Vaginal yeast infections in diabetic women

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Abstract **Two hundred and three diabetic women (89 with and 114 without genital symptoms) were examined for the presence of yeasts and *Trichomonas vaginalis*. Yeasts were isolated from the vaginas of 35,5% of patients and were more common in the symptomatic group (48,0%) than the asymptomatic group (25,4%; $P < 0,05$). *Candida albicans* was isolated from 12,8% of all patients and showed a significant association with pruritus vulvae ($P < 0,05$). A significant association was also shown between the presence of yeasts in the rectum and in the vagina. *C. glabrata* (*Torulopsis glabrata*) was the commonest yeast species isolated (50,0%), with *C. albicans* the next most frequent (36,1%). *T. vaginalis* infection was present in 14,3% of all subjects.**

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Pruritus vulvae is a common complaint among diabetic women and empirical treatment with antifungal agents appears to be the rule in busy outpatient clinics. Diabetes mellitus is frequently cited as one of the factors that predisposes to *Candida albicans* vaginitis.[1,2] There are, however, very few studies documenting the yeast genital flora in diabetic patients. Williams *et al.*[3] observed no significant difference in the isolation rate of *C. albicans* from the vaginas of diabetic and non-diabetic subjects. In a Finnish study[4] involving 160 diabetic girls followed over several months, *C. albicans* was isolated in 64% of the patients. In a more recent study Rowe *et al.*[5] isolated *C. albicans* in only 22,2% (6/22) of symptomatic diabetic women. Similar data on diabetic women from developing countries have to our knowledge not been published before.

This study was conducted to determine the prevalence of yeasts (particularly *C. albicans*) and *T. vaginalis* in diabetic women attending two busy outpatient clinics. In addition, the relationship between the degree of diabetic control, the extent of yeast colonisation and the role of the gastro-intestinal tract as a reservoir for vaginal yeast colonisation/infection was studied.

Patients and methods

A total of 211 consecutive diabetic women (108 black and 103 Indian) attending two separate outpatient diabetic clinics in Durban were studied. Any patient who had received antifungal therapy and/or any antibiotics in the preceding 4 weeks was excluded, as were patients in whom a vaginal speculum could not be passed.

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Information about age, duration of diabetes and medication was obtained from each patient, together with a brief history of vaginal symptoms (i.e. pruritus and/or discharge). Diagnosis of diabetes was based on the revised World Health Organisation diagnostic criteria.[6] Venous blood was drawn from each patient for the determination of random plasma glucose levels and the performance of serological tests for syphilis. The rapid plasma reagin (RPR) test (Becton Dickinson) was used to screen for syphilis and all reactive sera were titred and subjected to confirmatory tests — the *Treponema pallidum* haemagglutination (TPHA) (Fujirebio) or the fluorescent treponemal antibody absorption (FTA-ABS) test (Wellcome Diagnostics).

Separate sterile cotton tipped swabs were used to obtain material from each of five body sites, viz. both axillae, the groin, the mouth (posterior fauces, tongue and buccal mucosa), the rectum, and the vagina (two swabs). The vaginal specimens were collected under direct vision after insertion of a sterile, unlubricated speculum. One high vaginal swab and one swab each from the mouth, axillae, rectum and groin were immediately inoculated onto plates of Sabouraud's medium. The plates were incubated at 37°C within 2 hours. Plates were examined daily for 3 days and all yeast-like colonies were examined microscopically to confirm the presence of yeasts.

Yeasts which produced germ-tubes in human serum at 37°C after 2 hours were identified as *C. albicans*. Germ-tube negative yeasts were retested for this property and, if still negative, an API20C (auxanogramme) was used to identify these yeasts. Any yeasts not identified by this procedure were retested and if still not identified were labelled 'others'.

The remaining vaginal swab was used for the preparation of a wet smear which was examined within 2 minutes of collection for the presence of yeasts, motile trichomonads and pus cells.

Results were analysed statistically using Fisher's exact tests (2-tail) or the chi-square test as appropriate.

Results

Of the 211 patients recruited for the study, 3 refused consent. Three were excluded because they had received antifungal therapy 3 weeks before clinic attendance. Two others were excluded because of difficulties in passing a speculum — one was a 16-year-old virgin and the other a 65-year-old with severe deformity of the hip.

Results from the remaining 203 patients were analysed. The patients were allocated to one of two groups for this purpose: (*i*) symptomatic group (those with complaints of pruritus vulvae and/or vaginal discharge) — 89 women; and (*ii*) asymptomatic group — 114 women.

