Vulvovaginitis in a pediatric population: relationship among etiologic agents, age and Tanner staging of breast development

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ABSTRACT

Introduction. Vulvovaginitis accounts for 25% of all pediatric gynecology consultations.

Objective. To assess the etiology of vulvovaginitis based on age and Tanner staging of breast development.

Material and Methods. Descriptive, cross-sectional study conducted between January 1st and December 31st, 2011. Patients with vulvovaginitis were assessed based on two outcome measures: age group (GI: 0 to 8.9 years old, GII: 9 to 15.9 years old, and GIII: 16 to 18 years old), and the Tanner staging of breast development (I, II-III, IV-V).

Results. Two hundred and twenty-nine patients were included, 78 girls in the GI group, 134 in the GII group, and 17 in the GIII group; 81 girls were classified as TI, 36 as TII-III, and 112 as TIV-V based on Tanner staging. *Shigella* and *Oxyuris* were the most commonly found etiologic agents in younger girls. *Candida albicans*, other *Candida species*, *Gardnerella* and *Ureaplasma urealyticum* were the germs most commonly observed in older patients. *Oxyuris* was predominant in prepubertal girls, while *Candida albicans*, in postpubertal girls.

Conclusions. Hormonal influence was more relevant than the patient's age in terms of vulvovaginitis etiology.

Key words: *vulvovaginitis, childhood, adolescence, age, breast development stages.*

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INTRODUCTION

Vulvovaginitis is defined as an inflammation of the vulvovaginal mucous membranes.[1] It accounts for 25% of all pediatric gynecology consultations.[2] Decreased estrogen stimulus during the prepubertal period results in thinning of the vulvovaginal epithelium, local alkaline pH and thin labia minora, all factors that favor the development of vulvovaginitis. This disease accounts for 23% of all consultations made at our Pediatric and Adolescent Gynecology Unit. Among prepubertal girls, the most common clinical presentation is nonspecific vulvovaginitis (NSVV) caused by endogenous vaginal flora, which can become aggressive due to decreased mucous membrane integrity and physicochemical alterations.

Specific vulvovaginitis (SVV) is associated with a particular etiologic agent, grouped according to its respiratory, enteral or sexually-transmitted origin.[3] Little has been published in the literature regarding the relationship between the different etiologies and pubertal development.[4]

The objective of this study is to describe the etiology of vulvovaginitis in terms of age and estrogen stimulus in girls examined at our unit as part of walk-in consultations.

MATERIAL AND METHODS

All patients with vulvovaginitis examined at the Pediatric and Adolescent Gynecology Unit of Hospital Sor María Ludovica of La Plata between January 1st and December 31st, 2011 were included. Their medical history and physical and gynecological exams were recorded in the presence of an adult caregiver. Estrogen stimulus was assessed based on Marshall and Tanner staging of breast development.[5] Patients with chronic conditions referred by other specialties and those suspected of sexual abuse were excluded. An intravaginal discharge sample was collected with a swab from patients with genital secretions at the time of the assessment. Tests performed included a fresh smear, Gram staining, common germ culture, and direct immunofluorescence for *Chlamydia trachomatis* and *Ureaplasma urealyticum*. No cultures were taken from patients with signs and symptoms of

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oxyuriasis: anogenital and nasal pruritus, bruxism and perineogenital congestion. Diagnosis was established as per the recommendations in the *Manual of the Sociedad Argentina de Ginecología Infanto Juvenil*.[3]

Statistical method

Descriptive, cross-sectional study. Patients were grouped by age: GI (0 to 8.9 years old), GII (9 to 15.9 years old), and GIII (16 to 18 years old), and by breast development stage: Tanner I stage (TI); Tanner II-III stage (TII-III), and Tanner IV-V stage (TIV-V). Different 2x2 contingency tables were developed to test the association between positive cases and the corresponding age and Tanner stage groups. Age groups and germ types were assessed using the X^2 test.[6] The confidence interval was set at 95% (alpha error ≤ 0.05). The Epidat 3.1® software was used.[7]

Ethical considerations: this was a retrospective study, so it was not possible to obtain an informed consent. Data were anonymized. The study was approved by the hospital's Teaching and Research Board.

