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ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2021;10(2):334-7

How safe are children's shampoos?

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Received 30 October 2020; Accepted 19 January 2020
Available online 19.03.2021 with doi: 10.5455/medscience.2020.10.231

Abstract

Shampoos are daily care products designed to clean the hair and scalp. The aim of this study was to compare the contents of baby and newborn shampoos sold in supermarkets and pharmacies, determine the levels of substances reported to be dangerous to babies and newborns' health in these shampoos. This cross-sectional study included 18 newborn and baby shampoos that families could buy at supermarkets and pharmacies in Turkey. For newborn and baby shampoos, the number of preservative substances have been determined. A total of 68 chemicals was found in these 18 shampoos, with an average of 14.83 ± 2.43 chemicals in each shampoo. Most of these chemicals were not recommended for use in children. Shampoos that contain numerous chemicals and substances confirmed to be harmful or have suspicious effects should not be recommended. It is clear that more studies are needed in this under-researched area.

Keywords: Child, chemical, newborn, pediatrician, shampoo

Introduction

Hair and body cleaning and care are important routine parts of life for all newborns, infants, and children. As the number of baby shampoos offered to consumers in pharmacies and supermarkets increases almost daily, parents frequently ask healtcare provider, "Which shampoo would you recommend for my baby or child?" Also, on TVs, advertisements are frequently seen as this shampoo is recommended by the healtcare provider such as pediatricians. However, there are very few publications and resources to help parents on this subject [1].

Shampoos are hair care products designed to clean the hair and scalp. Shampoos contain many active chemical components such as surfactants, preservatives, detergents, pH adjusters, thickeners, conditioners, sequestration agents, and anti-dandruff agents [1]. The epidermis is thinner, and absorption of substances is higher in infants [2].

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Even low levels of chemicals can have negative effects on growth, and these effects are more pronounced during the early stages of life, especially the fetal and infancy periods [3,4]. Although there are many chemicals in baby shampoos, limited studies have investigated whether they are completely safe or unsafe. Most of the existing studies have focused on the dermatological side effects [5].

The aim of this study is to compare the contents of baby shampoos sold in supermarkets and pharmacies, determine the number of substances reported to be dangerous for infant health in these shampoos, and provide guidance for families on the selection of baby and newborn shampoos.

Material and Methods

Study Design and Sampling Frame

This cross-sectional study separately evaluated 18 infant and newborn shampoos that families could buy from supermarkets and pharmacies in Turkey. Only 3 shampoos were sold as newborn shampoos, while 15 shampoos were sold as baby shampoos. For newborn and baby shampoos, the number of preservative

substances have been determined. These chemical substances in the shampoos and the ways in which they were identified were obtained from the packages and recorded. Data included in this study were collected between July 2019 and November 2019. Ethical approval is not required as the study does not include human and animal elements.

Statistical Analysis

Data analysis was performed on Statistical Package for the Social Sciences (SPSS, version 22.0, Chicago, IL, USA) software. $p<0.05$ was regarded as statistically significant. Data were expressed as mean ± standard deviation (SD) and median values. Student's t test was used in the analysis of quantitative data for newborn and infant shampoo when data were normally distributed.

Results

The study included 18 newborn and baby shampoos. Three shampoos were for newborns, while 15 shampoos were recommended for use with infants. A total of 68 chemicals was found in these 18 shampoos. The shampoo with the fewest chemicals contained 10 substances, while the shampoo with the most chemicals contained 21 substances (Figure 1).

Table 1. Properties identified on baby and newborn shampoo packaging

Properties defined on shampoos	Shampoo N (%)
100% safe	1 (5.6%)
Alcohol-free	6 (33.3%)
Alkali-free	2 (11.1%)
Clinically tested	4 (22.2%)
Dermatologically tested	9 (50%)
Dye-free	9 (50%)
Hypoallergenic	10 (55,6%)
Ophthalmologically tested	3 (16.7%)
Paraben-free	12 (66.7%)
Perfume(fragrance)-free	1 (5.6%)
Phenoxyethanol-free	4 (22.2%)
Phthalate-free	4 (22.2%)
SLES-free	9 (50%)
SLS-free	10 (55,6%)
Soap-free	7 (38.9%)
Sulphate-free	2 (16.7%)
Tested by dermatologist	1 (5.6%)
Tested by pediatrician	3 (16.7%)
Tested by sleep specialist	1 (5.6%)

The all shampoos had an average of 14.83 ± 2.43 chemicals. The newborn shampoos had an average of 12.33±2.08 chemicals and baby shampoos had an average 15.33±2.22 chemicals ($p=0,047$). In addition, data on how the substances were identified on the shampoo packaging are presented in Table 1. Aqua or water was the only substance in all the shampoos. Table 2 presents the data we gathered on some chemicals found in shampoos that have been suggested to have negative effects on children's health.

