A Clinical trial on oral *H. pylori* infection of preschool children

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Abstract

In the present study, we aimed to explore the existence of oral *Helicobacter pylori* (*H. pylori*) infection and treatment of preschool children. A total 178 children were recruited and evaluated using the saliva *H. pylori* antigen test (HPS), the urea breath test (UBT C¹³). The treatments included toothpaste and mouth washing solution for two months. Participants were sorted into three subgroups: A. toothpaste group, B. combinative toothpaste and mouth rinse group, C group control. The positive rate of HPS and C¹³ were 76% and 15% respectively. After two months treatments, toothpaste provided a 26.87% effectiveness rate in the 95% of the confidence interval (CI) ranges on the oral *H. pylori* infection. Toothpaste and mouth rinse provided a 26.445% effectiveness rate in the 95% of the confidence interval (CI) ranges on the oral *H. pylori* infection. C group was 7.25% effectiveness rate. The difference between A or B and C were significant (p<0.001). The positive rate of HPS is significantly higher with parents suffered with stomach sympotms (p<0.001). We concluded oral *H. pylori* infection of preschool children exits and treatment were effectively reducing the infection.

Materials and methods

**H. pylori** antigen test for oral urease (HPS): HPS: *H. pylori* was specifically detected in saliva using a lateral flow immunochromatographic test device. The device for *H. pylori* antigen detection in saliva was identical to the urea breath test (UBT C¹³) used for stomach urease detection. The HPS test for saliva employed a monoclonal antibody that was developed against oral urease. Test Procedure: No food or drink was allowed 1 h prior to the test. A swab was placed under the tongue for at least 1 min. The swab was swirled vigorously for 15 s in a buffer solution, and then, we expunged as much liquid as possible from the swab by pressing and rotating the fiber portion against the wall of the tube. Next, 2–3 drops of the saliva/buffer mixture were added into the sample well. As the test begins, a purple color moves across the results window in the center of the test disk. The presence of 2 color bands (‘T’ band and ‘C’ band) within the result window indicates a positive result. The presence of only 1 purple color band indicates a negative result. Specificity: An in-house study was conducted with 3 separate lots of the HPS test to determine its specificity. The following common oral bacteria were applied: *Actinomyces naeslundii*, *A. odontolyticus*, *Bifidobacterium dentium*, *Corynebacterium matruchotii*, *Gemella haemolysans*, *Granulicatella adiacens*, *Streptococcus gordonii*, *S. salivarius*, *S. sanguinis*, and *Veillonella parvula*. All the above bacteria were analyzed and did not show interference or cross-reactivity with the test. Sensitivity: The test’s

**Introduction**

It is now recognized that *Helicobacter pylori* (*H. pylori*), like most enteric infections, is mainly acquired in childhood [1]. The age at which children are to become infected is still unclear, but findings in a number of cross-sectional studies suggest that infection is acquired before the age of five [2]. The prevalence of infection is highest in children in the developing world where up to 75% of children may be infected by the age of 10 [3]. These bacteria are found worldwide, but especially in developing countries, where up to 10% of children and 50% of adults are likely to have had an *H. pylori* infection — usually without any symptoms. Scientists suspect that *H. pylori* infection may be contagious because the infection seems to run in families and is more common where people live in crowded or unsanitary conditions [4]. Although research suggests that infection is passed from oral to oral, exactly how this happens isn’t really known.

Because the majority of physicians and scientists in this field ignore the colonized cavities of *H. pylori*, approximately 20% of the population of Asia suffers from oral *H. pylori* infection [5]. In China alone, more than 280 million people carry oral *H. pylori*, which results in 28 million recurrences of stomach *H. pylori* infection and the abuse of antibiotics by overuse [6-9] The aim of the present study was to use rapid immunochromatographic antigen tests of saliva (HPS) to identify oral *H. pylori* infection of preschool children and its treatments. The results were compared in parallel with the results of urea breath test (UBT).

**Methods**

The informed consent was obtained from all participants of parents. All children were recruited randomly who had already agreed to undergo various tests for the diagnosis of their oral and stomach *H. pylori* infection and accepted for treatments. There were total 178 children (average age 4.5 years old; range, 4-6 years) comprising 87 boy and 91 girl.

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sensitivity was 10 ng/ml HPS antigen [6].

**UBT C13** Each person swallowed a capsule of urea (UBT C13). Breath was collected and analyzed according to standard procedures.