Table I summarises the distribution and characteristics of the 2 categories of patients. The patients were well matched for age. Ninety-two per cent were 40 years of age or older. A high percentage (43,8%) of patients was symptomatic. There was no significant difference in the mean plasma glucose levels between the symptomatic and asymptomatic groups.

Yeasts were isolated from 35,5% of all patients; the symptomatic group had a significantly higher carrier rate (48,0%) compared with the asymptomatic group

(25,4%; $P < 0,05$). *T. vaginalis* was detected in 14,3% of all patients with no significant difference in prevalence rates between the two groups ($P > 0,05$).

TABLE I.
Summary of patient data

	Symptomatic	Asymptomatic	Total
No. of patients	89 (43,8%)	114 (56,2%)	203
Mean age (yrs)	48,9	51,7	50,3
Range (yrs)	18 - 70	26 - 74	18 - 74
Mean random plasma glucose level (mmol/l)	13,5	13,9	13,7
Yeast isolated from vagina	48,0%	25,4%*	35,5%
Trichomonas vaginalis	13,5%	15,0%	14,3%

*$P < 0,05$.

The association of vaginal symptoms with the presence of yeasts and trichomonads in the vagina is shown in Table II. Of the patients presenting with pruritus vulvae as the only symptom, 53,8% (21/39) had yeasts in the vagina while only 27,3% (5/22) of patients with discharge alone had yeasts in the vagina. There was a significant association between pruritus vulvae and the presence of yeasts ($P < 0,05$). In contrast, the presence of *T. vaginalis* was not associated with any of the symptoms studied.

The distribution of yeasts isolated from the mouth, vagina and rectum is shown in Table III. The overall vaginal prevalence of *C. albicans* was 12,8% (26/203 patients). This yeast was associated with genital symptoms in 84,6% (22/26) of the patients from whom it was isolated. Only 4 patients without symptoms yielded *C. albicans*. One of these had classic candidiasis on clinical grounds, while the other 3 patients had mild cervicitis.

TABLE III.
Distribution of yeast isolates in the mouth, vagina and rectum ($N = 203$)

		Vagina		
Yeast species	Mouth	No.	No. with symptoms	Rectum
C. albicans	61	26	22	34
C. glabrata	2	36	16	26
Other	9	10	5	25
Total	72	72	43	85

The mean random plasma glucose level in the patients with *C. albicans* did not differ significantly from that of patients with other yeast species ($P > 0,05$).

The yeast species most commonly isolated simultaneously from both the rectum and vagina was *C. glabrata* (*Torulopsis glabrata*) (Table III), but it showed no significant association with genital symptoms ($P > 0,05$). *C. albicans* was the second most common and was significantly associated with pruritus vulvae ($P < 0,05$). There was a significant correlation between the presence of similar species of yeasts in the vagina and in the rectum ($P < 0,05$).

C. albicans was by far the commonest of the yeasts isolated from the mouth; the prevalence rate was 30,1% (61/203). However, the presence of yeasts in the mouth, axilla or groin was not associated with vaginal carriage. The presence of *C. albicans* in the mouth showed no correlation with the random plasma glucose values at the time of sampling. In only 2 patients (1 from each group) was there serological evidence of syphilis.

Discussion

Previous studies on diabetic women in developed countries have found widely varying prevalence rates of candidal infection ranging from as low as 7% to as high as 64,1%.[3,4] Among a group of pregnant diabetic women in Denmark, 56% had yeast infection of the vagina with *C. albicans* the most common yeast isolated.[7]

In the present study over one-third of diabetic women studied had a yeast infection; only 36,1% of these were due to *C. albicans*. In fact the overall prevalence rate of the latter (12,8%) was low, compared with non-diabetic black women attending the antenatal clinic of the same hospital,[8] or sexually transmitted diseases clinics in Sudan and Kenya where rates of 20 - 30% have been found.[9,10] Unfortunately, because of the lack of published data, a comparison with vaginal yeast infections in black women elsewhere is not possible. Although the prevalence of *C. albicans* in this study was relatively low, it was significantly associated with pruritus vulvae as demonstrated by others.[11]

C. glabrata was the yeast most frequently isolated from vaginal specimens. A study in Sudan[9] similarly identified *C. glabrata* as the most common yeast in non-diabetic women with a vaginal discharge. Hoosen *et al.*[8] identified 37% of the yeasts in patients attending a routine antenatal clinic as *Candida* species (not *albicans*). Most European studies report *C. albicans* as the yeast most commonly isolated from the vagina (Table IV) of both diabetic and non-diabetic women.[2-4,7,12-14] The significance of the high vaginal carriage rate of *C. glabrata* is not clear since in this study no significant correlation could be found between isolation of this yeast and any of the vaginal symptoms investigated. Nevertheless 16 of 36 (44,4%) women harbouring *C. glabrata* were symptomatic.

