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ABSTRACT We examined the role of Helicobacter pylori infection as a cause of recurrent abdominal pain (RAP) among Iranian children in a population-based case–control study to determine the association between H. pylori infection and RAP among schoolchildren. A total of 1558 children aged 6–13 years were examined. Children with RAP confirmed by the Apley and Naish criteria were selected; 145 cases were selected for inclusion and were compared with 145 healthy children recruited from the same area. Both groups underwent stool antigen testing. The prevalence of RAP in the children tested was 9.3%. Children with RAP had a higher H. pylori infection rate than the control group (58.6% vs 44.8%) (OR = 1.744; 95% CI: 1.095–2.776). There was no significant difference between the RAP symptoms in children with positive stool test, i.e. infected with H. pylori, and those whose tests were negative. We identified H. pylori infection in more than 55% of the case group. Therefore, H. pylori infection

can be considered an important factor for RAP in children.

Douleur abdominale récurrente chez l'enfant et infection par Helicobacter pylori, République islamique d'Iran

RÉSUMÉ Nous avons examiné le rôle de l'infection par Helicobacter pylori en tant que cause de douleur abdominale récurrente parmi des enfants iraniens au cours d'une étude cas-témoin populationnelle afin de déterminer l'association entre cette infection et la douleur abdominale récurrente chez les enfants scolarisés. Au total, 1558 enfants âgés de 6 à 13 ans ont été examinés. Des enfants souffrant d'une douleur abdominale récurrente confirmée selon les critères définis par Apley et Naish ont été sélectionnés : 145 cas répondant au critère d'inclusion ont été comparés avec 145 enfants en bonne santé de la même région. Les deux groupes ont été soumis à un test de recherche d'antigènes dans les selles. L'incidence de la douleur abdominale récurrente testée était de 9,3 %. Les enfants ayant une douleur abdominale récurrente présentaient un taux d'infection par H. pylori plus élevé que le groupe témoin (58,6 % contre 44,8 % ; OR = 1,744 et IC à 95 % : 1,095-2,776). Il n'y avait pas de différence significative entre les symptômes de douleur abdominale récurrente chez les enfants ayant des coprocultures positives, donc une infection par H. pylori, et ceux dont les tests étaient négatifs. Nous avons identifié une infection par H. pylori chez plus de 55 % d'enfants du groupe témoin. Par conséquent, l'infection par H. pylori peut être considérée comme un facteur important de douleur abdominale chez l'enfant.

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Introduction

Recurrent abdominal pain (RAP) is a prevalent gastrointestinal problem among preschool children and schoolchildren (1). It is defined as sudden abdominal pain that occurs in the child at least 3 times over a span of 3 months or more, and is severe enough to affect his/her daily activity (2,3). Around 10–15% of schoolchildren experience RAP, and most often the pain does

not interfere with their school attendance, their efficiency, their interaction with other students, their activities while exercising or their personal and family affairs. Children who have RAP are usually at risk of anxiety, depression and loss of self-esteem (4–6). The difference in etiology of RAP in children can arise from functional gastrointestinal disorders or organic diseases (7).

Helicobacter pylori infection commonly occurs in childhood and lasts for a number of years (1,4,5,8). There is some evidence of a positive association between H. pylori infection and RAP. Several studies have demonstrated that between a quarter and a third of children with RAP had positive H. pylori infection (9–11). However, other studies did not support a causal association (6,12,13).

The association between H. pylori colonization and RAP is still controversial. Therefore, further studies need to be conducted to examine whether the role of H. pylori is causal. Considering the regional conditions and the high incidence of H. pylori colonization in the population under study (14), the present study aimed to explore the association between H. pylori infection and RAP in children in Ardabil, in the north west of the Islamic Republic of Iran.

Methods

Study design and population

We conducted a population-based, case–control study to investigate the relationship between H. pylori infection and RAP in children in Ardabil.

In the first phase of the study, because there is a wide variation in the socioeconomic conditions of the population in different areas of the city, the city was classified into 4 zones, north, south, east and west, and 4 schools were randomly selected in each zone. In each school, based on student numbers, 90–100 students were randomly chosen and examined according to Apley and Naish criteria (3).

Of 1556 students in the 16 schools surveyed from November 2012 to July 2013 in Ardabil city, we identified 155 children with confirmed RAP (all patients were assessed by a consultant paediatrician) (3).

Children who had received antibiotics, acid suppression drugs or anti-H. pylori therapy during the 3 months prior to the study, were excluded from the H. pylori subanalysis. A total of 10

children had received these treatments and were excluded; so the total number of children in the study group was 145.

In the second phase of the study, 145 healthy children from the same area who had no clinical manifestations of RAP, who met the exclusion criteria and were normal on physical examination were recruited as the control group. The controls were selected to match in terms of age and residential status with the case group. Both groups underwent stool antigen tests using the HpSA enzyme-linked immunosorbent assay.