Questioning form was given for their parent regarding the information of stomach symptoms in family members.

**Treatment**

The formula of toothpaste: Sorbitol alcohol, water, hydrated silica, polyethylene glycol, sodium lauryl sarcosinate, food flavor, cellulose gum, carrageenan, mica, sodium saccharin, trisodium phosphate, biological lysozyme (lytic enzymes, active enzyme protein)

The formula of mouth rinse; antibiotic agent.

**Statistical analyses**

The data for each diagnostic test method were analyzed by treatment grouping and test results of HPS and UBT C13 sub-grouping. Positive rates (P) for each diagnostic test in all individuals and within each subgroup were calculated using the number of individuals with positive results divided by the total number of individuals (N) for all or for each subgroup. The two sided 95% confidence interval (CI) was calculated for each rate using the exact method based on the binomial distribution. Positive rates between different tests were compared using the paired chi-square test (i.e., McNemar test). A two sided p-value of <0.05 was considered significant. All analyses were performed using the statistical analysis software (SAS) package [10].

**Results**

**Positive rate of HPS and UBTC13**

In this clinical trial, there were 136 children show positive of HPS included 71 boy and 65 girl among total 178 individuals; 28 children show positive of UBT C13 included 13 boy and 12 girl; 22 children show both positive of HPS and UBT C13 included 10 boy and 12 girl. The detection of the positive of HPS and UBT C13+ as well as both positive of HPS and UBT C13 listed in Figure 1.

**Positive rate of HPS related family stomach disease history**

Group A: Children live with parents who have stomach disease history. There were 41 children show positive of HPS.

Group B Children live with parents who have no stomach disease history. There were 28 children show positive of HPS. All saliva samples were scored as positive or negative (See Figure 2).

**Recover rate of toothpaste, mouth rinse**

In group C, toothpaste provided a 26.84% effectiveness rate in the 95% of the confidence interval (CI) ranges on the oral *H. pylori* infection.

Group D, both toothpaste and mouth rinse for two months provided a 26.44% effectiveness rate in the 95% of the confidence interval (CI) ranges on the oral *H. pylori* infection.

Group E, all children were control with use no treatments. After two month, they were positive rate of HPS of 7% children in 95% confidence interval ranges had been changed to negative of HPS (Figure 3).

**Discussion**

The urea breath test (UBT) C13, is a good rapid diagnostic procedure used to identify stomach infections by *H. pylori*. It is based upon the ability of *H. pylori* to convert urea to ammonia and carbon dioxide. Urea breath tests are recommended in leading society guidelines as a preferred non-invasive choice for detecting *H. pylori* of stomach before...
The close relationship between periodontal health and *H. pylori* infection: Dye BA et al. report that a total of 4504 participants who completed a periodontal examination and tested positive for *H. pylori* antibodies that show periodontal pockets with a depth of 5 mm or more were associated with increased odds of *H. pylori* seropositivity (odds ratio [OR]=1.47; 95% confidence interval [CI]=1.12, 1.94). The conclusion was that poor periodontal health, which is characterized by advanced periodontal pockets, could be associated with *H. pylori* infection in adults [16]. Fernández-Tilapa G et al. found that the prevalence of *H. pylori* in the oral cavity was higher among seropositive subjects than seronegative ones [17]. Furthermore, Nisha KJ et al. reported that there is a highly significant association between periodontal disease and the colonization of *H. pylori* in dental plaque [18]. Tsami A et al. detected *H. pylori* in subgingival dental plaque of children and their family [19]. Several reports have indicated that *H. pylori* colonies could be grown only from root canals but not from plaque. The root canals of endodontic-infected teeth could be a reservoir for live *H. pylori* that could serve as a potential source of transmission [20,21].

### Conclusions

- Oral *H. pylori*. Infection is acquired in preschool children.
- The prevalence of oral *H. pylori* infection is higher than stomach *H. pylori* infection.
- The prevalence of oral *H. pylori* infection is higher with parent had stomach symptoms.
- Toothpaste or combine with mouth rinse can effective reducing oral *H. pylori* infection.

### Author contributions

Yuee Xu, Xin Gao, Shuxiang Li, Xianping Wang, Yuang Song contributed to the conception, design, participate clinical trial and analysis data. John KC Yee drafted the manuscript and participate in discussion on this studies. All authors read and approved the final manuscript.

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