Table 2. Reportedly harmful or may be harmful surfactant and preservative substances in baby and newborn shampoos

Chemical substances	Shampoos N (%)
Perfume (fragrance)	17 (94.4%)
Sodium benzoate	14 (77.8%)
Sodium Laureth Sulfate (SLES)	5 (27.8%)
Phenoxyethanol	5 (27.8%)
Diazolidinyl urea	5 (27.8%)
BHT	3 (16.7%)
Alcohol	1 (5.6%)
Benzyl alcohol	1 (5.6%)

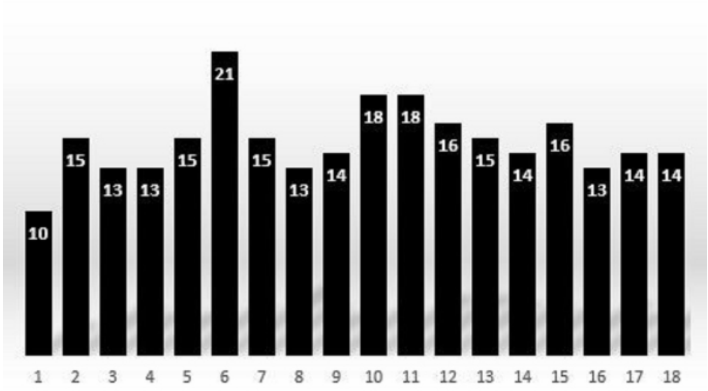

Figure 1. Total number of chemical substances in shampoos

Discussion

The most important finding of our study was that while newborn shampoos had fewer chemicals, baby shampoos contained 10–21 chemicals. It is clear that the shampoos selected for use with infants and newborns should be those with the fewest chemicals.

The use of baby lotion, powder, and shampoo has been reported to cause increased phthalate concentrations in urine, especially in children younger than 8 months old [6]. Phthalates are chemicals that can cause asthma, puberty disorders, thyroid hormone disorders, and reproductive health problems [7]. Studies have shown that exposure to phthalates can occur through many sources

such as plastics and personal care products. The plastic packaging used for the transport and storage of baby care products such as shampoos may be a source of phthalates [8-10]. High levels of phthalates can be found in perfumes, and in our study, we found that 94.4% of the baby and newborn products had perfume (fragrance), a quite high level.

Surfactants such as sodium laureth sulfate (SLES), sodium lauryl sulfate (SLS), sodium myreth sulfate, and sodium methyl cocoyl taurate are surface-active components that help foaming [11,12]. Many surfactants have been shown to cause eye and skin irritation in experimental animals and some human test subjects. The severity of irritation appears to increase with direct concentration [13]. Strong detergent cleansers can damage intercellular lipids, resulting in deterioration of the stratum corneum. This leads to dry skin formation and increased skin permeability, which can result in increased sensitivity to chemical and environmental toxins [14,15]. In our study, no baby shampoos contained SLS, but the number containing SLES was not low (27.8%).

Phenoxyethanol is an ether and an aromatic alcohol, also known as (2-hydroxyethoxy) benzene. It has been reported to have toxic effects on reproduction and has been banned in some European countries [16]. The United States Food and Drug Administration recommended discontinuation of the use of a breast cream containing phenoxyethanol due to the potential to cause diarrhea, vomiting, and possible effects on the nervous system in infants [12]. In our study, phenoxyethanol was found in 27.8% of the infant and newborn shampoos, a quite high level.

Diazolidinyl urea is another chemical substance that is used frequently in personal care products and has been suggested to have allergic and genotoxic effects [17,18]. In our study, we found that 27.8% of the infant and newborn shampoos had diazolidinyl urea. In our opinion, shampoos containing this substance should not be preferred for newborns.

Studies have shown that butylated hydroxytoluene (BHT) causes cancer in mice and is likely to cause cancer in humans. BHT has been reported to cause allergic reactions, hyperactivity, liver and kidney function disorders, estrogenic effects, and high cholesterol levels [19]. In our study, we found that 16.7% of the baby shampoos had BHT.

Benzyl alcohol and is an aromatic alcohol that can be used as a preservative, solvent, fragrance, and viscosity-reducing agent in personal care products. In neonates, benzyl alcohol toxicity has been reported to cause metabolic acidosis and seizures [20]. Sodium benzoate is widely used as a preservative in personal care products. Animal studies have shown that chronic exposure to benzyl alcohol and sodium benzoate can cause appetite loss and growth retardation in animals. It has also been reported that sodium benzoate inhibits the immune responses of natural killer cells, neutrophils, and phagocytic cells based on reactive oxygen intermediates [21,22]. In our study, the presence of benzyl alcohol in infant and newborn shampoos was found to be low (5.6%), but the presence of sodium benzoate (77.8%) was found to be very high. The most appropriate approach is to select newborn, infant, and children shampoos that contain small amounts of mostly harmless substances.

Side effect profiles of shampoos should be considered when choosing shampoo for children and if possible, products of natural origin should be preferred [23]. It has been reported that the natural baby skin-care products were well tolerated by infants and toddlers [24].

The most important limitation of this study was that the exact amounts of chemicals in shampoos could not be determined. For this reason, the chemical substances and contents of individual shampoos were not specified, so they could not be compared. In addition, collecting data from a single country could be considered to be a limitation.

Conclusions

Based on the study findings, the chemical substances in infant and baby shampoos should be clearly indicated on their packaging. Furthermore, we believe that the most beneficial approach to protect the health of infants and children is to use packaging for children's personal care products that does not have the potential to release any substances. Moreover, we think it would be useful to develop guidelines for the use of children's personal care products by age. More research is clearly needed in this area with very limited studies.

This study was presented as an oral presentation at the 2nd International Eurasian Congress of Social Pediatrics & 6th National Congress of Social Pediatrics.

Conflict of interests
The authors declare that they have no competing interests.

Financial Disclosure
All authors declare no financial support.

Ethical approval
Ethical approval is not required as the study does not include human and animal elements.

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