infants and young children need. Certainly, these are effective ways to ensure all the essential nutrients that are needed for a child’s proper growth and development [1].

Appropriate intake of nutrients that are needed for a child’s growth and development is fed during infancy and early childhood in order to provide him with appropriate nutrients that will enable his proper growth and development. The purpose of the present study was to determine the association between the dominant feeding patterns in early childhood and the manifestation of speech and language disorders in children aged 3 to 6 years. Material and Methods. A cross-sectional study was conducted during 2020 - 2021 and it included 100 children of typical development, aged 3 to 6 years. The research used the Child Development Inventory, as a developmental screening instrument. The questionnaire on feeding patterns was designed for the purpose of this research. For data entry and processing, the Statistical Package for the Social Sciences 20.0 software was used.

Results. There were no significant differences between the age categories of children in terms of deviations in the development of expressive and receptive speech. Most of the examined children (55%) were bottle-fed, whereas the remaining 45% were breastfed. A significantly higher percentage of bottle-fed children showed a deviation in the development of expressive and receptive speech compared to children who were breastfed for at least the first 6 months (74.5% versus 8.9%). Conclusion. Bottle-fed children showed a greater number of deviations in the development of both expressive and receptive speech, compared to breastfed children. Deviations in speech and language development were registered at each examined age, which means that speech and language disorders are not detected and treated in a timely manner.

Key words: Feeding Behavior; Speech Disorders; Language Disorders; Speech-Language Pathology; Breast Feeding; Bottle Feeding; Infant; Child, Preschool

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Conclusion. Bottle-fed children showed a greater number of deviations in the development of both expressive and receptive speech, compared to breastfed children. Deviations in speech and language development were registered at each examined age, which means that speech and language disorders are not detected and treated in a timely manner.

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Introduction. Feeding patterns include manners in which a child is fed during infancy and early childhood in order to provide him with appropriate nutrients that will enable his proper growth and development [1].

Breastfeeding is one of the healthiest and most effective ways to ensure all the essential nutrients that infants and young children need. Certainly, these are not the only benefits associated with breastfeeding, as one of the feeding patterns. In addition to meeting the infant’s nutritional needs, it has been associated with mother-infant bonding via the provision of regular intimate interaction between mother and child and stimulation of all senses that improve the child’s psychomotor, intellectual and language development [2]. Equally, breastfeeding reduces the severity of respiratory diseases during infancy, otological diseases and gastrointestinal infections, malnutrition and the de-
velopment of obesity, while it also affects the overall development of speech and language and motor skills [3–5].

The World Health Organization, pediatricians across the globe, as well as numerous Breastfeeding Associations recommend breastfeeding as the healthiest, easiest, and the least expensive way to feed a baby [6]. Breastfeeding is recommended as the primary method of feeding by 6 months of age due to its long-term benefits for the overall child development, including speech and language development [7].

In maternity hospitals around the world, as well as in our country, newborns are placed directly on their mother’s chest immediately after birth to ensure the first contact with the newborn child. Also, it is important to establish an effective breastfeeding technique for newborns including both how mothers should get their babies latched on properly at the breast and find a comfortable position when they are breastfeeding [8].

On the other hand, bottle-feeding is one of the feeding patterns used as breast milk replacement. It requires the use of an artificial nipple, either by bottle or pacifier and formula feeding [9]. Nowadays, the majority of mothers are familiar with both breast and bottle-feeding patterns.

With regard to mouth movements during breastfeeding, the newborns open their mouth wide enough to catch their mother’s nipple, while when bottle-feeding, babies do not have to open their mouth wide to latch onto the artificial nipple, or pacifier. During breastfeeding, the baby’s top and bottom lips are curled outward, more relaxed and closer to each other. Additionally, breastfeeding and bottle-feeding differ with respect to the infant’s jaw movements toward the inside of the mouth. Although a reduction in jaw movements was observed during breastfeeding, the activity of the perioral muscles during breastfeeding is higher than during bottle-feeding. Inadequate muscle tone gradually leads to the disturbed dynamic of muscle balance in the tongue, lips and cheeks. Pacifiers are made of a thicker material and they have different shape than the breast tissue and thus they lead to a non-physiological pressure in the oral cavity and limit the normal growth and development of the palate and occurrence of malocclusion [10, 11]. This type of infant feeding pattern can cause difficulties associated with the dental bite development due to the reduced muscular activity, resulting in altered dentition, as well as increased risk of developing speech and language disorders, with articulation and phonological disorders as the most common. Deviations in speech and language from developmental norms are more common in infants who are bottle-fed due to inadequate stimulation of oral muscles, which is not the case with breastfeeding [12, 13].

