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Research paper

Attitudes to and prevalence of bee product usage in pediatric pulmonology patients

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ABSTRACT

Introduction: For hundreds of years honey and bee products have been used in diets and as a home remedies. In order to assess the prevalence of bee products usage in pediatric pulmonary patients, an anonymous survey of parents/guardians was conducted.

Methods: A cross-sectional study was performed in the pediatric pulmonology outpatients clinic using a questionnaire which contained 20 open-ended and closed questions.

Results: Of 138 questionnaires distributed, 120 were fully completed and included in the analysis. 79% of the respondents had given their child some form of bee product to alleviate health problems (e.g. asthma and bronchitis), which most frequently included meadow honey, propolis and royal jelly. Living in the city and older age of parents/guardians significantly increased the probability of using bee products. Products were usually purchased in pharmacies or beekeepers shops. Bee product blends, used by ≈74%, were often produced at home, and they contained a variety of plant ingredients (pine needles, black radish, dandelions, onions, ginger, thyme, St Johns' Wort, yarrow, etc.). More than a half reported better improvements combining bee products and prescribed medicines. A few very mild side-effects were reported by 5% and one case of an allergic reaction to propolis.

Conclusions: Medicinal usage of bee products among pediatric pulmonology patients in South- East Serbia is widespread. Almost all interviewed parents/guardians would like to learn more about bee products and the possibilities for their safe and effective application.

1. Introduction

Respiratory infections are among the most common childhood diseases and since ancient times, numerous traditional and conventional medicines have been used for their treatment [1–3]. Recommended management of uncomplicated respiratory infections in everyday practice involves self-care and -treatment of symptoms [1] in order to improve the self-defenses. Honey and bee products have been used in diets, and as a home remedies in traditional medicine for thousands of years. The ancient Egyptians first began to breed honeybees (*Apis mellifera* L.) as domestic animals, and recommended honey for the treatment of wounds, and used other different bee products to make ointments, bandages, pills and pledgets [4,5].

Numerous studies have shown that the honey and bee products provide exceptional results in alleviating various conditions in humans [2,4,6]. Honey ingredients primarily have a positive effect on the respiratory and cardiovascular system (blood pressure regulation and reduction of cholesterol levels). Daily consumption of honey significantly regulates bowel functioning and reduces the risk of gastrointestinal disturbances, gastritis, stomach ulcers and similar diseases. There is a significant amount of data about the immunomodulatory, antimicrobial, anti-inflammatory and antioxidant effects of honey and even its ability to reduce the occurrence of benign and malignant tumors, which is a good basis for defining major therapeutic possibilities for its use in a modern medicine [2,5,7,8].

Bee products possess strong antioxidative activity that follows the order propolis > royal jelly > honey and gradually decreases over time and when exposed to heat [9]. Apart from extraordinary antibacterial effects [10,11], propolis (bee resin) exert antiproliferative properties, regulates immune response through a positive impact on natural killer cells and macrophage efficiency [10], and stimulates antibody production [12]. One of the clear indications for royal jelly,

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Table 1
Demographic characteristics and types of diagnosis found in the interviewed pediatric pulmonology outpatients.

	Gender		Age (years)			Diagnosis						
	Male	Female	< 5	5-10	> 10	Asthma	Bronchitis	Cough	Laryngitis	Pharyngitis	Pollen allergy	Rhinitis
N	61	59	32	44	44	51	20	19	4	4	15	7
%	50.8	49.1	26.6	36.7	36.7	43.3	17.5	15.8	3.3	3.3	12.5	5.8

among other numerous potential indications, is as a remedy against respiratory diseases and asthma [13]. Recent Cochrane Systematic Reviews pointed out that there was no strong evidence for or against using honey for acute cough in children although honey probably relieves cough symptoms and reduces cough duration better than no treatment and also that further research on efficacy of honey in treating chronic non-specific coughs in children is needed [14,15].

The process of treating children is complicated and it is necessary to establish a trusting relationship with parents/guardians. Although self-medication with complementary and alternative medicines in pediatric population is very popular and is believed to be almost without side effects, caution is absolutely necessary since even the most serious adverse reactions could occur [16]. The aim of our study was to determine the frequency of using bee products in diet and for the treatment of respiratory disorders in the pediatric population. The study also included an assessment of parents'/guardians' attitudes about the safety and efficacy of these products, as well as the habits of using honey in the everyday diet. In addition, this study reviews the contemporary knowledge of bee products and their effects.