RESULTS

1. Relationship between etiology and age

A total of 229 patients were analyzed: 78 patients from the GI group (6 ± 2 years old), 134 from the GII group (12.6 ± 1.8 years old), and 17 from the GIII group (16.7 ± 0.7 years old). Given the small size of group GIII, it was excluded from the statistical analysis. The etiologies of nonspecific vulvovaginitis were *Oxyuris* and mixed flora vulvovaginitis (MFVV); the etiologic agents of specific vulvovaginitis were *Shigella* sp., *Haemophylus influenzae, Candida albicans,* other *Candida* species, *Escherichia coli, Staphylococcus, Streptococcus pyogenes, Streptococcus agalactiae, Streptococcus pneumoniae, Chlamydia trachomatis, Gardnerella vaginalis, Trichomonas, Ureaplasma urealyticum, Mycoplasma* and herpes virus 1. Significant differences were observed for *Oxyuris* (p< 0.0001) and *Shigella* (p= 0.0047) between the GI and GII groups, with a higher percentage of positive cases among younger girls versus older girls (*Figure 1*). On the contrary, *Candida albicans, Gardnerella, Ureaplasma*, and other *Candida* species were more common among older than younger patients, showing significant differences *(Figure 1)*. In group GIII, positive cases were recorded only for *Oxyuris* (n= 3), *Chlamydia trachomatis* (n= 1), *Gardnerella* (n= 2), MFVV (n= 1), *Trichomonas* (n= 1) and *Candida* (n= 1).

In the GI group, the most common germs were *Oxyuris* (47.4%) and MFVV (26.9%); while in the GII group, the most frequent ones were MFVV (23.1%), other *Candida* species (22.3%), *Candida*

TABLE 1. *Comparison of germs by Tanner stages I, II-III and IV-V using the X^2 test*

Etiology	Tanner stage	Positive cases (n)	Comparison	X^2	p-value
Oxiurus sp.	I	40	I vs. II-III	1.77	0.1832
	II-III	13	I vs. IV-V	59.21	<0.0001*
	IV-V	3	II-III vs. IV-V	28.21	<0.0001*
U. urealyticum	I	0	I vs. II-III	0.18	0.6756
	II-III	1	I vs. IV-V	17.04	<0.0001*
	IV-V	21	II-III vs. IV-V	5.49	0.0191*
C. albicans	I	0	I vs. II-III	3.99	0.0457*
	II-III	3	I vs. IV-V	17.04	<0.0001*
	IV-V	21	II-III vs. IV-V	2.18	0.1402
Other *Candida* species	I	2	I vs. II-III	0.36	0.5482
	II-III	6	I vs. IV-V	15.40	0.0001*
	IV-V	25	II-III vs. IV-V	0.53	0.4683
G. vaginalis	I	0	I vs. II-III	1.87	0.1716
	II-III	2	I vs. IV-V	5.92	0.0150*
	IV-V	10	II-III vs. IV-V	0.09	0.7687
Shigella sp.	I	6	I vs. II-III	1.49	0.2215
	II-III	0	I vs. IV-V	6.28	0.0122*
	IV-V	0	II-III vs. IV-V		

Cells marked with an asterisk (*) and in grey show significant differences (p ≤ 0.05). The black cell indicates a null comparison that cannot be subjected to a statistical analysis. No significant differences were found for MFVV, *Haemophylus influenzae, E. coli, Staphyloccus* sp., *S. pyogenes, S. agalactiae, C. trachomatis, Trichomonas* and *Mycoplasma* species, herpes virus 1, and *S. pneumoniae* (p > 0.05).

albicans (17.9%), *Ureaplasma* (16.4%) and *Oxyuris* (11.9%) *(Figure 1)*.

2. Relationship between the etiology and Tanner stage

In terms of Tanner stage, 82 patients were classified as TI, 36 as TII-III, and 112 as TIV-V. Significant differences were observed for *Oxyuris*: the number of positive cases in the TI stage ($p < 0.0001$) and TII-III stage ($p < 0.0001$) was significantly higher compared to the TIV-V stage; as a result, a decreasing positivity degree, from TI to TIV-V, was recorded. Significant differences were observed between the TI and TIV-V groups ($p = 0.012$) for *Shigella*, with all cases found in the TI group. For *Candida albicans*, significant differences were found between TI and TII-III ($p= 0.0457$) and between TI and TIV-V ($p < 0.0001$), with a reverse pattern for *Oxyuris*. Other *Candida* species ($p= 0.0001$) and *Gardnerella* ($p= 0.015$) were the etiologies recorded in a significantly higher number of cases in the TIV-V group versus the TI group. Cases of *Ureaplasma* were significantly higher in the TIV-V stage compared to the TI ($p< 0.0001$) and the TII-III stages ($p= 0.0191$).

