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ADAPTED MILK FORMULAS IN THE NUTRITION OF CHILDREN

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From the evolutionary perspective, human milk represents a biological standard, that is, a gold standard in terms of nutrition for newborn babies, while adapted formulas represent an effective replacement for the nutrition of infants.

Based on a survey, the aim of this paper was to examine the extent to which adapted milk formulas are used as substitutes for human milk in infant nutrition, as well as the reasons for using and selecting adaptive milk formulas.

A total of 309 respondents, divided into three age categories, were interviewed: those aged from 20 to 25; from 25 to 30; and those over 30.

Of the total number of respondents, 62.13% fed their infants with human milk, 29.13% used adapted milk formulas, while 8.74% fed infants with human breast milk with the addition of adapted milk formulas. In our data analysis, the average values of baby weight were obtained, depending on whether they were fed with human milk or adapted milk formulas after three months and it was found that there was a statistically significant baby weight difference between the women who were breastfeeding and those who fed the self-administered dairy formulas ($p < 0.05$). When asked about the source of the recommendation on the use of adapted milk formulas, the largest number of respondents answered that they got the recommendation from their doctors (46.15%), while as the reason for use of adapted milk formulas instead of human milk, the majority of respondents (64.10%) stated that the reason was the absence of milk secretion.

The research shows that the infants fed with adaptive dairy formulas gain weight more quickly than breastfed infants, which is a tendency that can serve as the hypothesis that artificially fed children will have obesity problems later on in life. The benefit of the study itself was that the decision of using adaptive dairy formulas by the examined women regardless of their level of education was a result of consultation with their pediatricians and that fact gives special importance to the proper development of infants.

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Key words: *adapted milk formulas, nutrition, infants*

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Introduction

From the evolutionary perspective, human milk represents a biological standard, that is, a gold standard in terms of nutrition for newborn babies. The health benefits of human milk have been documented in many studies that have shown that human milk reduces the risk of developing infections, allergies, asthma, diabetes, obesity, cardiovascular diseases and various carcinomas both in childhood and in adulthood (1). A recent study has confirmed that human milk alleviates the onset of late metabolic disorders and provides protection against obesity and type 2 diabetes, while the World Health Organization recommends breastfeeding as mandatory in the first six months of an infant's life (2). The American Academy of Nutrition and Dietetics confirms that breastfeeding provides optimal nutrition and health care in the first six months, and that breastfeeding with a complementary diet from 6 to 12 months of age is an ideal nutritional approach for infants (3). In addition to its nutritional benefits, breastfeeding is convenient and inexpensive and it also represents an inseparable bond between the mother and the baby. The decision on breastfeeding is personal and it is often influenced by many factors. In many situations, breastfeeding is impossible or inadequate, so mothers decide for another type of infant nutrition. On a global level, only 38% of babies are exclusively breastfed with human milk (4). Human milk has a unique chemical and biochemical composition. It consists of water, proteins, lipids, carbohydrates, mineral substances and vitamins. Water is the main

component, and it makes about 87%. Lipids make up about 3.8% and provide 50% of the total energy value of milk. The protein content is about 10%, whereas about 70% of the protein is provided by whey protein (5). Milk changes throughout the day, as well as throughout the entire lactation period, and therefore we may distinguish between colostrum, transitional and mature mother's milk. Colostrum is the first food to be given to a baby, it is secreted in small quantities and is rich in immune components such as IgA, lactoferrin, leukocytes, as well as epidermal growth factor (6, 7, 8). Colostrum also contains relatively low lactose concentrations, indicating that its primary functions are immunological and trophic rather than nutritional. The levels of sodium, chloride and magnesium are higher, and the levels of potassium and calcium are lower in colostrum than in transitional and mature milk (7, 8). Transitional milk starts forming from the fifth day to two weeks after giving birth, whereas mature milk is considered to be the milk that is formed from the third week after labor. Human milk contains various bioactive factors (living cells, antibodies, cytokines, growth factors, oligosaccharides, hormones). Bioactive factors are the elements that affect biological processes and thus affect the bodily functions and ultimately our health. Mother's milk contains various growth factors that have a significant effect on the intestines, blood vessels, nervous and endocrine system of infants (9). Human milk contains many different living cells (white blood cells, stem cells). In early lactation, the infant may receive up to 10 white blood cells from the mother every day (10). Secretory IgA is the most important class of antibodies in breasts and its role is to protect the mucosal surface. There are many other anti-infective proteins, such as lysosomes and lactoferrin. The composition of mature milk is not constant, but it changes depending on the time of day, length of the breastfeeding and needs of an infant. If the infant is fed by human milk in large quantities, it meets the needs for water and, in that way, the kidneys are relieved and the baby does not retain excess fluid. At the end of breastfeeding milk is different in color, much brighter due to high fat content (9). While science has yet to discover the functions of all bioactive components, it is safe to say that breastfeeding is more than just nutrition.