2. Material and methods

The study was approved by the Ethical Committee of the Faculty of Medicine, University of Niš (No. 12-10580-2/4) and the Ethical Committee of the Clinical Center Niš (No. 27913/17). A cross-sectional study was performed using an anonymous questionnaire, paper questionnaires that were self-completed, and which contained 20 open-ended and closed questions.

2.1. Study population

Persons who brought the child to the clinic – parents or guardians were invited to complete a questionnaire in the waiting room of the pulmonology specialist at the Pediatric Clinic of the Health Center Niš (the Capital city of South-East Serbia). All questionnaires were completed anonymously, on a voluntary basis, and individual responses were not linked to the specific pediatric patient. Parents/guardians were able to skip questions they did not wish to answer and this resulted in an exclusion from the study.

2.2. Structure of the questionnaires

First seven questions where related to the demographic data, while the next three questions focused on the general attitude towards bee products. The third section (questions from 11 to 14; for more information see supplementary material) dealt with the type of bee product or bee product blend formulation and the frequency of its usage alongside health problem treated by it. The next group of questions dealt with the source of information/recommendation and the origin of bee product/bee product blend. The last set of questions were designed to reveal the previous experience and the effects observed during the consumption of bee products in pediatric pulmonology patients.

2.3. Data interpretation and statistical analysis

Data obtained from the questionnaires were statistically analyzed by SPSS 10 software. Since some questions allowed more than a single answer the sum was not always 100%. The data are shown in frequency distribution tables expressed as percentages, which were further analyzed using Pearson's Chi-square test. A probability value of $p < 0.05$ was deemed of significance.

3. Results

From 138 distributed questionnaires 120 were completed, and processed. A total of 79% of the respondents gave their child some form of bee products to alleviate their child's health problems. Respondents which declared that they do not use any of bee products for health problems, the remaining 21%, cited the reason of not believing that it can be helpful.

The data concerning patients'/guardians' gender and age distribution are presented in Table 1, as well the data related to the diagnosis and the reason for visit to the pulmonologists. The most frequent cause for visits to pulmonologists included asthma (36.7%) and bronchitis (17.5%) (Table 1). Almost 51% of patients were boys and around 69% of patients lived in urban areas. Out of total 120 interviewed parents/guardians 23 (19.2%) were males, while 97 (80.8%) were females, with average age of 37.3 ± 7 years.

According to our results the occurrence of specific pulmonary disorder is not dependent on the patients' place of residence (Table 2). On the other hand, univariate logistic regression analysis revealed that giving some form of bee products to the child, the place of residence (OR = 0.274, p = 0.008), and the age of parents/guardians (OR = 1.1392, p = 0.0084) might be considered as significant independent factors. These two variables entered the multivariate regression model, which showed that the life in the city and older age of parents/guardians significantly increase the probability of bee products application in nutrition, as well as for the treatment of health disturbances.

The most abundant bee product reported used was polyfloral honey, while the least utilized product was powdered propolis (Fig. 1). None of the respondents mentioned the application of bee venom, while perga (bee bread) was recognized as potential remedy by few respondents. Some of the interviewed patients' parents/guardians gave a

Table 2
Residence location of outpatients admitted by the pulmonologist.

Place of residence	Diagnosis							Statistical values
N	Asthma	Bronchitis	Cough	Laryngitis	Pharyngitis	Pollen allergy	Rhinitis	
Urban	33	15	15	3	2	11	4	$p > 0.05$,
Rural	18	5	4	1	2	4	3	$\chi^2 = 2.997$