The percent frequency of etiologies was assessed in relation to the total number of patients for each puberty category *(Figure 2)*. All *Shigella* cases were found in the TI stage, while *Mycoplasma* and herpes virus 1 were observed only in the TIV-V stage; however, MFVV was observed across the three stages. The highest number of different etiologic agents was recorded in the TIV-V stage *(Table 2)*.

Among the 21 patients who were already sexually active, 35% presented *Ureaplasma*, 29% had *Candida albicans* and 29% had *Gardnerella*. Taking into consideration the relationship between age and Tanner stages, neither the TI stage nor the GI group showed sexually-transmitted germs, except for *Chlamydia trachomatis*, which was found in one case corresponding to the GI groups and TII-III stage.

DISCUSSION

Vulvovaginitis during childhood and adolescence is a common reason for consultation. In our series, and consistent with some other authors' findings, nonspecific vulvovaginitis accounted for approximately 77% of all vulvovaginitis cases in prepubertal girls.[3] However, MFVV was frequent in all pubertal development stages. In relation to specific

FIGURE 1. *Percent frequency of patients with positive cultures for specific vulvovaginitis by age (GI and GII)*

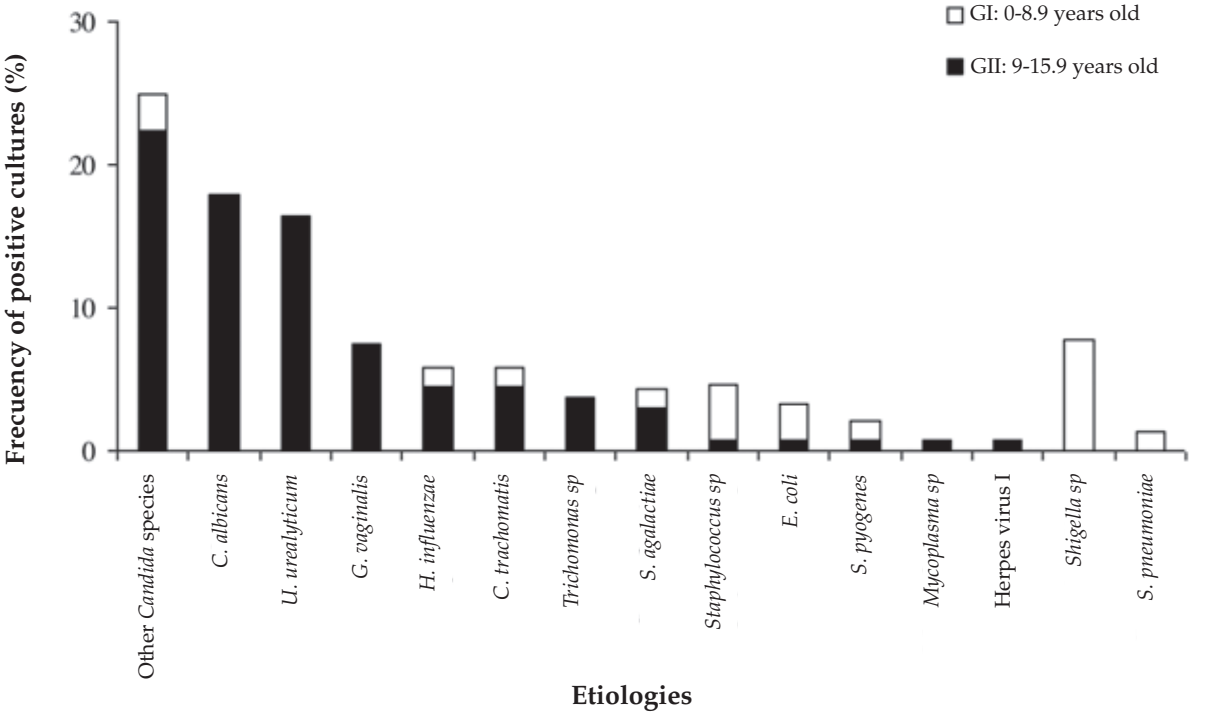

FIGURE 2. *Percent frequency of patients with positive cultures for specific vulvovaginitis in relation to Tanner staging (TI, TII-III and TIV-V)*