In addition, tube feeding is used as an alternative to breastfeeding and bottle feeding. It is often used to feed prematurely born babies, either fed via an orogastric or a nasogastric tube. Preterm babies are often prone to experience feeding difficulties that are related to the coordination of breathing, sucking and swallowing as compared to babies born at term. Correspondingly, premature babies are fed via a feeding tube, thus enabling them to receive adequate nutrition support for their proper growth and development in an alternative way. The use of gastric feeding tubes does not require the activation of speech organs and speech motor areas, leading to delayed stimulation of speech organs and muscle activation [14–16]. A number of studies have shown that bottle-fed infants have speech difficulties, changes in jaw development, as well as teeth alignment problems and a poor bite. Therefore, this issue has been receiving increased attention in recent years. In addition to more frequent deviations in speech and language development in bottle-fed infants, it was noted that children produce their first words later than breastfed children, often causing delayed or slower speech and language development. It is considered that additional and timely educational supports for parents, especially mothers, is needed, in order to raise awareness of negative aspects and effects on bottle feeding [17–19].

The effects of different feeding patterns are factors that can contribute to a child’s speech and language development, as well as a child’s ability to speak properly, but also to deviations in speech that require appropriate intervention by speech and language specialists. Moreover, breastfeeding has been shown to be a protective factor for proper speech and language development, as well as the overall development of children [1, 16, 20–23].

The purpose of the present study was to determine the relationship between dominant feeding patterns and speech and language disorders diagnosed in children aged 3 to 6 years. We hypothesized that children, who were breastfed until at least 6 months of age, had a lower incidence of speech and language disorders.

**Material and Methods**

The research was conducted as a cross-sectional study in 2020–2021 in kindergartens within the Primary School “Brača Novakov” in Silbaš, Despotovo and Parage, which are the surrounding villages of the municipality of Bačka Palanka.

The research included 100 typically developing children, aged between 3 and 6 years. Inclusion criteria for participation in the present study were parent or guardian informed consent, children aged from 3 to 6 years without developmental disabilities. As for the breastfeeding pattern, infants were breastfed for at least the first 6 months. Only children whose parents signed the consent for their child’s research participation were included in the sample. Thereupon, the research was approved by the Ethics Committee of the Faculty of Medicine in Novi Sad.
After obtaining a written consent from a school principal, the parents were given participant information sheets and consent forms. Then, the parents were given questionnaires with detailed instructions on how to fill them out. The average time required to fill out the questionnaire was about 20 minutes.

The Child Development Inventory (CDI), created by Dr. Harold Ireton in 1992, was used as a developmental screening instrument in this research [24]. The CDI is a standardized screening tool with high sensitivity (over 80%) while the validity of the test was confirmed by a sample of 1278 children aged 15 to 72 months in France. The CDI is a screening instrument comprising eight domains of child development and the General Development Scale. The instrument consists of 270 items that describe child’s behavior from 15 to 72 months of age. The questionnaire is easy to use and does not require much time to complete. Parents complete the test by circling YES/NO next to each statement. The subscales found in this questionnaire measure the child’s present development in eight areas: social, self-help, gross motor, fine motor, expressive language, language comprehension, letters, and numbers. The General Development Scale summarizes achievements on 8 subscales. The expressive language subscale contains 50 questions ranging from a simple gesture to a complex language structure, short story retelling, past and future events, proper use of grammar forms such as tenses. On the other hand, the receptive language subscale consists of 50 questions and describes language comprehension including items that range from understanding simple orders (responding to name, showing age-related body parts) to multi-level orders [24].

When scoring the test, only the YES response options were collected for each scale. Following the instructions given in the manual, the child’s age-related development was calculated for each area. Children whose performance was 2 standard deviations (SDs) below the mean in at least one area of development were eligible for early intervention services due to developmental delay.

The Feeding Practices Questionnaire was developed for the purpose of this research. It was designed for parents or guardians in order to gather information about their children’s feeding patterns, the manner in which the child was fed, the age at which solid foods were introduced, as well as the age at which the child spoke his first words.

