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Risk factors for the spread of microorganisms in daycare centers: an integrative literature review

Factores de riesgo para la propagación de microorganismos en guarderías: una revisión bibliográfica integradora
Fatores de risco para a disseminação de microrganismos em creches: revisão integrativa da literatura

ABSTRACT

The aim of this study was to identify risk factors for the spread of microorganisms in daycare centers in the literature. Method: The sample was selected through access to the following databases: Latin American and Caribbean Health Sciences Information Literature (LILACS), Current Nursing and Allied Health Literature (CINAHL), Cochrane, Embase, Medical Literature Analysis and Retrieval System Online (MedLine / PubMed), Web of Science (WOS). Results: The final sample was 67 articles that indicate the risk of spreading microorganisms and infectious diseases among children in daycare centers depends on the characteristics of the children and the environment. However, only the fact that children are cared for in daycare centers increases the likelihood of acquiring and developing infections, especially recurrent infections. Conclusions: The identification of risk factors aims to guarantee the assistance of children in day care centers so that they are not subjected to an unhealthy environment or situations that affect their health status or favor the occurrence of infectious diseases.

DESCRIPTORS: Child Day Care Centers; Control Agents for Microorganisms; Risk Factors; Infections.

RESUMEN

El objetivo de este estudio fue identificar los factores de riesgo para la propagación de microorganismos en las guarderías en la literatura. Método: La muestra se seleccionó accediendo a las siguientes bases de datos: Literatura de Información en Ciencias de la Salud de América Latina y el Caribe (LILACS), Literatura Actual de Enfermería y Salud Aliada (CINAHL), Cochrane, Embase, Literatura Médica Sistema de análisis y recuperación en línea (MedLine / PubMed), Web of Science (WOS). Resultados: La muestra final consistió en 67 artículos que indican que el riesgo de propagación de microorganismos y enfermedades infecciosas entre los niños en las guarderías depende de las características de los niños y el medio ambiente. Sin embargo, solo el hecho de que los niños sean atendidos en guarderías aumenta la probabilidad de contraer y desarrollar infecciones, especialmente infecciones recurrentes. Conclusiones: La identificación de los factores de riesgo tiene como objetivo garantizar la asistencia de los niños en las guarderías para que no se vean expuestos a un entorno no saludable o situaciones que afecten su estado de salud o favorezcan la aparición de enfermedades infecciosas.

DESCRIPTORES: Jardines Infante; Agentes de Control de Microorganismos; Factores de Riesgo; Infecciones.

RESUMO

O objetivo deste estudo foi identificar na literatura fatores de risco para a disseminação de microrganismos em creches. Método: A seleção da amostra se deu por meio do acesso às bases de dados: Literatura Latino-Americana e do Caribe de Informação em Ciências da Saúde (LILACS), Current Nursing and Allied Health Literature (CINAHL), Cochrane, Embase, Medical Literature Analysis and Retrieval System Online (MedLine/PubMed), Web of Science (WOS). Resultados: A amostra final foi de 67 artigos que indicam o risco de disseminação de microrganismos e doenças infecciosas entre crianças em creches depende das características das crianças e do ambiente. No entanto, somente o fato de crianças serem assistidas em creches aumenta a probabilidade de adquirir e desenvolver infecções, sobretudo as de repetição. Conclusões: A identificação dos fatores de risco visa garantir a assistência de crianças em creches de forma que não sejam submetidas a um ambiente ou situações insalubres que afetem seu estado de saúde ou favorecer a ocorrência de doenças infecciosas.

DESCRIPTORES: Creches; Agentes de Controle de Microrganismos; Fatores de risco; Infecções.