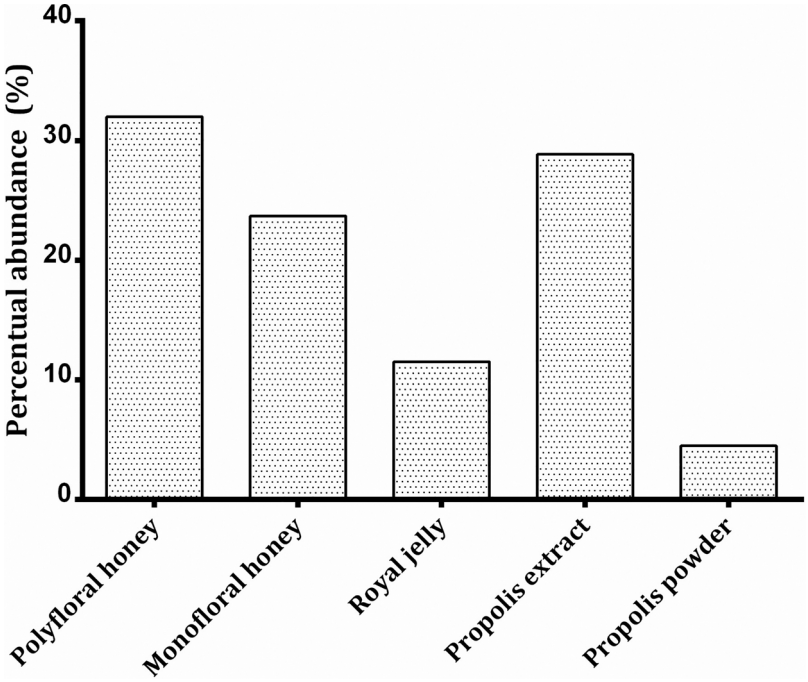

Fig. 1. Percentile abundance (%) of different bee type products.

Table 3
Content of different bee product blends used for children.

Blend No.	Number of users (N (%))	Blend content
1	29 (32.6)	Mixture of water, sugar, honey and lemon
3	11 (12.3)	Honey with pine needles
3	8 (8.9)	Honey with black radish
4	8 (8.9)	Honey with dandelions
5	7 (7.8)	Mixture of pollen, royal jelly and propolis
6	7 (7.9)	Honey with onions and nuts
7	6 (6.7)	Honey with added ginger
8	6 (6.7)	Honey with thyme, St Johns' Worth and yarrow
9	4 (4.5)	Honey with 99% of rapeseed oil
10	3 (3.3)	Propolis and olive oil

prescription for bee products blends that they administered to their children (Table 3). Out of 120 interviewed patients' parents/guardians, 89 reported to be using one of the ten reported blend types. The most frequently applied blend was water, sugar, honey and lemon (32.6%), followed by honey containing pine needles (12.3%) (Table 3). The pharmacy and beekeepers shops were the most frequently mentioned places used to obtain bee products/bee product blends, followed by herbal pharmacies and health food stores. Bee product blends were often produced at homes and they contained apart from bee products a variety of natural ingredients.

Statistical analysis revealed that there was a significant connection between the types of bee products applied for different symptom management (Table 4). The majority of parents/guardians reported giving honey or propolis to their children if they were suffering a dry cough, or they used it as an immune system booster (Table 4). The largest number of respondents (n = 29), reported giving their child three teaspoons of bee product/bee product blend per day. Fewer reported using the products once or twice per day. More than a half of the respondents (54%) had informed their doctor about their use of bee products prior to this survey.

Out of 120 interviewed parents/guardians around 50% reported to have a good experience in combining honey bee products with standard drugs, where their combined usage increased the self-estimated drug efficacy (Fig. 2). Conversely around 5% of respondents reported some undesired reactions arising after combining honey bee products with standard drugs, while no interactions were mentioned (Fig. 2). Apart from nausea and abdominal pain after consumption of honey and bee products blends, only one case of allergic reaction to propolis, as a severe undesired reaction, was reported. This allergy was recorded in female patient (age 11) prone to allergies, which was also the reason for her frequent visits to pediatrician, and was manifested as sever dyspnea. This child did not use any form of bee products in regular everyday diet and applied propolis, in a form of a nasal spray and liquid extract for oral use twice (both products were purchased at the pharmacy), after it was recommended by a physician.

All respondents (even the ones that do not use any kind of bee products) stated that they would like to learn more about bee products and the possibility of their safe and effective application.