Adapted formulas represent an effective replacement for the nutrition of infants. Although the production of an identical product is not possible, efforts have been invested to make a product that would be similar to human milk by its performance and which would allow normal growth and development. Cow or soy milk is most commonly used as the base, and other ingredients are added to complement the composition and make the profile of the milk that is most similar to human milk. Vitamins, minerals, fatty acids – arachidonic (AA) and docosahexaenoic (DHA) – as well as probiotics and other mostly genetically engineered compounds are usually added to adapted formulas. Providing optimum nutrition for infants is very important because the consequences of inadequate nutrition can hardly be overestimated (11). Children fed on adapted milk formulas have lower immune protection due to the lack of immunological factors provided by colostrum, as well as other bioactive factors that help protect the child during the first two years of its life when the immune and nervous systems are poorly developed (1). Apart from nutritive, the advantages of adapted milk formulas are also optimal levels of iron, iodine and vitamin D, the content of easily digestible proteins, the content of prebiotics that have a positive effect on the intestinal flora and the appropriate ratio of whey and casein proteins. The formulas themselves maintain an optimal concentration of nutrients as well as an optimal amount of essential fatty acids necessary for the proper development of infants.

Research aim

Based on a survey, the aim of this paper was to examine the extent to which adapted milk formulas are used as substitutes for human milk in infant nutrition, as well as the reasons for using and selecting adaptive milk formulas.

Methodology

Our descriptive study included the patients 20 to 40 years of age, who were randomly selected in the DONA FARM pharmacy in Niš during 2017. and who agreed to be interviewed. The survey was conducted using an anonymous questionnaire containing open-ended and closed-ended questions. The respondents completed it independently in the presence of a pharmacist, who was available in case of difficulties in understanding certain concepts. The respondents were informed about the objectives of the research, and the percentage that declined to participate in the study was 10%. Three hundred and nine correctly completed questionnaires were selected and they were the subject of further analysis. The study was conducted in accordance with the Declaration of Helsinki (12). The questionnaire consisted of several parts: socio-demographic characteristics of mothers (age, educational level), questions about the length of breastfeeding, as well as the use of adapted milk formulas. All the questions in the questionnaire offered the answers from among which the respondents had to choose (closed questions), except for the question on the reason for use of adapted milk formulas.

The statistical analysis of the data was performed by using the SPSS 20 software. A statistically significant difference was the value of $p < 0.05$, using the Student's T-Test.

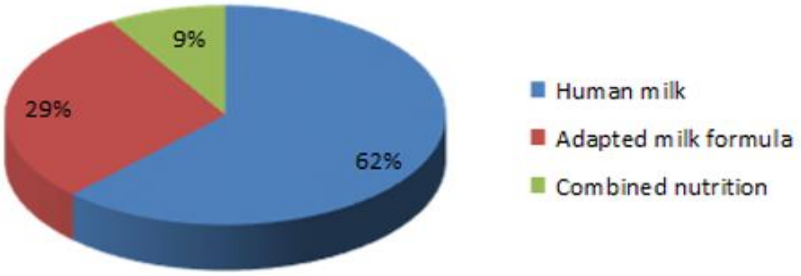
Results

From the total number of respondents, 192 (62.13%) fed infants with human milk, 90 (29.13%) used adapted milk formulas, while 27 (8.74%) fed infants with human breast milk with the addition of adapted milk formulas (Graph 1).

The demographic characteristics of the respondents are summarized in Table 1. In the upper part of the table, it can be clearly seen that the largest

number of respondents, 165 (53.4%), were over 30 years of age. In the lower part of the table, the interviewed patients were categorized according to their education. Most of them had secondary education – 186 (60.19%).

