Structural and Microbiological Analysis of Children’s Pacifiers Served in Public Health Service and Nursery

Análise Estrutural e Microbiológica das Chupetas de Crianças Atendidas em Serviços Públicos de Saúde e Creches

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Abstract

Despite the advances and advantages of breastfeeding, the non-nutritive sucking habit, especially that represented by the use of pacifiers, is still common in Brazilian children. It is estimated that two thirds of children will receive bottles and pacifiers at some point in the first year of life. The frequency of use and the possibility of contamination by harmful microorganisms may lead to the development of opportunistic infections affecting the children’s health. The objective of the study was to conduct a microbiological and structural analysis of pacifiers for children treated in public services and daycare centers. A cross-sectional study was carried out with pacifiers for children aged 6 to 36 months. The collected pacifier was placed in a sterile individualized container and transferred to the laboratory for analysis. The children’s pacifiers who are cared for in public health services and day care centers are contaminated not only the dirty ones but also the visually clean ones. The potentially pathogenic microorganisms found were mainly fungi and bacteria, Candida, Streptococcus and Pseudomonas, respectively.

Keywords: Pacifiers. Microbiology. Child Health.

1 Introduction

The non-nutritive sucking habit, especially that represented by the use of pacifiers, is still common in Brazilian children. It is estimated that two thirds of children will receive bottles and pacifiers at some point in the first year of life.3-5 Beside causing early weaning, calming children, favoring sleep, among others6,7 pacifiers are considered a risk factor for the development of opportunistic infections, because children lack the maturation of immune barriers, and this non-nutritive sucking has the capacity to be a reservoir of microorganisms, especially by gram-positive bacteria, such as *Streptococcus sp* and *Enterococcus sp*. In addition, greater contamination of this sucking object usually occurs in children who are in intense contact with the soil, in families or caregivers who perform unsatisfactory hygiene or by the monthly non-replacement of this device4,8.

Despite the numerous benefits reported to the use of pacifiers, this device can still be considered as a vehicle for contamination and transmission of potentially pathogenic microorganisms such as bacteria and fungi. The frequency of use, the possibility of contamination by harmful agents, the importance for public health and the limited publication on the subject, it is important to know about the structural and microbiological pacifiers conditions. Therefore, the purpose of this study was to carry out a microbiological analysis of the pacifiers of children treated in health services and day care centers in the state of Mato Grosso.

2 Material and Methods

A cross-sectional study was outlined with the pacifiers of children attending health services and day care centers. Children aged between 6 and 36 months old who had a habit of pacifier sucking and who were consulted and who were in daycare centers participated in the study. Breastfed infants and preschool children who used the pacifier sporadically, and
who had a cold or had oral infection were excluded from the study.

New pacifiers were offered to the participants in order to replace those included in the present study. The pacifiers were collected during the children’s stay period at Várzea Grande Health Stations and day care centers in Cuiabá-MT. The collected pacifier was packaged in a sterile individual container and transferred to the microbiology laboratory.

The material was collected with the use of procedure gloves by means of sterile individual swab, moistened with saline solution of individual sterile flaconate. The swab was scrubbed clockwise four times around the nipple, repeating the procedure on the pacifier nipple/base seam. After collection, the pacifier was discarded. The swab was immediately stored in a test tube containing 10 ml of Thioglycolate medium and then placed in the greenhouse for 1 hour for subsequent sowing on the plates containing culture medium.

After homogenizing the contaminated Thioglycolate samples, the Petri dishes were sown; those containing agar chocolate medium (CA), for viable bacteria growth, and those with Saboraud medium (SAB), for fungi growth. Such plates were numbered according to the number of the test tube containing the pacifier indication, corresponding to the material collected, for later identification during the counting of microorganisms present.

The samples were then incubated in a bacteriological oven at 35-37°C, for 24 hours for the microorganism’s growth. After the incubation period, the total number of colony forming units per milliliter (CFU/mL) of each evaluated microorganism was determined for each pacifier in the sample.

Since this research was carried out on inanimate objects, it was not necessary to submit the study to the Research Ethics Committee, however, the researchers requested authorization from Várzea Grande Health Stations and day care centers of Cuiabá-MT for data collection and parents’ authorization to replace those included in the present study. The pacifiers were microbial growth, 77.7% were coagulase negative Staphylococcus sp; 22.2% were Candidas sp.; 16.7% were Streptococcus sp.; 11.1% were Pseudomonas aeruginosa and Bacillus sp.; 5.6% were Staphylococcus aureus, Klebsiella pneumoniae and Citrobacter freundii. In the 14 pacifiers apparently cleaned, 11 were really clean because there was no microorganism growth, confirming the importance of proper cleaning, however, in the other 3 there was microbial growth, 21.4% of which were negative staphylococci sp. Coagulase; 14.3% Candida sp. and 7.1% Citrobacter freundii (Table 2).

3 Results and Discussion

Of the 32 pacifiers evaluated in this study, 19 (59.4%) of the pacifiers belonged to the female sex and 13 (40.6%) to the male sex.

