Meta-analysis on risk factors for human sporadic giardiasis

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Abstract

The flagellated protozoan *Giardia duodenalis* is an important source of infectious gastroenteritis worldwide, and endemic cases are described in both developing countries and industrialised ones. A meta-analysis was conducted to summarise the odds of acquiring giardiasis from different risk factors in children and mixed population. From 72 eligible observational studies (case-control and cohort studies), the following information was extracted and coded: country, time period, population, genotype, case definition, sample size of the non-infected and infected groups, type of model, risk factors and odds-ratio (OR). ORs were entered into a categorisation system that grouped the risk factors into travel, host-specific factors and pathways of exposure (i.e., person-to-person, animal, environment and food routes). Data were then partitioned into subsets of categories of risk factors by population type, and multilevel meta-analyses were adjusted to each partition to estimate the pooled ORs. Influential diagnostic statistics were performed in order to remove any influential OR originating from studies marked as having potential-for-bias. In the mixed population, travelling abroad and impaired immunity were the most determinant sources of disease (pooled OR=4.38, 95% CI: 2.35-8.16 and pooled OR=7.83, 95% CI: 4.05-15.1). The majority of identified risk factors in children and mixed population were associated with feco-oral transmission: person-to-person transmission (mixed population: pooled OR=3.39, 95% CI: 2.08-5.53; children: pooled OR=3.40, 95% CI: 1.87-6.19), lack of personal hygiene (mixed population: pooled OR=1.57, 95% CI: 1.28-1.92), working or spending time at a day care centre (mixed population: pooled OR=2.24, 95% CI: 1.81-2.77; children: pooled OR=1.48, 95% CI: 1.20-1.81), contact with animals (such as pets in children: pooled OR=1.80, 95% CI: 1.28-2.51), or farm environment, drinking untreated water (mixed population: pooled OR=1.86, 95% CI: 1.50-2.32) or swimming in contaminated water (mixed population: pooled OR=1.94, 95% CI: 1.55-2.43), contact with soil or wastewater (mixed population: pooled OR=2.06, 95% CI: 1.61-2.63). Breastfeeding was a protective factor in developing countries (pooled OR=0.58, 95% CI: 0.47-0.70). In children, no handwashing before eating (pooled OR=1.63, 95% CI: 1.11-2.40) or eating produce (pooled OR=2.19, 95% CI: 1.47-3.28) were found significant risk factors; whereas, in the mixed population, not washing vegetables before eating increased the odds of acquiring giardiasis by 2.16 (95% CI: 1.12-4.18). In conclusion, risk factors identified as significant in this meta-analysis, confirmed the known pathways of transmission of giardiasis, and, as such, they must be included in any case-control study to assign a source of infection. However, more detailed items including the frequency of consumption or better specifying the exposure (type of food, cooked or washed) as well as assemblage and subtype of *Giardia* could be of help for risk management purposes.