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Evelise Pires Cogo Simão

PhD in Nursing from the Faculty of Medicine of Botucatu, Universidade Estadual Paulista Júlio de Mesquita Filho (FMB / UNESP), Botucatu, SP, Brazil. Professor at Universidade Paulista (UNIP) Araçatuba and Centro Universitário de Adamantina (UNIFAI), SP, Brazil

ORCID: 0000-0002-7698-7740

Vinicius de Lima Lovadini

Master in Animal Science from the Faculty of Veterinary Medicine of Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP) Araçatuba, SP. Doctoral student in Nursing by the Inter-Doctoral Program in Nursing at the Ribeirão Preto College of Nursing, University of São Paulo (EERP / USP)

ORCID: 0000-0001-9066-2160

Ione Correa

Doutora em Farmacologia pela Universidade Estadual de Campinas (UNICAMP). Docenteda Faculdade de Medicina de Botucatu, Universidade Estadual Paulista Júlio de MesquitaFilho (FMB/UNESP), Botucatu, SP, Brasil

ORCID: 0000-0002-8953-9058

INTRODUCTION

The day care center has become a necessary environment in people's lives, in view of the socioeconomic changes that occurred with the insertion of women in the labor market, which requires these institutions of comprehensive assistance to children, to offer care so that their target audience do not become so vulnerable to illness.^[1]

The vulnerability portrayed is due to the child's immune immaturity at this stage and his dependence on the care of others, among other factors, making him highly susceptible to risks and injuries of any kind.^[2]

The risks to which children attending daycare centers are subject to any institution or establishment that assists them in a group, regardless of whether the name is a daycare center or pre-school, or whether it is publicly or privately managed.^[3]

However, the lack of maturation of immunological barriers in children in the age group of children assisted in daycare centers can be a risk factor for the development of opportunistic infections^[4], which is also pointed out as a fact that increases the chance of taking them to hospitalization.^[5]

Considering the health care of these children, aspects inherent to care of this nature are considered to be fundamental etiological factors for the occurrence of diseases, such as: the fact that the envi-

ronment groups people in a situation of daily and prolonged coexistence lasting 10 to 12 hours; the great physical contact between adult-children and child-child, unfolded in the various care and educational activities; the occurrence of outbreaks and potentially more severe infections, favored by the large transmission of pathogenic microorganisms, especially some enteric and respiratory ones, which are quickly transmitted between children and employees, reaching family members and the community in which they live.^[6,7]

In addition, the maternal educational level is also considered of paramount importance in childhood, since the better this level, the greater the chances of adequate care and stimuli, preventing and treating the diseases that can affect these children, resulting in a reduction morbidity and mortality.^[8,9]

However, structural aspects of the institution of assistance and material composition of objects (fomites) can contribute to the occurrence of accidents and the development of biofilms^[10], which requires the adoption of standardized precautions for the care of children and the environment, in order to reduce these risks.

Due to the risks inherent to daycare attendants, the prevalence of cases of acute diarrhea and deaths caused by this disease is 60% to 250% higher for these children, when compared to children not attending daycare centers who are in the

same age group. For pneumonia, on the other hand, the prevalence can be two to 12 times higher and the risk of becoming ill more due to acute respiratory infection can go from three to five, when the stay in these institutions increases from 15 to 50 hours per week.^[11]

Educators are the first to identify signs of malaise and health problems presented by children in daycare centers, and these professionals must ensure care and establish communication between institutions and family members/guardians, needing the help of health professionals, such as the nurse, to guarantee this care.^[12]

In view of the above, it is necessary to carry out a detailed survey of the literature about risk factors for children assisted in daycare centers.

The aim of this study was to identify risk factors for the spread of microorganisms in daycare centers in the literature.

To guide the investigation in the literature, the following guiding question was developed: What are the risk factors for children attending daycare centers related to the spread of microorganisms?

METHOD

The integrative literature review was the method adopted for this study, which in turn allows for a broad analysis of the literature, including discussions about methods and results of publications.^[13]

Sample design, data collection and analysis

Access to the following databases enabled the selection of the sample: Latin American and Caribbean Health Sciences Information Literature (LILACS), Current Nursing and Allied Health Literature (CINAHL), Cochrane, Embase, Medical Literature Analysis and Retrieval System Online (MedLine/PubMed), Web of Science (WOS).