4. Discussion

There has been a growing interest in apitherapy studies and in pharmacology and pharmacy research it is among the top 10 topics, covering almost 20% of all publications [17]. Bee products used in apitherapy include honey, propolis, pollen, royal jelly, bee poison, bee wax and perga (known also as bee bread – fermented bee pollen that is richer in free amino acids and peptides than pollen) [6]. Despite a great number of proven health benefits for pollen and perga, these two bee products are almost completely underestimated [6], which is in accordance with the results of the present study as well (Fig. 1 and Table 4). The therapy based on bee venom, widely used in rheumatoid arthritis, neurodegenerative diseases, liver fibrosis and atherosclerosis, bears different adverse effects [18] and it is not suitable for vulnerable populations such as pediatric. The awareness of these adverse effects arising after bee venom application might be the reason why none of the interviewed parents/guardians used this type of bee product to their children (Fig. 1 and Table 4).

Having in mind that the ingestion of honey is connected with infant botulism, honey-containing products or supplements, or the use of honey as a flavoring agent should not be given to infants younger than 12 months [19]. Also, people with known allergic reaction to some bee products should avoid them, since the ingestion may result in allergic

Table 4
Comparison between type of bee product used and symptoms treated.

Type of product/Symptom	Type of symptom							Statistical values
	Dry cough	Acute cough attack	Nocturnal cough	Allergic reaction	Immunity booster	Appetite stimulant	Other*	
Honey	18	7	2	7	32	2	2	$p < 0.001$
Propolis	8	4	4	4	20	13	7	$\chi^2 = 78{,}0713$
Pollen	0	0	0	2	4	2	4	
Bee wax	0	2	0	0	1	0	0	
Royal jelly	1	0	1	1	6	6	3	
Balm with bee product	0	0	1	1	3	0	2	
Perga	0	0	0	1	1	1	0	

* Other symptoms included.

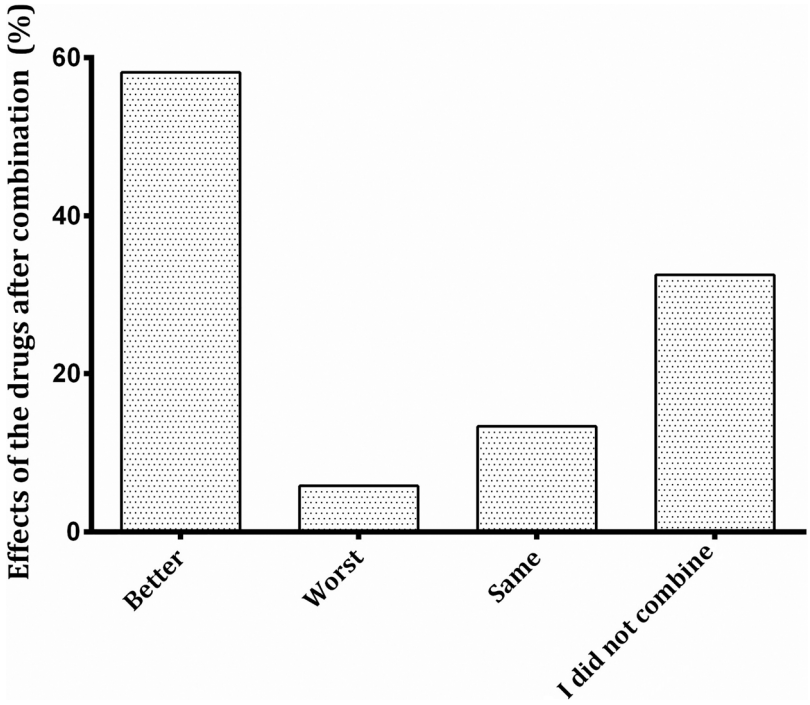

Fig. 2. Experience/attitudes related to the co-usage of honey bee products and standard drugs.

reactions ranging from mild to severe one, e.g. anaphylaxis [20]. According to Kumar et al. [3] parents and some primary healthcare practitioners appear unaware of the risk from botulism related to the use of honey for infants, while the health care professionals (pediatricians) are more concerned about the safety of the honey than the parents. Nevertheless for the population older than 1 year bee products represent an important functional food, due to the presence of molecules that prevent or influence various disease stages, and numerous studies confirmed that there are some traditionally claimed benefits of different bee products [21]. Mulholland and Chang in a large systematic review concluded that honey could be regarded as safe and relatively inexpensive treatment choice in children over one year old, while its efficacy must be further studied [15].