The literature points out that a higher prevalence of the use of these utensils has been observed in boys, firstborn, low birth weight babies, who were not breastfed at the maternity hospital, those with families of lower age, lower educational level of caregivers and higher frequency of artificial foods consumption.

At the time of pacifiers donation, 18 (56.3%) were dirty and 14 (43.8%) were visually clean. Regarding the type of pacifiers nipple that were discarded, 26 (81.3%) were orthodontic and 6 (18.8%) were conventional. Regarding the pacifier’s pacifiers material evaluated, 31 (96.9%) were silicone and only 1 (3.1%) were latex as described in Table 1.

### Table 1 - Characteristics of pacifiers of children treated in Health and Day Care Services

| Variables       | n = 32 | %  |
|-----------------|--------|----|
| Pacifiers       |        |    |
| Girls           | 19     | 59.4|
| Boys            | 13     | 40.6|
| Dirty           | 18     | 56.3|
| Clean           | 14     | 43.8|
| Pacifiers nipple|        |    |
| Orthodontic     | 26     | 81.3|
| Conventional    | 6      | 18.8|
| Pacifiers material|      |    |
| Silicone        | 31     | 96.9|
| Latex           | 1      | 3.1|

Legend: %: Percentage.
Source: Research data.

Similar to the findings of Silva et al. in their study, most pacifiers were also silicone pacifiers and most were dirty, although a few share them.

For the microorganisms evaluation, 100% of the 18 dirty pacifiers were microbial growth, 77.7% were coagulase negative Staphylococcus sp; 22.2% were Candidas sp.; 16.7% were Streptococcus sp.; 11.1% were Pseudomonas aeruginosa and Bacillus sp.; 5.6% were Staphylococcus aureus, Klebsiella pneumoniae and Citrobacter freundii. In the 14 pacifiers apparently cleaned, 11 were really clean because there was no microorganism growth, confirming the importance of proper cleaning, however, in the other 3 there was microbial growth, 21.4% of which were negative staphylococci sp. Coagulase; 14.3% Candida sp. and 7.1% Citrobacter freundii (Table 2).

### Table 2 - Microorganisms found in pacifiers of children treated in Health and Day Care Centers Services

| Type of Microorganism | n = 32 | %  |
|-----------------------|--------|----|
| Visually dirty pacifiers| 18     | 56.3|
| Coagulase-negative Staphylococcus | 14     | 77.7|
| Candidas sp           | 4      | 22.2|
| Streptococcus sp      | 3      | 16.7|
| Bacillus sp           | 2      | 11.1|
| Pseudomonas aeruginosa| 2      | 11.1|
| Staphylococcus aureus | 1      | 5.6|
| Klebsiella pneumoniae| 1      | 5.6|
| Citrobacter freundii  | 1      | 5.6|
| Visually clean pacifiers| 14     | 43.8|
| Coagulase-negative Staphylococcus | 3      | 21.4|
| Candidas sp           | 2      | 14.3|
| Citrobacter freundii  | 1      | 7.1|
| No micro-organisms    | 11     | 78.6|

Legend: %: Percentage.
Source: Research data.

Comina et al., observed that the two main isolated genera were also Staphylococcus and Candida; Silva et al.
also found Candida and Streptococcus, however mutans e Enterococcus sp type.

Pacifier is an object used by many children, resulting from a cultural habit of non-nutritive sucking. And for some time, it has been associated with negative effects related to the child’s health, such as poor dental occlusion and otitis media. Its use is also related to colonization and infection by microorganisms. During the first years of life, children are more susceptible to opportunistic microorganisms, especially Candida sp., due to the immaturity of the immune system and because they are in direct contact with the environment and often do not receive adequate hygiene. In the present study, Candidas sp., were found, both in dirty and clean pacifiers, such fact may be related to the high probability of being in the environment and the possible fecal-oral infection.

Studies show that children receiving breast milk are less likely to be colonized by Candida albicans while it is twice as high in children using pacifier and bottle. In the studies in general, the children who make use of the night before sleeping, all day and all night can develop the microorganism because it is considered a humid, warm and dark environment.

Inadequate hygiene conditions allow the microorganisms proliferation that can be pathogenic to the child health, such as diarrhea, caries, associated with low immunity, which leads to an imbalance of oral microbiota, and opportunistic diseases may arise.

Thus, strict hygiene standards and an efficient protocol for cleaning pacifiers should be adopted to avoid contamination and alleviate parents’ concern about the pacifiers safety and their children’s health.

4 Conclusion

The children’s pacifiers who are cared for in public health services and day care centers are contaminated not only the dirty ones but also the visually clean ones. The potentially pathogenic microorganisms found were mainly fungi and bacteria, Candida, Streptococcus and Pseudomonas, respectively. This instrument may be for sure related to some pathologies affecting children. The low level of knowledge and inadequate hygiene practices by caregivers are emphasized, so guiding actions to mothers such as lectures become interesting to improve the high contamination values.

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