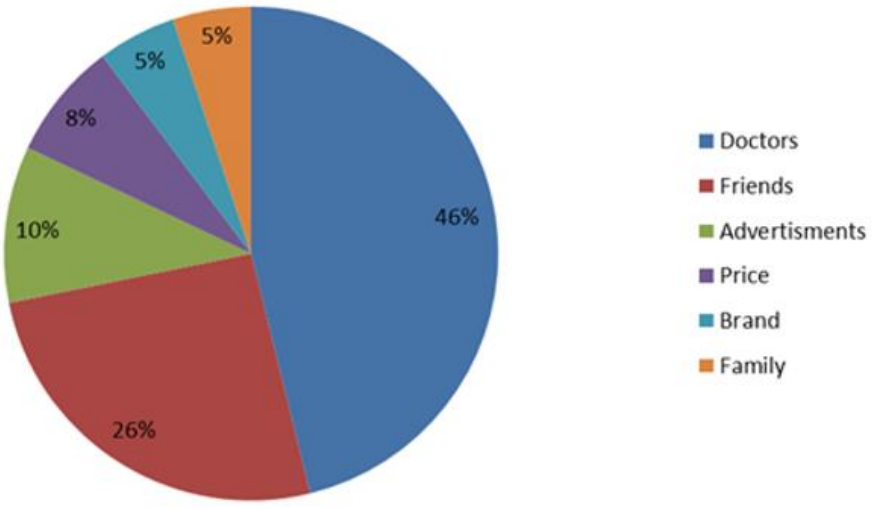
When asked about the source of the recommendation on the use of adapted milk formulas, the largest number of respondents answered that they got the recommendation from the doctor 54 (46.15%), whereas a somewhat smaller number of respondents got the recommendation from a friend 30 (25.64%). Some of the respondents were influenced by advertising 12 (10.26%), some were influenced by the price of adapted milk 9 (7.69%), whereas only a small number of respondents were influenced by the milk's brand 6 (5.13%), as well as by their family 6 (5.13%) (Graph 2).



Graph 1. Infant nutrition model

Table 1. Demographic characteristics of respondents

WOMEN	AGE			TOTAL
	20 - 25	25 – 30	> 30	
	24	120	165	309
EDUCATION	AGE			TOTAL
	20 - 25	25 – 30	> 30	
Primary	4	3	5	12
Secondary	11	83	92	186
Post-secondary	6	19	46	71
Higher	3	15	22	40



Graph 2. Factors that influence the purchase of an adapted milk formula

When asked about the brand of adapted milk they used, most mothers said that they used Novalac brand 36 (30.77%). On the other hand, Humana was used by 27 (23.08%), Aptamil by 24 (20.51%), Nestle by 15 (12.82%), Hipp by 9 (7.69%), whereas a much smaller number of respondents decided to use Bebelac 6 (5.13 %). When asked about the reason for use of adapted milk formulas instead of human milk, the majority of respondents 75 (64.1%) said that the reason was the absence of milk secretion, while a smaller number of respondents 27 (23.08%) said that the reason was insufficient milk secretion, while 15 (12.82%) did not want to state the reason. The largest number of respondents bought the milk formula in a pharmacy, as many as 90 (76.92%), a slightly lower number in a super market, 27 (23.08%), while no one responded positively to the question about online shopping. One of the questions in the survey was whether the patients had used some medications on their own initiative during the pregnancy. The answers we received from the respondents were that they most often used analgesics on their own initiative due to headache, stomachache, toothache and in cases of cold and flu.