The study was approved by the ethics board of Ardabil University of Medical Sciences. Informed consent was obtained from the parents of each child.

Helicobacter pylori stool antigen test

A microwell-based enzyme immunoassay was used to detect H. pylori antigens in stools (FemtoLab H. pylori; Astra, Italy). The stool samples were collected from each participant in clean containers and analysed according to the manufacturer's instructions. Spectrophotometric determination was performed using an enzyme immunoassay microplate reader at wavelength 450 nm (Stat Fax 2002, USA). Specimens with absorbance values ≥ 0.4 were defined as positive.

Statistical analysis

The results were analysed using SPSS, version16, using chi-squared, Fisher exact test and the t-test to examine the relationship between H. pylori infection and RAP. Statistical significance was set at the 5% level.

Results

We examined 1556 children from 16 schools, and 145 were observed to have RAP, 71 (49%) boys and 74 (51%) girls. The prevalence of childhood RAP in our sample was 9.3%.

The stool antigen test for H. pylori was positive for 85 individuals in the case group (58.6%) and 65 individuals in the control group (44.8%). The relationship between RAP and H. pylori

infection was statistically significant (OR = 1.744; 95% CI: 1.095–2.776, P = 0.01).

The age and sex distribution of the children in the 2 groups was comparable (Table 1). The average age was 8.77 [standard deviation (SD) 1.85] years in the case group and 8.81 (SD 1.90) years in the control group. There was no statistically significant difference between these groups in terms of age (P ≥ 0.05).

The relationship observed between the rate of H. pylori infection and socioeconomic status was statistically significant, with a greater proportion of children from poorer families being infected (P = 0.02; CI: 1.29–3.4) (Table 1). There was no statistically significant correlation between the rate of H. pylori infection and source of drinking water (P = 0.6).

The characteristics of RAP in children are shown in Table 2 . Duration of abdominal pain was 3–6 months in 101 children (69.65%) had. In 55 cases, the pain was periumbilical.

In 30 cases (20.7%) had abdominal pain within 30–60 min following the consumption of milk, yoghurt or ice cream. Defecation reduced pain in 109 (75.2%) children with RAP.

Over 75% of children had visited a paediatrician for RAP, and over 95% reported that the pain inhibited and interfered with their daily activities (Table 2).

The main concomitant gastrointestinal symptoms in children were constipation in 25 children (17.24%), and pain as a result of hunger in 53 children (36.5%). In these cases also the pain subsided with defecation.

The pain occurring as a result of hunger is one of the commonest symptoms in children, thus, it should be noted that the majority of cases in this study presented with other symptoms along with abdominal pain.

Discussion

Recurrent abdominal pain is the clinical manifestation of a series of disorders. Abdominal pain is the main gastrointestinal complaint in preschool and school children with a prevalence of about 10% (1). In the present study, the prevalence of RAP in children was 9.3%; in some previous studies this ranged from 10% to 15% among 4–16-year-old children (6,14). Also, Yang et al. demonstrated a prevalence of 9.8% in schoolchildren (1), which is in concordance with our findings. The mean age of children suffering from RAP in the present study was 8.7 years, whereas in several previous Iranian studies on RAP in children, carried out in other areas of the country, a mean age of 12.7 years was reported (5,15)). Similarly, in a study performed by Ukarapol et al., mean age was 10.5 years for children with RAP (16).

No statistically significant difference was observed between the seianxes in terms of RAP incidence. These findings are in line with studies conducted on Iran, European and Sri Lankan children (5,6,17,18). To date, in almost all studies conducted on children with RAP, around half were male and half female.

In this study, a positive relationship between H. pylori infection and RAP was observed, which is in agreement with the findings of Wewer et al. (9), Özen et al. (10) and Das et al. (11).

Malaty et al. have shown that H. pylori infection occurs in about 81% of children suffering from RAP (14). The infection mainly develops during childhood and varies across populations.

We found a higher prevalence of H. pylori infection in males compared with female children, i.e. male gender is associated with a statistically higher risk of being infected. However, Ertem et al. (19), Iranikhah et al. (20) and Bode et al. (6) found no statistically significant relationship between sex and H. pylori infection. Our findings also diverge from the results of Özen et al. (10). The inconsistency among these finding could be ascribed to geographical variation and differences in sample size.

The present study revealed that there was no statistically significant relationship between different age groups with positive stool antigen, while studies carried out by Ertem et al. (19) in Turkey and Nakayama et al. (21) in Japan, indicated a significant relationship between age and H. pylori infection. Their findings suggested infection rate increased with age; however, a previous Iranian study found no significant relationship between H. pylori infection and age (5). In a study in Texas, USA, it was shown that the greater the age, the lower the infection rate (14). The discrepancies could arise from geographical and genetic variation among the individuals under study.

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