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Reference


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A PROSPECTIVE STUDY OF INTRAFAMILIAL OROPHARYNGEAL TRANSMISSION OF KINGELLA KINGAE

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Abstract: To evaluate the intrafamilial oropharyngeal transmission of Kingella kingae, we conducted a prospective study among pairs of siblings. We found that 55% of children who suffered from osteoarticular infections due to K. kingae, and 40% of asymptomatic carriers of K. kingae had siblings with positive oropharyngeal carriage.

Key Words: oropharyngeal, carriage, intrafamilial, transmission, Kingella kingae, polymerase chain reaction

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Kingella kingae is a Gram-negative bacterium and nowadays recognized as a major cause of joint and bone infections in young children.1 This microorganism is a member of the normal flora of the oropharynx, and the carriage rate among children <4-year old is around 10%.2,3 Oropharyngeal carriage is a prerequisite for later invasive K. kingae infections.1,3 K. kingae is transmitted from child-to-child through close personal contact. On average, young children put their hands or objects in their mouth once every 3 minutes. Commensal respiratory organisms, such as K. kingae, which are disseminated by large droplets, are likely to spread between young children who share toys coated with saliva. In addition, viral infections can increase child-to-child transmission of K. kingae through contaminated respiratory secretions.1,2 Daycare center attendance is associated with an increased risk of K. kingae colonization and transmission.4 A recent study showed that during an outbreak of osteoarticular infections (OAIs) due to a single K. kingae strain in a daycare center, 85% of the noninfected children and personnel were asymptomatic carriers of K. kingae.5 To the best of our knowledge, there is currently no information in the literature regarding the intrafamilial transmission of K. kingae in western countries. The primary objective of this study was to determine whether children presenting with OAIs due to K. kingae or oropharyngeal asymptomatic carriers were more likely to have siblings colonized by the same microorganism.

PATIENTS AND METHODS

From January 2008 through May 2013, we investigated oropharyngeal carriage of K. kingae in children aged 6–48 months in a prospective and consecutive clinical study. Two groups of children were studied: a group of healthy controls and a group with children admitted to our emergency department with a diagnosis of OAI due to K. kingae. Siblings, from patients of both groups, aged between 6 and 48 months were screened for oropharyngeal carriage of K. kingae. Children with final diagnosis of OAI due to K. kingae were all patients admitted to our emergency department and hospitalized in our orthopedic department for the medico-surgical treatment. The diagnosis of K. kingae OAI was confirmed by a positive K. kingae-specific polymerase chain reaction (PCR) on either synovial fluid or bone aspiration. Healthy children and their siblings were either recruited among children hospitalized for clean surgery, attending our orthopedic outpatient clinic, visiting the emergency department for minor problems or among children of hospital staff. Exclusion criteria was the administration of antimicrobial drugs during the 2 previous months. Oropharyngeal samples were obtained by rubbing a cotton swab on the tonsils, and the presence of K. kingae was detected by a real-time PCR.6 The study received institutional review board approval (09-029R, Mat-Ped 09-008R) and was conducted in accordance with Good Clinical Practice guidelines and the provisions of the Declaration of Helsinki. Data concerning age of patients are expressed as mean ± standard deviation (normal distribution of patients concerning age confirmed by the Shapiro-Wilk test). Pearson’s χ2 test was used and simple and conditional probabilities were calculated. A value of P < 0.05 was considered statistically significant. Statistical analyses were performed with IBM SPSS (version 21.0 for Windows, Armonk, NY).

RESULTS

During the study period, a total of 57 patients were diagnosed with OAIs due to K. kingae, whereas 761 healthy controls sustained oropharyngeal carriage screening. A total of 818 throat swabs were thus performed among which 65 pairs of siblings (130 children) were analyzed for this study. Thirteen were siblings of children with OAI due to K. kingae, the remaining 52 pairs were constituted by siblings of healthy controls. Forty pairs of the asymptomatic controls presented negative oropharyngeal swabs for both children, whereas for the remaining 12 pairs, at least 1 sibling was an oropharyngeal carrier of K. kingae: in 3 cases, both were asymptomatic carriers and in 9 cases, only 1 of the siblings presented a positive K. kingae PCR test.

Thirteen children presented with an OAI; 5 cases were admitted for osteomyelitis, 2 for spondylodiscitis, 1 for osteochondritis and 5 children were suffering from septic arthritis. Mean age at infection was 16.2 ± 5.5 months. Eight of the affected children were males (61.5%). All children had a positive oropharyngeal K. kingae PCR. From the siblings of these infected children (mean age 29.8 ± 12.4 months), 1 developed an OAI due to K. kingae within the following weeks and 7 were asymptomatic carriers of K. kingae (53.8%). We noted that 40% (10 of 25) of children presenting with a positive swab for K. kingae had siblings who were also oropharyngeal carriers. Conditional probabilities demonstrated that if a child has a positive swab for K. kingae, its sibling has a probability of 50% of being an oropharyngeal carrier. Finally, a sibling of a child presenting with OAI due to K. kingae is not more likely to be an asymptomatic carrier than the sibling of a healthy carrier (Pearson’s χ2 test, P = 0.141).