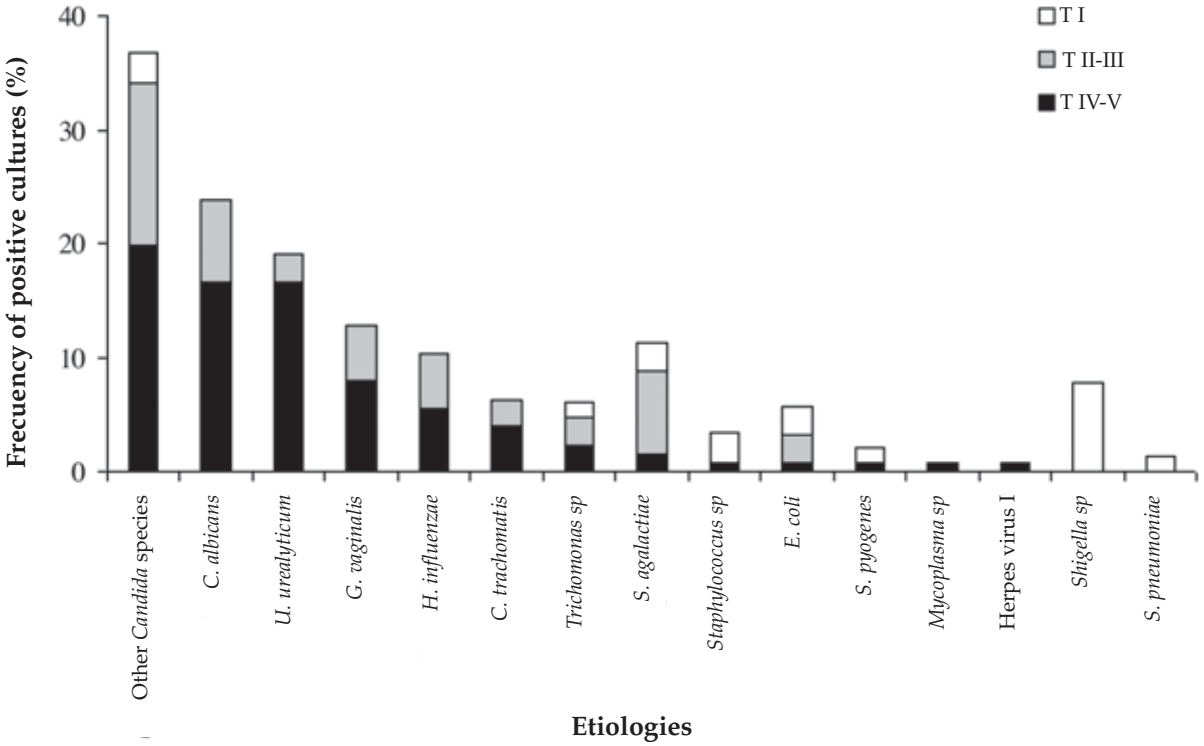

TABLE 2. *Percentage of patients with positive cultures in relation to Tanner staging (TI, TII-III and TIV-V). The value between brackets shows the number of cases*