The following search strategies and descriptors were used:

- For Latin American and Caribbean Literature on Health Sciences Information (LILACS): (child day care centers or guarderías infantiles or creches or creche) and (microorganismos or microorganismo or micro-organismos or micro-organismo or microorganismo or microorganismos)

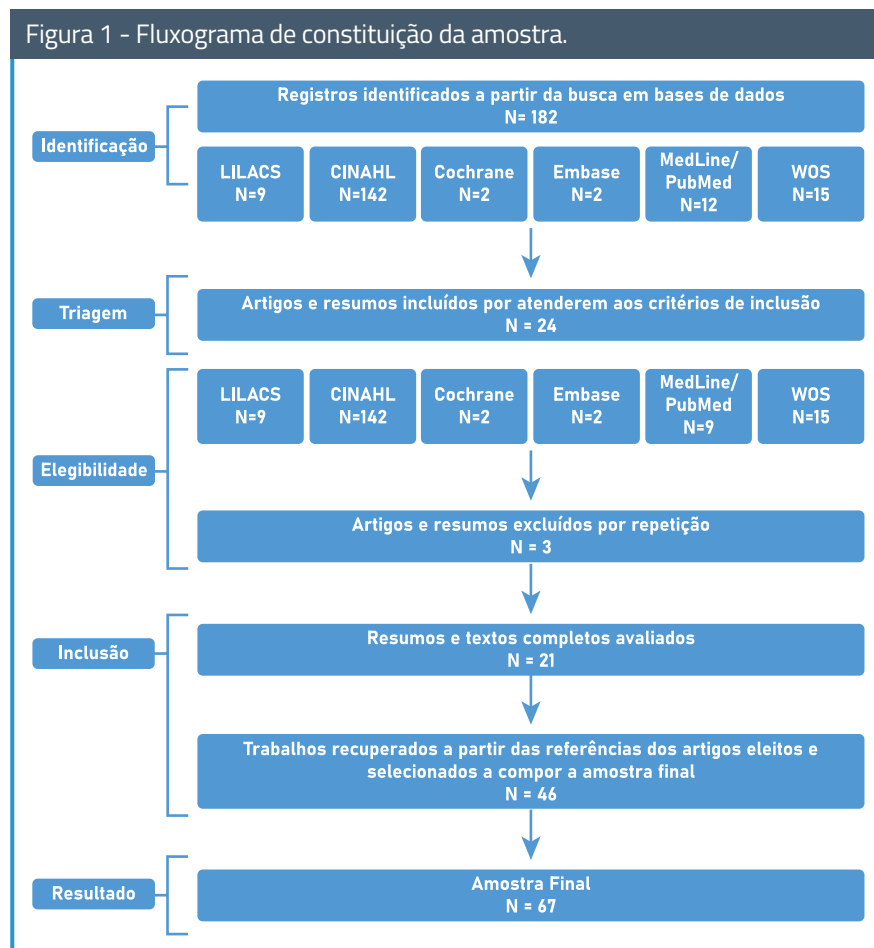
and (infection or infección or infecção or infecções).

- For Web of Science (WOS): (child day care centers or daycare centers for children or child daycare centers or child daycare center or day care centers for children) and (prevention or control or preventive therapy or prophylaxis or preventive measures) and (microorganisms) and (infection or infections).
- For Medical Literature Analysis and Retrieval System Online (MedLine/PubMed): (child day care centers or daycare centers for children or child daycare centers or child daycare center or day care centers for children) and (prevention or control or preventive therapy or prophylaxis or preventive measures) and (microorganisms)

and (infection or infections).

- For Cochrane: (child day care centers or daycare centers for children or child daycare centers or child daycare center or day care centers for children) and (prevention or control or preventive therapy or prophylaxis or preventive measures) and (microorganisms) and (infection or infections).
- For Current Nursing and Allied Health Literature (CINAHL): (child day care centers or daycare centers for children or child daycare centers or child daycare center or day care centers for children) and (microorganisms).
- For Embase: ((child day care centers) or (daycare centers for children) or (child daycare centers) or (child daycare center) or (day care centers for children)) and (prevention or control or (preventive therapy) or prophylaxis or (preventive measures)) and (microorganisms) and (infection or infections).

Figura 1 - Fluxograma de constituição da amostra.



The search strategies for this study were formulated using as a reference research that analyzed using the available sample to identify the best method for searching databases, with the insertion of parentheses or their removal, considering whether or not the use parentheses, double quotes, truncation and use of a single search or search history.^[14, 15]

We adopted as inclusion criteria full articles or only available abstracts (due to the difficulty of obtaining them in full) related to the object of the research, in Portuguese, English and Spanish, from national and international journals, indexed in the referred databases. As exclusion criteria, we chose not to compute/analyze articles that did not involve the nursery environment in their context, as well as those that did not maintain coherence with the previously established research question.