The majority of respondents in our survey had the opinion that honey should be included in the child's diet, and they declared that their children consumed bee products in every-day diet. In addition, respondents who used bee products as a food, or as a medicine, by themselves, gave their children honey, as well as some other bee products, as part of their dietary regime. According to Đorđević et al. [22] honey, propolis and royal jelly are the bee products present in regular diet of Serbian preschool and school children. Our results point out that the most commonly used bee products were honey and propolis and this might be expected since these two products are the most popular and accessible bee products with many known beneficial effects on health.

The occurrence of specific pulmonary disorder in our studied population is not dependent on the place of residence, while the parents/guardians age and their place of residence influences the frequency and readiness for bee products application to the child. The older the parents/guardians are, it is more likely that they will apply some kind of bee product to the child in order to alleviate its respiratory complains. It is also more likely that a child living in the city will use some kind of bee products (Table 2). The last fact could be explained by greater availability of public pharmacies, herbal pharmacies, beekeepers and hospitals but also by greater flow of information and consequently better awareness of the city' population towards different treatment regimes. On the contrary, Aumeeruddy et al [23] observed a significantly higher score for the consumption and medicinal use of honey among rural population of Mauritius which also had greater faith in the curative capability and usage of natural medicines compared to urban residents. Also, the results of their study demonstrated higher score of usage and trust in natural remedies among older adults, which is similar to the findings of our investigation. In Serbia, the usage of medicinal plants and other natural products has a very long history and nowadays the certain number of publications testifies that this usage is still current and not forgotten [24–26]. Natural medicines are believed to have no side effects and that their effectiveness is proved through a long-

standing use in traditional recipes. Traditional and complementary medicines (that includes honey and bee products blends) are widely used for children, often because of perceived as safe [3].

Among the diseases which have been globally reported, by patients or health professionals, to be successfully treated or healed with apitherapy include rhinosinusitis and asthma [21,27]. Honey is a well-known remedy for colds, as well as for mouth, throat or bronchial irritations and infections, especially in temperate climates and places with considerable temperature fluctuations. Apart from antibacterial effects, the benefits of honey ingestion in these conditions are related to the soothing and relaxing effects of fructose [21]. Honey is a superior to both dextromethorphan and placebo for night-time coughing associated with upper respiratory tract infections [28], possibly due to its antioxidant and antimicrobial effects, or simply due to a sweet taste that might induce endogenous opioids release [28,29]. Also, mono- and polyfloral honeys have been used by both urban and rural population of south eastern Serbia as a natural remedy for different types of cough (Fig. 1 and Table 4), especially for the management of dry cough.

Royal jelly and its derivate components showed high antibacterial activity (especially against Gram positive bacteria) even against many multidrug resistant bacteria, such as MRSA (methicillin-resistant *Staphylococcus aureus*) [30]. It is frequently mentioned that royal jelly, among other potential indications, might be a remedy for respiratory diseases and asthma [31]. Some reports from 70's point out that royal jelly can be beneficial in bronchial asthma after its sublingual application (50–500 mg per day but also 100–150 mg per day) and aerosol inhalations with honey and royal jelly in spastic bronchitis [13]. Since royal jelly is light and heat susceptible and undergoes oxidation to a direct contact with air, proper storage conditions (especially temperature and time) are crucial for maintaining its beneficial properties [29,32]. Our results revealed that royal jelly is most frequently applied as an immune system booster and appetite stimulant, but not such often for the management of any kind of caught as suggested by the previous studies (Table 4).

Despite the great differences in the chemical composition of propolis arriving from different geographic locations, this bees designed resin, that protects them from infections, it exhibits significant antibacterial, antifungal, and in some cases antiviral, activity [11]. Medicinal uses of propolis includes the treatment of various respiratory infections, immune system support and improvement due to an increase in antibody production, and activation of B and T lymphocytes [21,22]. The findings related to the effects of propolis as an immune system booster are additionally supported by the results of our study, where this proven potential of propolis become a common knowledge since it was most frequently reported to be used for immune system support (Table 4). Anti-asthmatic treatment and support to the respiratory system are some of the most popular applications of propolis or its extracts, although enough substantiating evidence or reference to scientific studies could not be found in the literature [21]. Propolis should be used cautiously in people prone to allergies since it is a potent allergen and sensitizing agent [20]. The allergic potential of propolis was confirmed in our study: a single case of allergy reported by a patient' mother.