Etiology	**T I**	**Etiology**	**T II-III**	**Etiology**	**T IV-V**
Oxiurus sp	51.95 (40)	*Oxiurus sp*	30.95 (13)	Other *Candida*	19.84 (25)
NSVV	25.97 (20)	NSVV	21.43 (9)	NSVV	19.05 (24)
Shigella sp	7.79 (6)	Other *Candida*	14.29 (6)	*C. albicans*	16.67 (21)
H. influenzae	2.60 (2)	*H. influenzae*	7.14 (3)	*Ureaplasma sp*	16.67 (21)
E. coli	2.60 (2)	*C. albicans*	7.14 (3)	*G. vaginalis*	7.94 (10)
Other *Candida*	2.60 (2)	*Chlamydia sp*	4.76 (2)	*Chlamydia sp*	5.56 (7)
Staphylococcus sp	2.60 (2)	*G. vaginalis*	4.76 (2)	*Trichomonas sp*	3.97 (5)
S. pyogenes	1.30 (1)	*Staphylococcus* sp	2.38 (1)	*Oxiurus sp*	2.38 (3)
S. pneumoniae	1.30 (1)	*S. agalactiae*	2.38 (1)	*S. agalactiae*	2.38 (3)
S. agalactiae	1.30 (1)	*Trichomonas sp*	2.38 (1)	*H. influenzae*	1.59 (2)
C. albicans	0.00 (0)	*Ureaplasma sp*	2.38 (1)	*E. coli*	0.79 (1)
Chlamydia sp	0.00 (0)	*Shigella sp*	0.00 (0)	*Staphylococcus sp*	0.79 (1)
G. vaginalis	0.00 (0)	*E. coli*	0.00 (0)	*S. pyogenes*	0.79 (1)
Trichomonas sp	0.00 (0)	*S. pyogenes*	0.00 (0)	*Mycoplasma sp*	0.79 (1)
Ureaplasma sp	0.00 (0)	*S. pneumoniae*	0.00 (0)	Herpes virus I	0.79 (1)
Mycoplasma sp	0.00 (0)	*Mycoplasma sp*	0.00 (0)	*Shigella sp*	0.00 (0)
Herpes virus I	0.00 (0)	Herpes virus I	0.00 (0)	*S. pneumoniae*	0.00 (0)

vulvovaginitis, certain pathogens were associated with a specific Tanner breast development stage, which indicates that such pathogens are mainly related to a specific estrogen level.[4,7] This is the case of the *Shigella* genus in prepubertal patients, which has been recorded only in the context of an alkaline pH, characteristic of this stage.[3,7]

Gryngarten, et al. published that the germs responsible for most specific vulvovaginitis are respiratory tract pathogens (*Haemophilus influenzae* and *Streptoccocus pyogenes*), which cause mucopurulent discharge after the onset of menarche.[8-10] Notwithstanding this, in our study, we found that *Shigella* was most common in patients with vulvovaginitis and bleeding, followed by *Escherichia coli*. Such high prevalence can be explained by poor hygiene in the studied population.

In the late stages of development, when there is an estrogen stimulus, the most common cases were due to *Candida albicans* and other *Candida* species given that fungi tend to have a higher adherence to the vulvovaginal epithelium due to the hormonal action.[11]

Some etiologies were more common in the younger age group, e.g. *Shigella* and *Oxyuris*. In relation to *Oxyuris*, and in agreement with other authors, given that it is difficult to make an etiological diagnosis using a Graham's test with a relatively low recovery rate, an empiric treatment is warranted whenever patients have a consistent medical history and clinical condition.[8,12] *Candida albicans*, other *Candida* species, *Gardnerella* and *Ureaplasma* were commonly found in girls older than 9 years old.[13,14]

In the case of *Chlamydia trachomatis* (one positive result in the younger age group), the patient was assessed by an interdisciplinary team, who ruled out the suspicion of sexual abuse. Although this pathogen is associated with abuse, there are other modes of transmission, such as oropharyngeal, conjunctival or mother-to-child.[2,15] The germs observed in the patients who were sexually active can be related to such activity.

Among the study's strengths, we could mention that it delves deep into the relationship between pubertal development stage and vulvovaginitis etiology, a topic that has been scarcely published in the literature, and the number of thoroughly studied patients, which allowed us to make statistically valid conclusions.

However, in the study we did not analyze the relationship of cases with other concurrent pathologies, prior antibiotic therapy, and duration of symptoms, which should be assessed in future studies and could be of interest for all pediatricians. Sexual abuse consultations were not included in the analysis because most patients had received an empiric treatment at the primary care facilities, before attending our unit.

CONCLUSIONS

Hormonal influence was more relevant than the patient's age in terms of the etiology of vulvovaginitis. Pubertal development should be assessed at the time of recording a detailed medical history so as to establish the etiological diagnosis.■

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