After selecting the articles, by title and abstract, careful reading and content analysis were performed. As a guide for this process, a modified data collection

instrument from Ursi and Galvão was used [15], which addresses five relevant aspects in the studies found and used in the collection of review data, described below: study identification, authors, intervention studied, result, recommendations and conclusions. In addition to these aspects, we will also address the title of the journal, year of publication, place and country of study, language(s) of the article, descriptors/keywords, professional category of the first author, proposed objective, type of study and age group of the children in the study.

The period established for data collection was from January 2017 to December 2018, studies published between the years

1983 to 2018 were selected. All information was validated by the three researchers responsible for the research.

The sample was selected through access to the listed databases, consulted in April 2017. The articles that were repeated, between the databases, were considered only once, allowing the sample flowchart to be configured. After the constitution of the first sample, the references of the elected articles were consulted, cataloging the sample that became the result and final flowchart of this study, as shown in Figure 1.

The collected material was analyzed by descriptive statistics and presented in the form of tables and figures.

RESULTS

In the LILACS database, seven articles were selected for analysis, Cochrane one, Embase two, MedLine/PubMed ten and Web of Science four, totaling 21 articles, after excluding three repeated items. After analyzing the references of the first constituted sample, 46 studies were incorporated into it, thus constituting the final sample with 67 articles. It is noteworthy that 79% (53) of the studies were published in international journals and 21% (14) in national journals.

Regarding the country of origin of the studies, Table 1 shows the distribution of publications considering their nation.

Of the total studies analyzed, 21 (31%) were obtained only in the presentation of abstracts and the remaining 46 (69%) were obtained in full.

DISCUSSION

The results of this integrative review revealed that children attending daycare centers in the age group from zero to seven years old have a higher number of disease cases, which would have been associated with factors such as crowding and very close contact with other people.

Table 1. Distribution of publications studied, according to the country of origin. Botucatu-SP, Brazil, 2019.

| Países de origem | % |
|--|-----|
| Brasil | 27 |
| Estados Unidos | 27 |
| Portugal | 4,5 |
| China, França, Turquia, Finlândia, Canadá, sendo duas ocorrências para cada nação | 15 |
| Espanha, Rússia, Inglaterra, Groelândia, Nigéria, Holanda, Itália, Reino Unido, Islândia, Geórgia, Alemanha, Suécia, Austrália, sendo uma ocorrência para cada nação | 19 |
| Não foi identificada a nação de publicação | 7,5 |
| Total | 100 |

Table 2. Characterization of the publications studied. Botucatu-SP, Brazil, 2019.

| Título do periódico | Título do artigo | Descritores/ Palavras -chave | Acesso ao estudo |
|----------------------------------|---|--|------------------|
| UNOPAR Cient. Ciênc. biol. saúde | Identificação de Staphylococcus e Enterobactérias em brinquedos de uma creche em Mato Grosso, Brasil. | Jogos e brinquedos, creches, Staphylococcus. Enterobacteriaceae. | Íntegra |
| Rev. cuba. estomatol. | Análise estrutural e microbiológica de chupetas de crianças de creches públicas e particulares. | Contaminação, chupetas, microorganismos. | Íntegra |
| Rev. bras. anal. clin. | Níveis séricos de proteína catiônica eosinofílica e contagem de eosinófilos em crianças enteroparasitadas, residentes em área de baixo nível sócioeconômico na cidade de Natal, RN, Brasil. | Proteína catiônica eosinofílica, enteroparasitas, eosinófilos. | Íntegra |
| Pediatr. mod. | Infestações por protozoários na infância | Protozoários, infestações, infância. | Íntegra |
| Braz. j. microbiol. | Nasopharyngeal colonization by Haemophilus influenzae in children attending day-care centers, in Ribeirão Preto, State of São Paulo, Brazil | Haemophilus influenzae, creches, colonização por Hib, AntiHib vacinação. | Íntegra |

