Original Article

Effects of Multiple Cleaning and Disinfection Interventions on Infectious Diseases in Children: A Group Randomized Trial in China*

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Abstract

Objective To assess the effectiveness of multiple cleaning and disinfection interventions in the homes and kindergartens, in reducing gastrointestinal and respiratory illnesses of children.

Methods From October 2010 to September 2011, we performed a prospective, controlled study in China. 408 children under 5 years old were recruited and group randomized into intervention and control groups. Families and kindergartens in the intervention group were provided with antibacterial products for hand hygiene and surface cleaning or disinfection for one year. Each child's illness symptoms and sick leave were recorded every day.

Results A total of 393 children completed the study, with similar baseline demographics in each of the 2 groups. Except for abdominal pain, the odds of symptoms (fever, cough and expectoration, runny nose and nasal congestion, diarrhea), illness (acute respiratory illness and gastrointestinal illness), and sick leave per person each month were significantly reduced by interventions. The rates of fever, diarrhea, acute respiratory illness, gastrointestinal illness and sick leave per person per year were significantly decreased as well.

Conclusion Not only the acute respiratory and gastrointestinal illness but the sick leave rate in children were significantly reduced by multiple interventions.

Key words: Communicable disease control; Child daycare centers; Sick leave; Antibacterial agents; Hand hygiene; Domestic hygiene; Surface cleaning; Surface disinfection

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INTRODUCTION

Acute infectious respiratory and gastrointestinal diseases are the leading causes of child mortality. The World Health Organization estimated that more than 3.5 million children under the age of 5 died of diarrhea and acute respiratory-related infectious diseases each year in WHO regions from 2000-2003[1]. Diarrhea and respiratory diseases are caused by a variety of pathogens transmitted by the fecal-oral route, including protozoa, bacteria, fungi, and viruses. Contaminated surfaces or hands play key roles in the route of contact transmission of these

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infectious diseases[2]. During the past few decades, research on the epidemiology of infectious disease has focused on hand hygiene in hospitals, day care facilities, schools and homes. In contrast to hand hygiene, surface cleaning or disinfection has recently begun to gain a better insight in healthcare settings[3], but contaminated surfaces and integrated interventions in community and non-acute settings remain to be little studied[4-6]. Does hand hygiene and surface cleaning or disinfection through multiple interventions affect the risk of infectious disease transmission more efficiently? Therefore, in order to assess the effects of multiple interventions on the prevention of infectious disease, we selected children (under 5 years old) from kindergartens in central China, carried out multiple interventions (hand hygiene and surface cleaning or disinfection) in the kindergartens and homes, and monitored infectious illnesses for the course of one year.

MATERIALS AND METHODS

Ethics Statement and study Population

This study involved a prospective, group randomized, controlled design. Two kindergartens were identified from Xiantao city, Hubei province of China. Both of them are located in the downtown area, and managed by the same committee. The distance between the two kindergartens is 3 km. One of the kindergartens has 14 classes (589 children), the other has 16 classes (660 children). Due to the third grade children generally more than 5 years, from the grade one and grade two classes, we randomly selected 5 classes (221 children) and 6 classes (244 children) respectively at the two kindergartens. Questionnaires requesting the basic information of the children and the families involved, along with the informed consent forms, were distributed to parents or guardians before the study began, and all forms were required to be filled out and signed by the parents or guardians. All the families declared their written consent to participate in the study. Considering that the children played together in the same kindergartens, shared the same transmission routes, we did not adopt the use of individual randomized design. Randomization was based on the kindergarten, 221 children from one kindergarten as the intervention group, and 245 children from the other kindergarten as the control group. At the data analysis phase, 48 children were excluded because their families already had antibacterial products or their guardians didn't complete the questionnaire, 9 children were excluded because of above 5 years old, 15 children were excluded because of losing to follow-up (Figure 1).

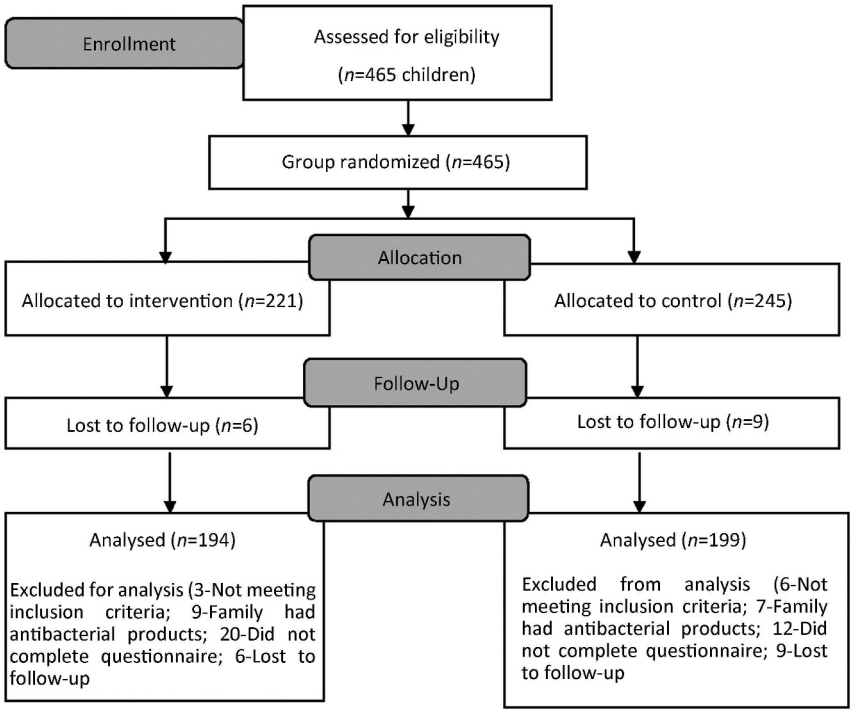

Figure 1. Participant Flow Diagram.