Respiratory infections and symptoms that are often treated by wild honey and its mixtures with medicinal plants in Burkina Faso included coughing, throat infections and colds [27]. According to FAO (Food and Agriculture Organization of the United Nations), the combination of several bee products synergistically increase their beneficial properties which are greater than their individual biological values [21]. Thus, it is common practice to prepare the combination of a few bee products with medicinal plants that are traditionally recognized as effective for the treatment of certain aliments. In traditional medicine plants and oils, that are mentioned as a part of bee product blends in our study (Table 3), are frequently recognized as those that are able to relief respiratory complaints, e.g. onion bulbs in honey for relieving cough and asthma; decoct of pine needles (*Pinus sylvestris* L.) in honey, as a syrup for chronic bronchitis; thyme flowering brunches in different mixtures with monofloral or polyfloral honey [25,33–36]. Traditional experience and animal experiments have claimed that rapeseed oil could be useful as adjuvant therapy in asthma [33,37]. Aumeeruddy et al. [23] concluded in their survey that the main bee product blend for treating cough and sore throat is mixture of honey and lemon or ginger. It is also interesting to mention that all studied participants in that study reported to be using honey alone for the treatment of asthma [23], while numbers in our study was slightly less than 2/3 of the interviewed parents/guardians. The blend of honey, hot water and lemon juice is also the most commonly used natural remedy for respiratory tract complaints in the UK [3].

According to EMA/HMPC, among other therapeutic indications, medicinal plants named in Table 3 are traditional herbal medicinal product used for productive cough associated with cold (thyme – *Thymus vulgaris* L. and *Thymus zygis* L., herba); temporary loss of appetite (yarrow – *Achillea millefolium* L., herba); symptomatic treatment of mild, spasmodic gastrointestinal complaints including bloating and flatulence (ginger – *Zingiber officinale* Roscoe, rhizome, St Johns' Worth – *Hypericum perforatum* L., herba, yarrow – *Achillea millefolium* L., herba and dandelions – *Taraxacum officinale* Weber ex Wigg., radix cum herba). Also, EMA/HMPC do not recommend the use of a large number of medicinal plants in children under 12 years or even 18 years of age due to lack of adequate scientific safety data [38].

The most of the interviewed parents/guardians used bee products or blends as adjunct therapy to the conventional medicines prescribed to their children. Interestingly, only around half of the respondents (54%) inform the doctor about the use of bee products either alone or in combination with the standard prescribed drugs. Although bee products are traditionally used for centuries, modern medicine suggest that its usage should be safe, effective and compliant with the latest scientific knowledge. Committee on Herbal Medicinal Products (HMPC) is considering possible extension of the scope of the traditional use registration procedure to "products other than herbal substances with a long tradition of safe use' including 'substances of animal, mineral or metallic origin and micro-organisms", which include honey, royal jelly and propolis, etc. [38]. Such extension would be a large step forward especially in the field of complementary and alternative medicine.

4.1. Strengths and limitations of the study

Our study group included parents/guardians of patients from the pulmonology specialist at the tertiary care institution i.e. Pediatric Clinic of the Clinical Centre Nis. Since majority of children from several districts gravitate towards this clinic, we can say that the sample of 120 completed questionnaires could be adequate in size for this type of study. This is the first study conducted on bee products utilization among pediatric pulmonology patients in region. One of the limitations of this study is the self-reported data, where one can only relay on the parent's/guardian's memory from the time of bee products consumption and its readiness to report the usage of such products. Also, possible attention distractions of the examinees by surroundings of the waiting room could not be excluded.

5. Conclusion

Having in mind that bee products possess numerous health promoting effects their application is in the focus of today's research. The most frequently used bee product was honey, followed by bee products blends and propolis. The self perception of the effectiveness of bee product and standard drug combination on the symptoms relief was relatively high. Also, a significant number of the interviewed parents/guardians reported to be using different bee product blends containing a variety of medicinal plants traditionally recognized as effective. We believe that patients would be more compliant to apytherapy once better and more detailed studies on their effects are completed. Indeed

almost all interviewed parents/guardians stated that they would like to learn more about bee products and the possibilities of their safe and effective use. However, when it comes to pediatric population, particular attention should be paid to focusing both on the parents'/guardians' and health professionals' awareness on the latest scientific information in this field.

Conflict of interests

The authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.eujim.2019.02.001.

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