aged 45 years and above.

In addition, *Gardnerella vaginalis*, *Trichomonas vaginalis* and *Candida albicans* infections can also be easily diagnosed from cervical cytology, by identification either of the organism or of characteristic cytological cellular changes.

### Résumé

Une étude de 2224 femmes adultes de la clinique de cytologie à l'University College Hospital, Ibadan, Nigéria, a montré une prévalence de 14.5 pourcent d'infections Vaginales

Spécifiques' (c'est-à-dire, *Gardnerella vaginalis*, le *Trichomonas vaginalis* et le *Candida albicans*). Pour les organismes individuels, les taux étaient 9.76% pour le *Gardnerella vaginalis*, 2.52% pour le *Trichomonas vaginalis* et 2.20% pour le *Candida albicans*. Presque la moitié des patients étaient asymptomatiques tandis que les autres ont été envoyées d'autres cliniques avec de suppuration vaginale, d'érosion cervicale, de saignement découlant des rapports sexuels, de saignement intermenstruel et d'autres symptômes et indications variés. Les infections étaient d'une distribution presque uniforme dans tous les groupes d'âge étudiés. La promiscuité augmentée, soit par suite de la mobilité redoublée des maris (ce qui est attribuable à la dépression économique) soit par l'usage croissant de la contraception par les femmes plus âgées, a été supposée être responsable de la persistance de ces infections dans les femmes âgées de 45 ans et plus.

En plus, le *Gardnerella vaginalis*, le *Trichomonas vaginalis* et le *Candida albicans* peuvent être diagnostiqués facilement à travers la cytologie cervicale, soit par l'identification de l'organisme soit à travers le changement cellulaire cytologique caractéristique.

### Introduction

In most developed countries, cervical cancer screening by cytology is an integral part of gynaecological practice. In Nigeria, and most other developing countries, this is yet to become widely available. Even where it is available, there is gross under-utilization, either because of poverty, ignorance, lack of cytopathologists or inadequate funding. In countries where it is comprehensively provided,

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Table 4. Prevalence of infections (specific organisms by age)

Age (years)	<i>Gardnerella vaginalis</i>		<i>Trichomonas vaginalis</i>		<i>Candida albicans</i>		Total	
	No. of cases	% *	No. of cases	% *	No. of cases	% *	No. of cases	% *
20-24	11	11.3	1	1.2	0	0.0	12	12.5
25-29	24	8.6	4	1.4	5	1.8	33	11.8
30-34	49	10.4	10	2.1	13	2.8	72	15.3
35-39	52	9.1	24	4.2	12	2.8	88	16.1
40-44	49	11.6	7	1.7	12	2.1	68	15.4
45-49	18	7.4	5	2.1	6	2.5	29	12.0
> 50	14	7.1	5	2.5	1	0.5	20	10.1
Total	217		56		49		322	

\*The percentages are of the total number of patients in each age group shown in Table 1.

Table 5. Indication for cytology v. organism isolated

Indication	<i>G. vaginalis</i>		<i>T. vaginalis</i>		<i>C. albicans</i>		Total	
	No. of cases	% *	No. of cases	% *	No. of cases	% *	No. of cases	% *
Routine	99	8.86	22	1.97	24	2.15	145	12.97
Cervical erosion	29	10.03	9	3.11	10	3.46	48	16.6
Post-coital bleeding	29	15.26	14	7.37	3	1.58	46	24.21
Intermenstrual bleeding/irregular menses	15	11.03	3	2.21	1	0.74	19	13.98
Vaginal discharge	25	24.51	8	7.84	11	10.78	44	43.13
Cervicitis	8	6.72	—	—	—	—	8	6.72
Post-menopausal bleeding	5	7.94	—	—	—	—	5	7.94
Others	7	3.38	—	—	—	—	7	3.38
Total	217		56		49		322	

\*Percentage of the total number of patients who had cytology for the indication shown. (The total figures for each group are shown in Table 3.)

bleeding, dyspareunia and cervical erosion is suggestive of a definitive vaginitis. We are therefore of the opinion that vaginosis or non-specific vaginitis should be abandoned and replaced by vaginitis or cervicitis due to *Gardnerella vaginalis*. Non-specific vaginitis should be reserved for those cases where symptoms and signs of vaginitis are present but no pathogen is isolated from cultures. The fact that repeat smears 3 months after treatment (with

metronidazole) were normal, vaginal discharge had ceased and cervical erosions had almost completely disappeared confirmed that this organism was responsible for the vaginitis and discharge and cervicitis.