| | | | |
|---|---|---|---------|
| Rev. Hosp. Clin. Fac. Med. Univ. São Paulo | Oropharyngeal colonization by Haemophilus influenzae in healthy children from Taubaté (São Paulo), prior to the Haemophilus influenzae type b vaccination program in Brazil | Haemophilus influenzae, Haemophilus influenzae type b (Hib), Crianças, Resistência antimicrobiana, Colonização da orofaringe. | Íntegra |
| Universidade Federal de São Paulo | Aplicação da reação em cadeia da polimerase em estudos epidemiológicos da infecção pelo citomegalovírus humano em diferentes populações pediátricas | Reação da cadeia de polimerase, citomegalovírus, epidemiologia, pediatria. | Resumo |
| Respiration | OM-85 BV: primary versus secondary prevention. | Adjuvantes imunológicos, adolescente, fatores etários, bactérias, extratos de célula, creches, método duplo-cego, estudos de acompanhamento, doenças otorrinolaringológica, prevenção primária, recidivas, infecções do trato, fatores de tempo, adulto, criança, pré-escolar, humanos. | Resumo |
| Journal of Pediatric Gastroenterology and Nutrition | Fermented milk consumption and common infections in children attending day-care centers: A randomized trial. | Doenças infecciosas comuns, infecção gastrointestinal, Lactobacillus casei, Lactobacillus casei CNCM I-1518, infecção respiratória, rinofaringite. | Íntegra |
| Plos One | Methicillin-Resistant Staphylococcus aureus Nasal Colonization in Chinese Children: A Prevalence Meta-Analysis and Review of Influencing Factors. | MRSA, Staphylococcus aureus resistente à metilina, nasal, nasofaríngea, colonização, transporte, crianças. | Íntegra |
| Euro Surveill | Outbreak of cryptosporidiosis in a child day-care centre in Gipuzkoa, Spain, October to December 2011. | - | Íntegra |
| Curr Opin Gastroenterol | Gastrointestinal infections in children. | - | Íntegra |
| J Clin Gastroenterol | Use of probiotics and yogurts in maintenance of health. | logurte, probiótico, saúde, Lactobacillus, Bifidobacterium. | Íntegra |
| J Am Diet Assoc | Microbial evaluation of foodservice surfaces in Texas child-care centers. | - | Íntegra |
| Nurs Times | The safe use of children's toys within the healthcare setting. | - | Íntegra |
| Int J Circumpolar Health | Infection control in day-care centres in Greenland. | Higiene das mãos, crianças, creches, Groelândia, infecções. | Íntegra |
| Southeast Asian J Trop Med Public Health | Incidence of enteric bacteria and Staphylococcus aureus in day care centers in Akwa Ibom State, Nigeria. | - | Íntegra |
| Pediatr Infect Dis J | Diversity and sharing of Haemophilus influenzae strains colonizing healthy children attending day-care centers. | Haemophilus influenzae, colonização, compartilhamento, creche. | Íntegra |
| J Clin Microbiol | Nasopharyngeal carriage of potential bacterial pathogens related to day care attendance, with special reference to the molecular epidemiology of Haemophilus influenzae. | - | Íntegra |
| Pediatr Infect Dis J | Overview of Lysol scientific studies. | Creches, rinovírus, rotavírus, lysol, desinfetantes. | Íntegra |
| Pediatr Med Chir | The tonsils and adenoids as a site of infection and the cause of obstruction. | - | Resumo |