Discussion

According to the results of our research, the respondents with a higher level of education and older age have a more positive attitude towards breastfeeding, which can be explained by a more responsible attitude toward the condition in which they are. This study showed that a large number of women (62.13%) breastfed their children with human milk. Many studies have shown that educated women have a higher awareness of breastfeeding and that they support breastfeeding more than women with lower levels of education (13). The promotion and support of breastfeeding and the awareness of the community as to the implementation of breastfeeding recommendations represent a significant step in our health care system. The World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF) recommend that breastfeeding should be continued until the second year of life, and even later. A particular emphasis on the continuation of breastfeeding is placed in the countries where hygiene is poor and where infection rates are high (14, 15) The American Academy of Pediatrics recommends breastfeeding for at least 12 months, while European countries, such as Denmark and the UK, recommend breastfeeding for 6 months (16). According to the UK guidelines, if there is no possibility of breastfeeding, the most appropriate option for the nutrition of babies is an adapted formula for babies (17, 18). Adapted formulas are an effective substitute for human milk and they are formulated in such a way as to imitate the nutritional composition of human milk. All adapted formulas must meet certain standards that would affect the normal growth and development of infants (19). The production process itself is highly regulated and supervised in order to meet the national and international quality criteria (20, 21). Over the next five years, baby food in the form of adapted formulas is expected to be the fastest growing category of food products (22). Formulas for babies must have an adequate amount of water, carbohydrates, proteins, fats, vitamins and minerals. The composition of the formula for babies is strictly regulated and each manufacturer must follow the prescribed guidelines. The required range of nutrients must be maintained throughout the entire shelf life of the product (23, 24). For amino acids, it is only allowed to add L-shaped amino acids, while D-shapes are not allowed as they can cause D-acidosis (25). Fructose should be avoided due to fructose intolerance, as well as hydrogenated fats and oils that are not generally permitted in the product. The World Health Organization (WHO) has sent an announcement that cow's milk and goat's milk should not be used in infants due to various harmful effects to their health. In addition to the WHO guidelines, local agencies from different countries control and follow the regulations on children's formulas, including the requirements for quality of production practices in their countries. From the manufacturers' perspective, it is in their best interest to continuously improve their products in order to obtain a formula that would be identical to human milk. There are three main classes of milk for babies: formulas based on cow's milk, soybeans and specialized formulas (23, 24). According to the American Academy of Pediatrics, young children of one year of age should not be fed with raw, unmodified or unpasteurized cow milk as a substitute for human milk or formula (26). Recent studies have shown that high protein content in the formula is associated with high body weight in childhood, which can lead to a 20% increased risk of obesity later in life (27), whereas cow's milk is one of the most common causes of food allergy (28). Soybean protein formulas are the effective options for infants with galactosemia or congenital lactose deficiency, and they can help with colic allergies. However, it rarely happens that children allergic to milk are also allergic to soy (29). Soy-based products should not be used in infants under the age of six months with food allergies (30). Further, the addition of probiotics to the formula represents a key strategy for reducing the incidence and severity of diarrhea in infants. Specialized formulas are prescribed by the doctor because they are intended for nutrition when there are certain problems (31).

Conclusion

While science has yet to discover the functions of all the bioactive components of both human milk and adapted milk formulas, it can be said with certainty that adapted milk formulas are considered the best choice in the cases of insufficient secretion of mother's milk, as well as a supplement to breastfeeding of babies that do not progress adequately in terms of their body weight. This research showed that the decision on the use adaptive milk formulas was the result of consultation with the pediatricians, and this fact gives a special contribution to the appropriate development of infants.

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ADAPTIRANE MLEČNE FORMULE U ISHRANI DECE

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Iz perspektive evolucije, humano mleko predstavlja biološku normu, odnosno zlatni standard kada je u pitanju ishrana novorođene dece, dok se adaptirane formule koriste kao efikasna zamena za ishranu odojčadi.

Cilj ovog rada bio je da se na osnovu ankete ispita u kojoj meri se adaptirane mlečne formule koriste kao zamena za humano mleko u ishrani odojčadi, kao i da se ispitaju razlozi za korišćenje i odabir adaptiranih mlečnih formula.

Intervjuisano je ukupno 309 ispitanica podeljenih u tri starosne kategorije: one starosti od 20 do 25 godina; od 25 do 30; i preko 30 godina.

Od ukupnog broja ispitanica, 62,13% hranilo je odojčad humanim mlekom, 29,13% adaptiranim mlečnim formulama, dok je 8,74% dojilja uz humano mleko dohranjivalo odojčad adaptiranim mlečnim formulama. Analizom podataka dobijene su prosečne vrednosti težine beba, u zavisnosti od toga da li su hranjene humanim mlekom ili adaptiranom mlečnom formulom, nakon tri meseca i utvrdjeno je da je postojala statistički značajna razlika u težini beba između žena koje su dojile i koje su hranile odojčad apatiranim mlečnim formulama ($p < 0,05$). Na pitanje o izvoru preporuke o korišćenju adaptiranih mlečnih formula, najveći broj ispitanica odgovorio je da je preporuku dobio od stane lekara (46,15%), dok je kao razlog korišćenja adaprtirane mlečne formule najveći broj naveo izostanak lučenja mleka (64,10%).

Istraživanje pokazuje da odojčad hranjena adaptiranim mlečnim formulama dobija na težini brže od dojene odojčadi, što je tendencija koja može da posluži kao hipoteza da će veštački hranjene bebe kasnije u životu biti gojazne. Benefit same studije bio je da je odluka o korišćenju adaptiranih mlečnih formula, bez obzira na nivo obrazovanja ispitanica, bila rezultat konsultacije sa pedijatrom, a ta činjenica daje poseban značaj kvalitetnom razvoju odojčadi.

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Ključne reči: *adaptirane mlečne formule, ishrana, odojčad*