The organisms identified in this study are mostly sexually transmitted. It was therefore not surprising that the largest group of women with such infections were in the 30-44 age bracket. Surprisingly, however, the infections



Table 1. Age distribution

Age (years)	No. of cases	%
20-24	83	3.7
25-29	278	12.5
30-34	472	21.2
35-39	570	25.6
40-44	422	19.0
45-49	242	10.9
50-54	123	5.5
> 55	34	1.6
Total	2224	100.0

Table 2. Parity of 2224 patients who had cervical cytology at UCH, Ibadan

Parity	No. of cases	%
0	89	4
1-2	226	10.2
3-4	782	35.2
5-6	854	38.4
7-8	211	9.5
> 9	62	2.7
Total	2224	100.0

infection identified. Both *G. vaginalis* and *T. vaginalis* were diagnosed from 5% of the women, while another 6% had both *G. vaginalis* and *C. albicans* infections. All these organisms were present in smears from 3.4% of the patients. When these infections were matched against the age, those in the 30-44 years age group were the most commonly affected. Table 4 shows these differences.

Table 5 shows the organisms v. the indication for cytology. Those with vaginal discharge, as expected, had the highest positive association with specific infection. As many as 43.13% of those who had cytology because of vaginal discharge, had specific infections. These infections were least common in those with post-menopausal bleeding.

## Discussion

The prevalence of 'specific' vaginal infections in this study was 14.5%. This may not be reflective

Table 3. Indications for cytology

Indication	No. of cases	%
Routine	1118	50.3
Cervical erosion	289	13.0
Post-coital bleeding	290	8.5
Intermenstrual bleeding	136	6.1
Vaginal discharge	102	4.6
Cervicitis	119	5.4
Post-menopausal bleeding	63	2.8
Others*	207	9.3
Total	2224	100.0

\*Others include previous abnormal smears, suspicious carcinoma of the cervix, cervical polyps and atrophic vaginites.

tive of the true prevalence in this environment. The women were a highly selected group by virtue of their symptomatology and ability to pay for the services. Only 50.3% were asymptomatic. In various other studies where the community as a whole was studied, higher prevalence rates were found [9,10]. West *et al.* [10] found a prevalence rate for *G. vaginalis* of 53% in women presenting with symptoms of vaginitis but only 22 percent in a control population. In our series, *G. vaginalis* was present in 24.51% of those presenting with vaginal discharge and in only 8.86% of asymptomatic controls. The differences in the prevalence rates in our series and those of others may be due to the different environmental factors, but, more importantly, it may be due to the method of diagnosing these infections. In our study, identification was simply from the slides whereas others cultured swabs from their patients. Although detection by cytology is specific, its sensitivity is probably not very high. However, in an environment like ours, which typifies most developing nations, it may be quite expensive to run cultures. Reliance can, however, be placed on cytology, which in addition offers screening for cervical intra-epithelial neoplasia.

Various types of vaginitis have been described. The most controversial has been that due to *Gardnerella vaginalis*. Blackwell *et al.* [12] referred to it as vaginosis (discharge occurring without vaginitis). The occurrence of *G. vaginalis* alone in patients with post-coital



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were still very common after 45 years. In our environment, coitus amongst peri- and post-menopausal women is often on the decline. This is more so amongst the uneducated who constituted over 70% of our patients. The persistence of these infections in this group may therefore reflect the increasing sexual promiscuity, especially amongst the men. The increased mobility of husbands for economic reasons may be a major contributing factor. On the other hand, the greater utilization of various methods of contraception in older women [13] may encourage multiple sexual partners and hence spread of these infections.

In this study, 28% of smears were abnormal. Apart from those with cervical intra-epithelial neoplasia (CIN) (6.9%), all other patients with other forms of abnormal smears were treated with oral metronidazole (400 mg three times daily for 7 days) and vaginal clotrimazole (200 mg mode for 3 days) and the smears repeated 3 months after treatment. After treatment, only 8.9% of smears remained abnormal, with persistence of non-specific inflammatory changes in 1% of smears. The 7.9% overall incidence of CIN in this series is much higher than that from other parts of the world [14-16], but lower than the 9.3% reported by Omigbodun *et al.* [17] from a smaller population at our sexually transmitted disease clinic.

From the results of our series, we suggest that when a smear is reported as inflammatory, metronidazole and clotrimazole should be offered in the dosage described above and the smear repeated 3 months after treatment. Since infections isolated in this study are often sexually transmitted, we also recommend that the male partners should be treated when *G. vaginalis* and *T. vaginalis* are isolated.

Cervical cytology is an important investigative/screening tool for the gynaecologist's armamentarium. This study has confirmed the findings of Omigbodun *et al.* [17] that the incidence of CIN is high in our environment. There is therefore an urgent need to fund better cytological services, and make them free, to encourage a wider population screening. A well organized health education campaign and public enlightenment on the benefit of the cervical smear will ensure a better response to screening. In the developing countries, where most of the population is rural, and an organized health care system does not exist, mobile cytological

screening services may provide the best solution. Although cervical cytology programmes are lacking in our environment, where they are being provided the added advantage of isolating infections must be recognized. Where facilities for cultures are inadequate, patients who present either to sexually transmitted disease clinics or to gynaecology clinics with vaginal discharge, post-coital bleeding or dyspareunia, or are found to have a cervical erosion, should have cervical cytology, not only for excluding CIN but also for specific infections which are easily treatable. The high specificity but relatively low sensitivity of this diagnostic method, however, remains a limiting factor.

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