| | | | |
|--|--|---|---------|
| Rev Bras Otorrinolaringol | Prevalência de Streptococcus pyogenes em orofaringe de crianças que frequentam creches: estudo comparativo entre diferentes regiões do país. | Creches, orofaringe, Streptococcus pyogenes. | Íntegra |
| Rev Saúde Pública | Mortalidade de crianças usuárias de creches no Município de São Paulo. | Mortalidade infantil, creches, causa básica de morte, coeficiente de mortalidade, variações sazonais. | Íntegra |
| Ciênc Saúde Coletiva | Doenças infecciosas em crianças pré-escolares brasileiras assistidas em creches. | Infecção, criança, creches. | Íntegra |
| Pediatria | Mortalidade por varicela em crianças atendidas em creche. | Varicela, epidemiologia, mortalidade, coeficiente de mortalidade, creches. | Íntegra |
| Rev Saúde Pública | Fatores de risco e proteção à infecção respiratória aguda em lactentes. | Cuidado Pré-Natal, imunidade materno-adquirida, bem-estar do lactente, infecções pneumocócicas, prevenção & controle, estudos transversais. | Íntegra |
| Pediatrics | Prevalence of rotavirus on high-risk fomites in day-care facilities. | - | Resumo |
| Rev Saúde Pública | Association between child-care and acute diarrhea: a study in Portuguese children. | Diarreia, cuidado da criança, doença aguda, fatores de risco, creches. | Íntegra |
| Rev Epidemiol | Child-Care Practices: Effects of Social Change on the Epidemiology of Infectious Diseases and Antibiotic Resistance. | - | Íntegra |
| Anais do 3º Congresso Brasileiro de Enfermagem Pediátrica e Neonatal e do 16º Encontro Catarinense de Enfermagem Pediátrica; | Contagem de microrganismos aeróbicos mesófilos totais em amostras de brinquedos manipulados por crianças usuárias de creche. | - | Resumo |
| J Infect Control | Brinquedos e sua higienização em creches. | - | Resumo |
| Ciênc Saúde Coletiva | Avaliação das condições higiênico-sanitárias das cozinhas de creches públicas e filantrópicas. | Creches, higiene dos alimentos, manipulação de alimentos, qualidade dos alimentos. | Íntegra |
| J Pediatr | As creches e pré-escolas e as doenças transmissíveis. | Creches, infecção, controle de infecção, doenças infecciosas. | Íntegra |
| Nurs Health Sci | Pacifiers: a microbial reservoir. | Bofilme, látex, contaminação microbiana, chupeta, silicone. | Íntegra |
| Turk J Pediatr. | Incidence of Haemophilus influenzae in a day-care center. | - | Resumo |
| Am. J. Epidemiol. | Public health impact of various risk factors for acute otitis media in Northern Finland. | Fração atribuível, criança, creche, métodos epidemiológicos, inflamação na orelha, fatores de risco | Íntegra |
| Braz. J. Infect. Dis. | An epidemiological study of Haemophilus influenzae at a Brazilian day care center. | Haemophilus influenzae, creche, colonização. | Íntegra |
| J. Clin. Microbiol. | Haemophilus influenza carriage in children attending French day care centers: a molecular epidemiological study. | - | Íntegra |

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|--------------------------|--|---|---------|
| J. Infect. Dis. | Decreased point prevalence of Haemophilus influenzae type b (Hib) oropharyngeal colonization by mass immunization of Brazilian children less than 5 years old with Hib polyribosylhibitol phosphate polysaccharidetetanus toxoid conjugate vaccine in combination with diphtheria tetanus toxoids-pertussis vaccine. | - | Íntegra |
| Pediatrics | Haemophilus influenzae type b colonization in household contacts of infected and colonized children enrolled in day care. | - | Resumo |
| Pediatr Infect Dis J. | Outbreak of Haemophilus influenzae type b disease among fully vaccinated children in a daycare center. | Haemophilus, vacinação, transporte, surto. | Íntegra |
| J Pediatr | Pharyngeal colonization with Haemophilus influenzae type b in children in a day care center without invasive disease. | - | Íntegra |
| Pediatr Int. | Pharyngeal colonization with Haemophilus influenzae type b among healthy Turkish infants and children. | Colonização, Haemophilus influenzae tipo b, crianças turcas. | Íntegra |
| Pediatrics | Childhood upper respiratory tract infections: to what degree is incidence affected by day-care attendance? | - | Resumo |
| Bull N Y Acad Med | Acute illness in day-care: how much does it cost? | - | Íntegra |
| Scand J Prim Health Care | Upper airway infections in preschool children—frequency and risk factors. | Infecções do trato respiratório superior, pré-escolares, frequência, fatores de risco, epidemiologia, Atenção Primária. | Íntegra |
| Am J Public Health | Form of day care and respiratory infections among Finnish children. | - | Íntegra |
| Acta Paediatrica | Day care in relation to respiratory-tract and gastrointestinal infections in a German. birth cohort study | Coorte, creche, infecções gastrointestinais, infecções respiratórias. | Íntegra |
| Pediatrics | Health care utilization and expenditures associated with child care attendance: a nationally representative sample. | Cuidados infantis, crianças, custos, despesas, utilização, pesquisa do painel de despesas médicas | Íntegra |
| Am. J. Epidemiol. | Group day care and the risk of serious infectious illnesses. | - | Resumo |
| Pediatr Pulmonol | Respiratory illness in children attending daycare. | - | Resumo |
| Pediatrics | Estimation of direct and indirect costs because of common infections in toddlers attending day care centers. | Custos, creche, doenças infecciosas, custos diretos, custos indiretos. | Resumo |
| J Infect | Molecular epidemiology and nasal carriage of Staphylococcus aureus and methicillin-resistant S. aureus among young children attending day care centers and kindergartens in Hong Kong. | Staphylococcus aureus, MRSA, resistência antimicrobiana, creches, epidemiologia molecular. | Íntegra |