The Statistical Package for the Social Sciences 20.0 software was used for data entry and processing. For the purpose of structural and descriptive analysis of the sample according to the relevant variables, frequency distribution and percentages were used, in order to show the representation of a certain category or response. The characteristics of the numerical data were processed using standard procedures of descriptive and comparative statistics for the analysis of numerical features. As part of descriptive statistics, data are presented in the form of arithmetic mean, SD, as well as frequency and percentage. In the context of comparative statistics, the Pearson’s coefficient of linear correlation and chi-square test were used. In the tests applied, the threshold probability (p) value corresponded to the significance level of 95% (p < 0.05) and 99% (p < 0.01).

Results

The sample included 100 respondents, 43% of girls and 57% of boys aged from 3 to 6 years. As shown in Table 1, 20% of children were from 3 to 4 years of age, 25% were 5 years of age, while a slightly higher number of respondents were in the age category of 6 years (35%). The age range included children between 36 and 72 months with a mean age of

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60.6 (12.9%) months. As for the parents’ educational level (Table 1), the largest percentage of parents had a secondary education (55%), while the next most frequent were parents with a primary education. In the examined sample, 18% of parents had a degree in vocational college and higher education.

Using the $\chi^2$ test, the association between the speech and language disorders and belonging to the same age-group was assessed. The results are shown in Tables 2 and 3.

As shown in Table 2, using the $\chi^2$ test, no statistically significant differences were found between different age groups (3, 4, 5 and 6 years), in terms of deviations in the development of receptive speech.

As it can be seen in Table 3, by using the $\chi^2$ test, no statistically significant differences were found between different age groups of children in terms of receptive speech.

Using the Pearson’s correlation coefficient, the linear relationship between children’s age in months and presence of speech and language disorders was assessed. The results are shown in Table 4.

As shown in Table 4, assessing the association between children’s age and speech and language disorders, there is no evidence of a statistically significant relationship between children’s age and the expressive speech development, as well as between the children’s age and the development of receptive speech.

With respect to the correlation of feeding frequency for breastfed and bottle-fed children by the time they are 6 months old, a slightly higher percentage (55%) of examined children were bottle-fed compared to those who were breastfed (45%).

Using the $\chi^2$ test, the relationship between different feeding patterns and the presence of speech-language disorders was assessed. The results are shown in Tables 5 and 6.

The results of the $\chi^2$ test showed that there was a significant relationship between feeding patterns and expressive language development at $\chi^2 = 43.11; p < 0.001$. It can be seen that a significantly higher percentage of bottle-fed children showed a deviation in the development of expressive speech compared to children who were breastfed for at least the first 6 months (74.5% vs. 8.9%) (Table 5). In other words, 91.1% of breastfed children showed no disorders in the domain of expressive language, i.e., language production, compared to 25.5% of children who were bottle-fed.

As seen in Table 6, the results of the $\chi^2$ test showed a significant relationship between feeding patterns and receptive language development at $\chi^2 = 22.64; p < 0.001$. It can be noticed that a higher percentage of bottle-fed children showed deviations in the development of receptive language skills, i.e., deviations in speech comprehension, compared to breastfed children (43.6% vs. 2.2%). In other words,
97.8% of children who were breastfed until they were 6 months old did not show disorders in the domain of receptive language skills compared to 56.4% of children who were bottle-fed.

**Discussion**

The World Health Organization, United Nations Children's Fund (UNICEF), pediatricians throughout the world, as well as numerous associations recommend guidelines on breastfeeding as the healthiest, most appropriate feeding option available, and the least expensive due to its stimulating and protective effect on the overall child's growth and development [7]. Statistics show that the percentage of breastfed children has increased and that in 2000, 36% of children were breastfed, and in 2015, as many as 43%. In 1997, Sweden ranked highest with 97% (26.27) of infants who were breastfed until 6 months of age [25, 26].

A study by Asara et al. [27] indicates a high percentage of breastfeeding as a feeding pattern (77.3%), while the percentage of bottle-fed children was 22.7%. A study conducted in Mexico showed that the percentage of breastfeeding as a feeding pattern until 6 months of age accounted for 31%, while the percentage of adapted formula-fed infants in the same age group was 69%. In Indonesia, the percentage of breastfed infants was 42%, while 58% of infants were bottle-fed [28].

The UNICEF data show that there are only 13% of women in Serbia who breastfeed their children until 6 months of age, which is a small percentage, thus requiring interventions to increase their awareness of the benefits of breastfeeding [25].