DISCUSSION

K. kingae is a component of the oropharyngeal flora of young children and is transmitted from person to person. Although pathogenesis of K. kingae invasive infections remains unclear, there is evidence that K. kingae first colonizes the oropharynx before penetrating the bloodstream and invading distant organs. Previous studies also suggested that respiratory carriage of K. kingae is a prerequisite for distant infection of joint and bone.1–3

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Child-to-child transmission of *K. kingae* has been described by many authors, and as well as the fact that 50% of children carry this microorganism for long periods. Possible mechanisms of transmission of *K. kingae* include saliva and dissemination of upper respiratory secretions from children suffering from viral infections and daycare center attendance represents a major transmission risk factor. Recent studies showed that daycare attendees frequently exhibit the same strain continuously or intermittently for weeks or even months, which is then replaced by a new strain, suggesting that this carriage is a dynamic process with a frequent turnover of strains.

In the other hand, it has been reported that transmission of *K. kingae* between daycare center attendees is elevated and outbreaks of invasive infections due to *K. kingae* is possible. There is, to the best of our knowledge, only 1 prospective study in the English literature which suggests an intrafamilial oropharyngeal transmission of *K. kingae* between Bedouins siblings. Our results show that almost 55% of children with OAI due to *K. kingae* have siblings who are either asymptomatic or symptomatic carriers of a *K. kingae* strain. Considering all children together, the risk for a sibling of a *K. kingae* carrier to have a positive oropharyngeal *K. kingae* PCR is of 40%.

*K. kingae*'s eradication from colonized mucosa is difficult to achieve. Rifampicin alone or in combination with amoxicillin has been tried, with success rates ranging from 47 to 80%. Given the small risk of asymptomatic carriers to develop invasive infections, most authors do not administer any chemoprophylaxis to the asymptomatic carriers of *K. kingae*, a recommendation that we support.

The main limitation of this study is the relative small number of patients. Because the carriage rate for children <4 years is approximately 10% and the risk for a carrier to develop an invasive OAI is <1%, it was difficult to recruit a larger number of sibling pairs during the study period. Nevertheless, this study will be continued and will hopefully recruit more patients. These are the preliminary results of a database we will continue to feed up to perform further statistical analysis.

It has been reported in recent studies that *K. kingae* organisms show great genomic variability. Moreover, whereas some clones that are commonly found colonizing the pharynx of healthy children are seldom, if ever detected among patients with clinical disease, others are rarely carried asymptptomatically but are frequently cultured from infected sites, indicating differences in strains virulence. Added to the above, some clones show association with specific syndromes (skeletal system infections, bacteremia or endocarditis) indicating biological specialization and remarkable tissue tropism. As a result of the study’s methodology, some of the healthy carriers of *K. kingae* among the children we studied could be carriers of a strain which are not associated with invasive OAI.

In this prospective study, we have shown that the rate of intrafamilial oropharyngeal transmission of *K. kingae* is high in siblings between 6 months and 4 years of age. This risk of transmission is a factor that should not be neglected, especially when dealing with clones of *K. kingae* responsible for invasive infections. Further prospective studies with a larger amount of participants are required to understand better the patterns of such a transmission and its role in invasive infections in this sensitive age group of children.

**REFERENCES**


**FORMAL INFECTIOUS DISEASES CONSULTATIONS AT A TERTIARY PEDIATRIC HOSPITAL**

**A 14-YEAR REVIEW**

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**Abstract:** We analyzed the formal consultations seen by the infectious diseases service over a 14-year period at one of the largest pediatric hospitals in Australia. We highlight the increasing demand for pediatric infectious diseases expertise and the reasons for which consultations are sought. Our findings will help in planning and resource allocation in an era of increasingly complex patients.

**Key Words:** referrals, specialization, antibacterial agents, antimicrobial stewardship, children

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**AN INFECTIOUS DISEASES CONSULTATION HAS BEEN SHOWN TO IMPROVE THE RECOGNITION AND CLINICAL OUTCOME OF LIFE-THREATENING INFECTIONS.**

With increasingly complex patients, more intense immunosuppressive treatment and emerging infections, there is rising demand for infectious diseases expertise. The role of the infectious diseases specialist is even more important in the era of multidrug resistant organisms and antimicrobial stewardship. We describe the evolution and