Social, economic, geographical and dietary factors have been cited[9] as important in influencing the distribution of yeasts. It would therefore be necessary to investigate the possible role of these factors in South African and Sudanese black women, both of whom belong to developing communities. Moreover, the role of *C. glabrata* in genital symptoms in developing countries, especially among diabetic females, requires further evaluation.

TABLE II.
Association of vaginal symptoms with yeasts and *Trichomonas vaginalis*

	Yeasts		*T. vaginalis*		Yeast and *T. vaginalis*		Total with yeast and/or *T. vaginalis*	
Symptom(s)	No.	%	No.	%	No.	%	No.	%
Pruritus vulvae ($N = 39$)	16	41,0	4	10,3	5	12,8	25	64,1
Vaginal discharge ($N = 22$)	4	18,2	1	4,6	1	4,6	6	27,3
Pruritus and vaginal discharge ($N = 28$)	16	57,1	0	0,0	1	3,6	17	60,7
None ($N = 114$)	23	20,2	11	9,7	6	5,3	40	35,1

TABLE IV.
Yeasts and *Trichomonas vaginalis* prevalence rates (%) reported in various studies

Population studied	Country*	Yeasts	*C. albicans*	Other yeasts	*T. vaginalis*
Diabetic girls	Finland[4]	90,2	64,1	35,9	NR
Family planning	UK[11]	21,0	72,3	27,7	1,0
Antenatal clinic	UK[12]	13,6	78,7	22,3	6,0
Venereology clinic	UK[13]	26,0	81,0	19,0	17,8
Diabetic women	UK[3]	NR	7	NR	2,0
STD clinic	Kenya[10]	NR	24,0	NR	34,0
STD clinic	Sudan[9]	29,7	25,4	74,6	NR
Antenatal clinic	RSA[8]	60,0	38,1	61,9	49,0
Diabetic clinic (Present study)	RSA	35,5	36,1	63,9	14,3

* With reference cited.
NR = not reported.

The proportion of patients with vulvovaginal symptoms was high (43,8%). Only in 61,8% of these patients could we implicate either trichomoniasis or candidiasis as causes of these symptoms (Table I). It is possible that in some instances yeasts may have been missed on culture since it has been estimated that at least 10^3 cfu/ml are required for a culture to be positive.[15] *Gardnerella vaginalis* was not sought in this study and may have accounted for the vaginal symptoms in some of these patients.

The strong overall association between rectal and vaginal colonisation by the same species of yeasts demonstrated in several studies[4,15-17] was also evident in our diabetic population.

An increase in the oral carriage of yeasts, associated with poor control of diabetes, has been reported,[18] but we could establish no such correlation in this study. Although *C. albicans* was by far the commonest yeast isolated from the mouth, no significant association with its presence in the vagina was evident. This finding does not agree with that of Hilton and Warnock.[17]

The relatively high prevalence of *T. vaginalis* in both the symptomatic and asymptomatic groups is noteworthy and needs to be considered when management of these patients is planned, particularly in busy clinic situations where treatment may be empirical. The low prevalence of syphilis is not surprising considering the mean age of our patients.

In summary, our findings support both the association of *C. albicans* with pruritus vulvae and the association of rectal carriage with vaginal infection. However, no correlation between genital or oral yeast and random blood glucose levels was noted. In addition the role of *C. glabrata* in genital infections remains unclear.

The findings presented in this study argue against empirical antifungal therapy of diabetic patients presenting with genital symptoms for two reasons. Firstly, as indicated above, in almost one-third of patients neither yeasts nor trichomonads could be implicated in the aetiology of the symptoms so that empirical therapy directed against these agents would be inappropriate. Secondly, the high prevalence of trichomoniasis (14,3%) implies that empirical antifungal therapy alone is not appropriate for this group of patients.

We therefore conclude that laboratory diagnosis is essential before initiation of appropriate therapy in diabetic patients presenting with vulvovaginal symptoms.

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