Rapid Urinary Antigen Test in Children with Nasophryngeal Pneumococcal Carriage

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Abstract

Objective: To assessment the results of the Binax NOW urinary antigen test in healthy children and the influence of nasopharyngeal pneumococcal carriage on the results of the antigen detection test.

Material and Methods: The study was performed on a total of 223 healthy children aged 2–60 months. All the children enrolled and provided both nasopharyngeal swab specimens for culture and urine samples for the antigen detection test (Binax NOW).

Results: A total of 24 children (11%) were nasopharyngeal carriers of *Streptococcus pneumonia*. In 16 of these children (66.5%), the pneumococcal urinary antigen test was positive. False positive and false negative rates were found 33.4% and 8.5%, respectively.

Conclusion: It should be considered that a positive Binax NOW test alone is poor for distinguishing the pneumococcal infection from carriage.

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Keywords: Binax NOW, carriage, child, pneumococcal

Introduction

Streptococcus pneumoniae is a major cause of mortality and is the leading cause of bacteremia/sepsis, meningitis, pneumonia, and otitis media in childhood (1). *S. pneumonia* infections are difficult to accurately diagnose in children. A commercial rapid urinay pneumococcal antigen test (Binax NOW) that detects the C polysaccharide antigen present in all *S. pneumoniae* is used in diagnosis of pneumococcal infection (2). This rapid urinary test has excellent sensitivity and specificity in adults, but studies performed in children is informed that test's sensitivity and specificity rates is lower than adult's (3, 4). Further, studies report that children with nasopharyngeal carriage of *S. pneumoniae* had high rates of positive test results because of pneumococcal antigen reactions (1, 5). We evaluated the Binax NOW urinary antigen test in healthy children and determined the influence of nasopharyngeal pneumococcal carriage on the results of the antigen detection test.

Material and Methods

The study was performed on a total of 223 healthy children aged 2-60 months and received routine clinical care at Ege University Medicine Faculty Health Child Policlinic, between September 2009 and March 2010. The study was approved by local ethics committee. This study was conducted in accordance with the principles of the Declaration of Helsinki 2008. Inform consent was obtained from all parents. All children had been vaccinated with 7-valent pneumococcal conjugate vaccine in accordance with national vaccination schedule. All children enrolled and provided both nasopharyngeal swab specimens for culture and urine samples for the antigen detection

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test. Pneumococci were identified using a visual inspection for typical colony morphology, a-hemolysis, solubility testing, and susceptibility to ethylhydrocupreine (Optochin). Further, the Binax NOW test (*S. pneumoniae* urinary antigen test, Binax, Inc. Scarborough, Maine, USA) was simultaneously conducted for determining the urinary pneumococcal antigen. Binax NOW is a rapid immunochoromatographic test and uses a rabbit anti-*S. pneumonia* antibody that binds to any soluble pneumococcal antigen (C polysaccharide) present in the sample. A swab was dipped into urinary specimen and inserted into the test device. A buffer solution was added, and the device was closed. The results were visually read after 15 min. A pink to purple color on both the sample and control lines indicated a positive result. Statistical analysis was performed with the SPSS for Windows (SPSS for Windows, version 15.0; SPSS Inc., Chicago, IL, USA). The rate of children with and without nasopharyngeal carriage who had Binax NOW test results was compared using the Fisher's exact test. P value <0.05 was considered significant.

Results

Our study included 223 children, ages between 2 and 60 months (23.10±16,98 months, median age=19 months), 134 (60%) males and 89 (40%) females. Pneumococcal nasopharyngeal carriage was present in 24 (10.8%) of 223. In 16 of 24 (%66.7) nasopharyngeal carriage children, pneumococcal antigen was determined positive in their urine samples with the Binax NOW test. Further, in 17 of 199 (8.5%) non-nasopharyngeal pneumococcal carriage children, pneumococcal antigen was determined positive in urine samples (Table 1) (p<0.001). The urine antigen detection test was markedly more likely to indicate a positive result for patients who were nasopharyngeal carriers of pneumococcal than for those who were not.

The sensitivity, specificity, and positive and negative predictive values of the Binax NOW test for the detection of nasopharyngeal carriage of *S. pneumonia* were 66.6%, 91.5%, 48.5, and 95.8, respectively. False positive and false negative rates were found 33.4% and 8.5% respectively.

Discussion

Our study determined that 24 of 223 (10.8%) children are nasopharyngeal carriers of pneumococi. In some developing countries, rates of pneumococcal carriage in children are 80%-90% (1, 6). This study has been performed in children living in urban areas, and all children were vaccinated with 7-valent pneumococcal conjugate vaccine. We suspect that it was because of these reasons.

We found that rates of positive urinary antigen test results significantly varied according to the status nasopharyngeal carriers of the children (Table 1) (p<0.001). In the study by Hammer et al. (7), they considered the pneumococcal antigen detect with the Binax NOW test in the healthy children who were nasopharyngeal pneumococcal carriers was similarly to our study. As a result of this study, it is emphasized that the test may be useful for the diagnosis of pneumococcal infections with low rates of pneumococcal nasopharyngeal carriage. Other studies mentioned that Binax NOW test did not diagnose pneumococcal infections in children because of a high rate of nasopharyngeal carriage (1, 8). The Binax NOW test was determined positive in 66.5% of children who were nasopharyngeal pneumococcal carriers; however, we found low rates of pneumococcal nasopharyngeal carriage (10.8%) in our study. In contrast, the Binax Now test can lose its specificity in children.

Flores et al. (2) and Moisi et al. (9) mentoined in their study that the Binax Now test can be performed in the children for a rapid diagnosis of *S. pneumoniae* infections. Both studies were perfomed in the children with invasive pneumococcal infection, and the Binax NOW test was assessed through such specific materials like pleural or cerebrospinal fluid. Further, in these studies, children were not searched if they were nasopharyngeal carriers or not.

Our study determined that sensitivity, specificity, and positive and negative predictive values of the Binax NOW test for the detection of nasopharyngeal carriage of *S. pneumonia* were 66.6%, 91.5%, 48.5 and 95.8, respectively. In another study determined that the Binax NOW test from the nasal samples had a sensitivity of 95%, a specificity of 78%, and the positive and negative predictive values were 83% and 93%, respectively (10).

Conclusion

In conclusion, the usefulness of the Binax NOW test can be limited based on the positivity of test in children who are nasopharyngeal carriers. Therefore, we recommend that the clinicians should be careful to consider pneumococcal infection in the presence of rapid pneumo-

Table 1. Streptococcus pneumonia Binax NOW antigen test and nasopharyngeal culture results.

	Nasopharyngeal carriers	**Nasopharyngeal culture (-)**	**Total**
Binax NOW (+)	16	17	33
Binax NOW (-)	8	182	190
Total	24	199	223
p<0.001; Binax NOW (urinay pneumococcal antigen test)			

coccal urinary antigen positivity alone. In that situation, it can be more sensitive to use other rapid diagnosis tests.

Ethics Committee Approval: Ethics committee approval was received for this study from the local ethics committee.

Informed Consent: Informed consent was obtained from patients and their parents who participated in this study.

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