

Global prevalence of intestinal protozoan contamination in vegetables and fruits: A systematic review and meta-analysis

Badri Milad, Olfatifar Meysam, Karim Md Robiul, Modirian Ehsan, Houshmand Elham, Abdoli Amir, Nikoonejad Alireza, Sotoodeh Simin, Zargar Ali, Samimi Rasoul, Hashemipour Sima, Mahmoudi Razzagh, Fasihi Harandi Majid, Hajjalilo Elham, Piri Hossein, Bijani Behzad, Vafae Eslahi Aida.

Abstract:

Environmental contamination of vegetables and fruits with intestinal protozoan trophozoites, cysts and oocysts is a means of transmitting parasitic agents of public health importance. The purpose of this systematic review and meta-analysis was to determine the global prevalence of intestinal protozoan parasite contamination in vegetables and fruits. Several databases (Web of Science, PubMed, Scopus, ProQuest and Google Scholar) were searched for literature published up to August 2021. Pooled prevalence was determined using the meta-package in R (version 3.6.1). Out of 90,404 publications, 189 articles (202 datasets) met the inclusion criteria. Among these, 183 investigations documented protozoan contamination in vegetables and 20 in fruits. The pooled prevalence (95% confidence interval) was 20% (16%–24%) for vegetables and 13% (7%–21%) for fruits. The highest pooled prevalence was found in South-East Asian WHO region 37% (6%–76%). The most prevalent protozoan parasite in vegetables was *Cryptosporidium* spp. (11%, 7%–15%). As well, *Entamoeba histolytica* was the most common agent found in fruits (9%, 4%–14%). Furthermore, the unwashed samples had the highest pooled prevalence of contamination (22%, 3%–49%). Our data suggest a possible risk of protozoan infection in humans via unwashed vegetables and fruits. Accidental ingestion of protozoa occurs through consumption of contaminated vegetables and fruits that have been improperly washed and prepared under poor sanitation. Using sanitary irrigation water, consuming properly cleaned and cooked vegetables, and practicing good hygiene can all assist to reduce the risk of protozoa infection.

Keywords: Vegetables, Fruits, Protozoan contamination, Public health, Food-borne diseases