The research data that have been obtained for the purpose of this study show that 45% of infants are breastfed compared to those bottle-fed, which is slightly higher and amounts to 55%. These data are in line with the findings of other studies [28, 29], which suggests that the percentage of breastfed children is lower compared to the percentage of bottle-fed children. There are different reasons why women choose bottle-feeding instead of breastfeeding. The most frequently cited reasons to stop breastfeeding in the study conducted in the United Kingdom were related to the fact that many mothers experience discomfort or pain or they do not see benefits of breastfeeding as a feeding practice. As stated in the previous research, one of the benefits of bottle feeding arises from the fact that in this way other family members are more likely to be actively involved in feeding babies and bonding experience, as well as that mothers have the opportunity to be away from home longer and return to work before the end of their maternity leave [6]. Results of a longitudinal study that followed the impact of breastfeeding on a number of areas of children's development, from birth to the age of three, showed that in terms of language development breastfeeding reduces the risk of speech disorders by 50 – 60% compared to children who are being fed otherwise [30]. As pointed out earlier, different feeding patterns can also affect early speech and language development in children [15, 16, 20, 22, 23].

In our research, we identified speech and language disorders among children 3 to 6 years of age. The obtained data indicate that there is no statistically significant difference between different age categories in relation to the presence of deviations both in speech production and speech-language comprehension. As already shown in studies by Campbell et al. and Schriber et al. [31, 32] the prevalence of speech and language disorders in children varies with their age. It is increasing from 15 – 16% at the age of 3, while decreasing to 4% at the age of 6 years. A smaller percentage of speech and language disorders in children aged 6 is explained by timely detection of the child with speech delay and early onset of speech and language therapy at the youngest possible age.
Our results are not in line with previous research findings, indicating that there is no difference in deviations in speech-language development based on ages and thus speech and language disorders can be found at any age. Hence, we can assume that children from the examined groups were not referred for assessment in a timely manner for speech and language disorders. In a research [13, 15, 16, 19, 20] examining the impact of different feeding patterns on children's speech and language development, the assessment of the effects of breastfeeding and bottle feeding was carried out; the results suggest that a larger number of deviations in speech and language development have been found in bottle-fed than in breastfed children. Breastfed children scored higher on tests that assessed speech comprehension, the number of words produced correctly and better articulation of sounds compared to bottle-fed children. The research confirms and suggests protective effects of breastfeeding on the overall child development [20].

Given that a significantly higher percentage of bottle-fed children demonstrated deviations precisely in these areas of speech-language development, our research findings are in line with the data provided by these authors.

Therefore, we investigated speech and language development through expressive language development acquisition, i.e., speech production skills. The data we obtained indicate that as many as 74.5% of bottle-fed infants show deviations in speech production compared to 8.9% of breastfed infants. A research by Vieira et al. [33] indicates that breastfed children do not show statistically significant deviations in speech production, although bottle-feeding contributes to the reduction of orofacial region muscles, which significantly affects the occurrence of articulation disorders. Further Brisque Neiva et al. [34] suggest that deviations in expressive language, i.e., language production, are lower if the child is breastfed due to effects of stimulation to the motility of oral cavity. Accordingly, Barbosa [16] in her research examined the influence of bottle feeding and breastfeeding as a feeding pattern on the development of expressive speech. Out of a total of 128 children, 42.6% of bottle-fed children showed deviations in expressive speech, and the study revealed that among the barriers cited were the inactivation of oral muscles, poor and altered dentition, as well as changes in dental bite that were recorded during the study [12, 34].

In our research, we have also assessed the influence of breastfeeding and bottle feeding on the development of receptive language skills, i.e., language comprehension in children. The data that we obtained are in favor of the fact that bottle-fed children, in 43.6% of cases show a deviation in the development of receptive speech compared to children who are breastfed [2.2%]. In both cases, the development of expressive and receptive speech showed greater deviations from developmental norms in bottle-fed children, therefore we can conclude that the assumption we made at the very start of the present study proved to be true.

Conclusion

A large number of studies have confirmed that disorders in children’s speech and language development have a number of possible causes and infant feeding patterns have been reported as one of the possible causes.

Deviations in speech and language development were registered within every age group of the sample, which means that a number of speech and language disorders were not detected and treated in a timely manner.

The incidence in deviations of expressive and receptive speech is higher in bottle-fed children as compared to breastfed children.

The present study underlines the need for further more detailed research in order to determine specific deviations in children’s speech and language development as early as possible by using more precise instruments and screening tests, and thus comparing the effects of different feeding patterns on the test achievements.

References


