Indian J Physiol Pharmacol 2004; 48 (2) : 225–229

NON-SECRETOR STATUS; A PREDISPOSING FACTOR FOR VAGINAL CANDIDIASIS

DAYAPRASAD G. KULKARNI AND VENKATESH D.*

Department of Physiology,
Sri Devaraj Urs Medical College,
Tamaka, Kolar

(Received on May 22, 2003)

Abstract : A secretor is an individual who secretes blood group antigens into body fluids such as saliva, sweat, tears, semen and serum. An attempt has been made to establish the correlation between the secretor status and susceptibility to vaginal candidiasis. The secretor status was determined by haemagglutination inhibition technique. The presence of *Candida albicans* infection was detected by direct microscopy of the wet smear and confirmed by germ tube test and corn meal agar test. It was observed that out of the 64 patients, 15 were secretors and 49 were non-secretors. However 43 subjects were secretors and 13 non-secretors among the 56 controls. Thus prevalence of vaginal candidiasis was significantly higher in non-secretor group ($P<0.01$). The absence of blood group antigens in the body fluids and the lack of enzyme glycosyl transferase enhance the attachment of yeast to the epithelial cell and render the non-secretor more prone to infection.

Key words : vaginal candidiasis, blood group antigens, secretors, uro-epithelium

INTRODUCTION

Blood group antigens are secreted into various body fluids by the secretors. Non-secretors on the other hand, put out little or none of their blood group antigens into these body fluids. Absence of the blood group antigen is a health disadvantage, as this appears to increase susceptibility to a number of diseases. The secretion of the antigen into saliva and mucus offers added degree of protection against bacterial fimbria lectins. Earlier studies have indicated that the secretors are more prone to hemolytic anemia, oral cancer and viral infections (1), whereas diseases like tuberculosis, rheumatic fever, juvenile diabetes and various autoimmune diseases are more common in non-secretors (2). Inability to secrete the blood group substances in gastrointestinal mucus has also been associated with peptic ulcer, gastric malignancy and pernicious anemia (3). Lack of blood group antigen in mucosal

*Corresponding Author : Department of Physiology, Vydehi Institute of Medical Sciences and Research Centre, No. 82, EPIP area, whitefield, Bangalore – 560 066

fluid in non-secretors might contribute to the colonisation by *H. pylori,* which appears to attach itself with greater aggressiveness and cause local inflammation (4, 5). It has been reported that urinary tract infections are more common in women than men and more likely to be in non-secretors (6). Non-secretion of blood group antigen might greatly influence the pathogenic sequel of urinary tract infection (7). Women belonging to B and AB groups showed significantly higher relative risk of infection (8). It has been reported that oral carriers of *Candida albicans* among healthy subjects were predominantly non-secretors (9) and significant number of them belonged to O group (10). However, Shin ES et al (11) have not been able to establish any association between oral candida carriage with secretor status or ABO blood groups. These earlier studies have evaluated the relationship between ABO blood group, secretor status with oral carrier state of *Candida albicans* in healthy population. Information about the influence of secretor status on vaginal candidiasis is not readily available in Indian population. Hence, an attempt has been made to establish the relationship between the secretor status and ABO blood groups with vaginal candidates thus evaluating them as predisposing factors for the infection.

METHODS

This was a hospital-based study involving patients with the history of leucorrehoea attending the Medical College hospital. The patients were in the age group of 25 to 35 years. They gave no history of any other major illness and had not consumed any antibiotics in the recent past. Asymptomatic, clinically normal female relatives of the patients of comparable age group served as controls. There were 64 patients and 56 controls. The ABO groups were determined by the conventional haemagglutination test using the Anti A, B and D sera (12). The secretor status was determined by using the haemagglutination inhibition test (13). It is based on the principle that, if ABH antigens are present in a soluble form in saliva, they will neutralize the antibodies in the antisera added. Thus the antibodies are not available in the mixture of saliva and antisera to agglutinate red cell suspension possessing the same antigen added to this mixture. Thus haemagglutination inhibition indicates that the subject is a secretor.

In the subjects suspected to have vaginal candidiasis, 2 high vaginal swabs were taken. One swab was used for microscopic examination immediately. A smear was prepared with material collected, heat fixed and stained by Grams' method. The characteristic budding cells (blastoconidia), yeast hypae that were Gram positive, and the beaded appearance of cell content suggested the presence of *Candida albicans.* The material on the other swab was transferred to the culture medium, Sabouraud's Dextrose Agar containing glucose, mycological peptone, agar and water with the pH adjusted to 5.4. It was incubated for a period of 48 hours at 37°C. The pasty, opaque and pale coloured colonies that developed on incubation were subjected to germ tube test and corn meal agar test (14) for confirmation of candidial growth.