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|------------------------|--|---|---------|
| J Clin Microbiol | Molecular epidemiology and risk factors for nasal carriage of <i>Staphylococcus aureus</i> and methicillin-resistant <i>S. aureus</i> in infants attending day care centers in Brazil. | - | Íntegra |
| Pediatr Infect Dis J. | Outbreak of diarrhea in a day care center with spread to household members: the role of <i>Cryptosporidium</i> . | - | Resumo |
| Am J Epidemiol | An outbreak of cryptosporidiosis in a day-care center in Georgia | Criptosporidiose, creche, diarreia. | |
| Am J Dis Child | Cryptosporidiosis outbreak in a day-care center | Cryptosporidium, Creche, Diarréia | Resumo |
| Pediatrics | Effect of infection control measures on the frequency of diarrheal episodes in child care: a randomized, controlled trial. | Diarreia, infecção, cuidados infantis, creches. | Resumo |
| JAMA | Transmission of <i>Escherichia coli</i> O157:H7 infection in Minnesota child daycare facilities. | - | Resumo |
| Am J Epidemiol | Effect of fecal contamination on diarrheal illness rates in day-care centers. | Criança, creches infantis, controle de doenças transmissíveis, creche, diarreia, microbiologia ambiental, monitoramento ambiental, fezes. | Resumo |
| Am J Public Health | Communitywide shigellosis: Control of an outbreak and risk factors in child day-care centers. | - | Íntegra |
| Am J Epidemiol | Environmental contamination in child day-care centers. | Creche, diarreia. | Resumo |
| Am J Epidemiol. | Transmission dynamics of enteric bacteria in day-care centers. | - | Resumo |
| Scand. J. Infect. Dis. | Carriage of multiresistant <i>Streptococcus pneumoniae</i> among children attending day-care centres in the Stockholm area. | - | Resumo |
| Microb. Drug Resist. | Carriage of respiratory tract pathogens and molecular epidemiology of <i>Streptococcus pneumoniae</i> colonization in healthy children attending day care centers in Lisbon, Portugal. | - | Resumo |
| J. Infect. Dis. | Carriage of internationally spread clones of <i>Streptococcus pneumoniae</i> with unusual drug resistance patterns in children attending day care centers in Lisbon, Portugal. | - | Íntegra |
| Am J Infect Contro | Impact of an infection control program in a specialized preschool. | - | Íntegra |

[16, 17] Among the habits of these children, which facilitate the spread of microorganisms, are the habit of constantly bringing hands and objects to the mou-

th, which is more pronounced until the second year of life, [17, 47, 49], fecal incontinence and poor hand hygiene. [18] Still, it is observed that the procedures for

washing and disinfecting toys are performed without any type of standardization or protocol, which impacts on the health conditions of these children in the same

Table 3. Characterization of studies according to the risk factor for the spread of microorganisms and diseases in children cared for in daycare centers. Botucatu-SP, Brazil, 2019.