Statistical analysis

Chi square test was applied to find the association between the study and control group with respect to their secretor status.

RESULTS

Amongst the controls (n = 56) 43 subjects were secretors and remaining 13 were non-secretors. 22.0% belonged to blood group 'A', 33.9% were 'B' group, 35.6% were 'O' group and 8.5% were 'AB'. In the patients with confirmed vaginal candidiasis (n = 64) 15 were secretors and 49 were non-secretors. Among the patients, 20.3% were 'A' group, 43.7% belonged to 'B', 29.7% were 'O' and 6.3% were 'AB' group (Table I). The prevalence of vaginal candidiasis was significantly higher in non-secretors ($P<0.01$). Patients belonging to 'B' group were more prone to develop vaginal candidiasis. (Fig. 1)

TABLE I: Comparison of the secretor status between the study and control groups.

	Study group (n = 64)	*Study group (n = 56)*
Secretors	15	43
Non-secretors	49	13

(Chi square=31.94, Degree of freedom is 1, $P<0.01$)

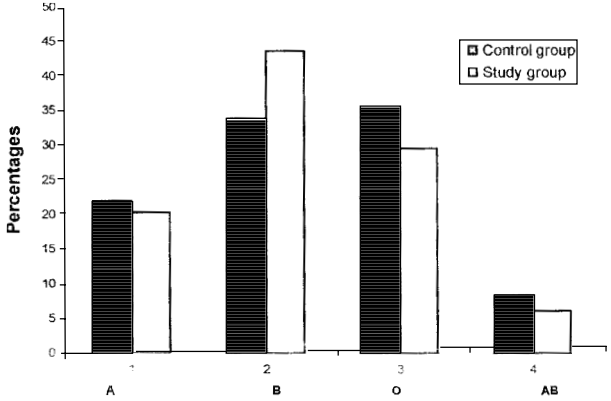

Fig. 1: Pattern of blood group distribution in normal subjects and patients with vaginal candidiasis.

DISCUSSION

It was evident that the non-secretors were more prone to develop vaginal candidiasis. They lack the glyco-compounds and the enzyme glycosyl-transferase enhancing the chance of attachment of the organism to the epithelial surface and hence causing the infection (9). It has been shown that non-secretor saliva not only fails to prevent the attachment of candida but actually promotes its binding to the tissues (15). The virulence attributes of candida could be due to host recognition by cell surface adhesin. In attachment studies, preincubation of blastospores with the boiled saliva of secretor reduced their binding ability to the epithelial cell by inhibition of the adhesin on their surface. The concentrations of IgA and IgG antibodies were lower in non-secretors (16). These antibodies were demonstrated to provide local immunity by destroying the organism. The secretors wall out the invading organisms and prevent its entry into the host. They have innate defense against superficial infection by candida species due to the ability of the subject to secrete water-soluble form of blood group antigen into the body fluids. The blood group substances in the body fluids of the secretors act as receptors and bind to the pathogenic organism. The bondage reduces the contact with mucosal surface or the epithelial layer thus reducing the possibility of infection. The secretor status alters the carbohydrates

present in the body fluids. This will influence microbial attachment and persistence.

Stapleton et al (17) have reported that women with history of recurrent urinary tract infection with *E coli* were predominantly non-secretors. The uro-epithelial cells of non-secretors exhibited tendency for greater adherence of the uro-pathogenic *E coli* when compared to secretors. Radiolabelled *E coli* showed greater affinity to bind to extended globo series, Sialosyl-gal globoside (SGG) and Disialosyl-gal-globoside (DSGG) formed from glycosphingolipids extracted from the non-secretors. The SGG and DSGG were selectively produced by them as a result of sailyation of glycolipids. In the secretors, the glycolipids were fucosylated and processed as ABH antigens. They have reported that there was a difference in the expression of blood group antigen on the vaginal epithelium and mucus, which could act as a critical factor in influencing the susceptibility to urinary tract infection. Increased susceptibility to recurrent urinary tract infection among women may be due to interaction between uropathogenic organism and women's uroepithelial cell. Women with recurrent UTI will have prolonged colonisation of vaginal mucosa with uropathhogenic organism even in infection free interval. A similar mechanism could play a role in the causation of vaginal candidaisis.

In an earlier study, the relative percentages of healthy subjects carrying oral candida were higher in O group. There were a higher number of non-secretors (48.9%) with oral and vaginal candida infection compared to their proportion (26.6%) in healthy population (18). The results of our study also indicate a pattern of infection similar to the earlier reports. In our study relatively larger number of patients belonged to 'B' group, which is consistent with earlier reports (8). It is likely that absence of anti-B isohemagglutinin and a non-secretor status combine to increase risk of vaginal candidiasis. However a study with a larger sample could conclusively establish the possible relationship between the candida infection and ABO blood group. It can be concluded that the absence of local immunity and lack of innate defense mechanism in non-secretors could act as a predisposing factor for the development of vaginal candidiasis.

ACKNOWLEDGEMENTS

The authors are thankful to Shri B. K. Rajan, Assistant Director, Regional Occupational Health Centre, Bangalore. Faculty, Department of Microbiology and Department of Obstetrics and Gynecology, Sri Devaraj Urs Medical College, Kolar for their help and co-operation during this study.

REFERENCES

1. Raza MW, Blackwell CC, Molyneaux P, et al. Association between secretor status and respiratory viral illness. *BMJ* 1991; 303: 815–818.

2. Patrick AW, Collier A. An infectious aetiology of insulin-dependent diabetes mellitus ? Role of the secretor status. *FEMS Microbiol Immunol* 1989; 1(6–7): 411–416.

3. Suadicani P, Hein HO, Gyntelberg F. Genetic and life-style determinants of peptic ulcer. A study of 3387 men aged 54 to 74 years: The Copenhagen Male Study. *Scand J Gastroenterol* 1999; 34: 12–17.

4. Dickey W, Collins JS, Watson RG et al. Secretor status and Helicobacter pylori infection are independent risk factors for gastro duodenal disease. *Gut* 1993; 34: 351–353.

5. Oberhuber G, Kranz A, Dejaco C et al. Blood groups Lewis (b) and ABH expression in gastric mucosa: lack of inter-relation with Helicobacter pylori colonisation and occurrence of gastric MALT lymphoma. *Gut* 1997; 41: 37–42.

6. Robert D. Harrington, Thomas M. Hooton. Urinary tract infection risk factors and Gender. Journal of Gender-specific *Medicine* 2000; 3: 27–34.

7. May SJ, Blackwell CC, Brettle RP, MacCallum CJ, Weir DM. Non-secretion of ABO blood group antigens: a host factor predisposing to recurrent urinary tract infections and renal scarring. FEMS Microbiol Immunol 1989; 1(6–7): 383–387.

8. Kinane DF, Blackwell CC, Brettle RP et al. ABO blood group, secretor status and susceptibility to recurrent urinary tract infection in women. *Br Med J* 1982; 285: 7–9.

9. Thom SM, Blackwell CC, MacCallum CJ et al. Non-secretion of blood group antigens and susceptibility to infection by Candida species. *FEMS Microbiol Immunol* 1989; 1(6–7): 401–405.

10. Burford-Mason AP, Weber JC, Willoughby JM, Oral carriage of Candida albicans, ABO blood group and secretor status in health subjects. *J Med Vet Mycol* 1988; 26(1): 49–56.

11. Shin ES, Chung SC and Kim YK et al. The relationship between oral Candida carriage and the secretor status of blood group antigens in saliva. *Oral Surg Oral Med Endod* 2003; 96(1): 48–53.

12. Harsh Mohan. Pathology practical Book (Jaypee Brothers) First Edition, 2000; 217–220.

13. Lewis SM, Bain BJ, Bates I. Dacie and Lewis practical Haematology (Churchill livingstone) 9th Edition, 2001; 446–447.

14. Betty A Forbes, Daniel F Sachin, Alice S Weissfied, Bailey and Scott's Diagnostic Microbiology (Mosby publication) 10th Edition: 956–957.

15. Cameron BJ, Douglas LJ Blood group glycolipids as epithelial cell receptors for Candida albicans. *Infect Immun* 1996; 64: 891–896.

16. Grundbacher FJ. Immunoglobulins, secretor status, and the incidence of rheumatic fever and rheumatic heart disease. *Hum Hered* 1972; 22: 399–404.

17. Stapleton A, Nudelman E, Clausen H, Hakomori S, Stamm WE. Binding of uropathogenic Escherichia coli R 45 to glycolipids extracted from vaginal epithelial cell is dependent on histo-blood group secretor status. *J Clin Invest* 1992; 90: 965–972.

18. Chaim W, Foxman B, Sobel JD. Association of recurrent vaginal candidates and secretory ABO and Lewis phenotype. *J Infect Dis* 1997; 176: 828–830.