| Fatores de risco | | | N. | % |
|-------------------|---------------------|--|----|----|
| Ligados à criança | Ligados ao cuidador | Ligados ao ambiente/ objetos inanimados | | |
| | | X | 30 | 45 |
| X | | | 16 | 24 |
| X | | X | 14 | 21 |
| | X | X | 2 | 3 |
| X | X | X | 5 | 7 |
| Total | 67 | 100 | | |

way as their habits.^[19,20]

The risk of infectious diseases among children in daycare centers depends, in part, on the child's own characteristics (including age, sex, immune status and recent enrollment in a new child care environment) and the type of environment (group size, establishment child care and day care hygiene policies/practices).^[21]

A study carried out in daycare centers in São Paulo, in 2004, points out as the main risk factors for the spread of microorganisms with pathogenic potential in daycare centers, the following items: number of children per class, children cared for jointly regardless of age group, incomplete vaccination, use of cloth diapers that are not unique pieces with impermeable lining, diapers used without clothes on them (greater environmental contamination), contamination of the hands after certain activities (using the bathroom, changing diapers, blowing your nose), contact with blood and secretions, diaper changes and food handling carried out by the same person, contamination of the surface where diaper changes occur, environmental contamination and toy contamination.^[22,23]

They are listed as hygienic-sanitary characteristics of the infrastructure that favor infections in daycare centers, water quality, presence of domestic animals, children's hygiene with the use of soap, presence of flies during meals, seasonality, length of stay in daycare, number number of children in the daycare center, number of children per class, number of children per m², number

of children per employee, size of the area and ventilation.^[24]

Complementing this information, they are related to the housing conditions of children that can directly interfere in the spread of microorganisms and the installation of infectious diseases, the way of living in overcrowded conditions (more than one person per room), this factor being associated with increased rates infection in younger children, but not older than 36 months.^[19] Having older siblings showed similar effects to daycare^[25], as well as living with smokers and sharing rooms.^[23]

It is also considered that the children who attend daycare centers are, for the most part, from families with low socioeconomic conditions and with parents with a low educational level, conditions that can increase the risks of the appearance of diseases.^[21]

However, only the fact that children are cared for in daycare centers is more likely to acquire and develop infections, especially recurrent ones, such as respiratory, gastrointestinal and skin infections.^[23-26]

Considering the involvement of children with acute otitis media, the variables pointed out as risk factors were smoking by parents and short duration of breastfeeding; attendance at day care centers and not having siblings; and daycare attendance.^[20]

As for respiratory tract infections, maternal smoking is emphasized^[22] as a habit that exposes children to these diseases. Other characteristics raised for the occurrence of this disease are cohabitation with

children under five years old at home, secondhand smoke, children of mothers with low schooling, agglomeration and early interruption of breastfeeding.^[22,25]

Another factor that deserves special attention is that day care centers, due to their crowded environment, inadequate hygienic conditions, close contacts and heavy exposure to antimicrobials among the participants are a favorable environment for the transmission of *S. aureus* and MRSA.^[24]

Enteroparasitosis is associated with socio-sanitary conditions and through fecal contamination to which individuals are exposed.^[25] Pacifiers are highlighted by the possibility of participating as vectors in the transmission of these diseases.^[18] Other characteristics pointed out as facilitators in the acquisition of enteroparasitosis are the child's age, family income, mother's education, number of hours spent in the institution, diaper use, tap water consumption and raw vegetables intake.^[20-27]

When assessing the children's food during their stay in daycare centers, the risks of contamination are greater due to the preparation of food well in advance, which favors prolonged exposure to possible contaminating agents and inadequate hygiene conditions in the preparation and distribution places of those foods.^[27]

CONCLUSION

In view of the evidence that proves the spread of microorganisms and parasites in daycare centers and the vulnerability factors of the children who attend them, regarding the occurrence of infectious diseases, especially those that affect the respiratory and gastrointestinal tracts, it is extremely important that health professionals strengthen their performance in this scenario.

The identification of risk factors to which children assisted in daycare centers are subject, both those related to the institution or the people who are part of it on a daily basis, is of paramount importance to guarantee the children's right to education, so that they do not are subjected to an unhealthy environment or situations / practices that may affect their health status

or favor the occurrence of infectious diseases. The adoption of simple preventive

measures, such as washing hands of professionals and children, are effective in redu-

cing the spread of microorganisms and the transmission of diseases. ■

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