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Abstract

Introduction: The pacifier is a non-nutritive sucking habit that constitutes a physiological activity during the first months of the baby's life. However, if this habit is prolonged beyond the recommended age, it can affect the establishment of a correct dental occlusion and favor the appearance of secondary habits.

Objectives: The aim of this study is to determine the parents' and non-parents' level of awareness regarding the pacifier's habit and the consequences associated with its late withdrawal. As a secondary objective, it has been proposed to evaluate the age of onset and withdrawal of the pacifier in the children of the studied sample.

Material and methods: A cross-sectional descriptive study has been conducted through an online form.

Results: 515 people have filled in the online form. Both parents and non-parents have obtained the same number of correct answers in the form. 75.74% of parents and 82.49% of non-parents demonstrate awareness regarding the maximum recommended age of withdrawal. In addition, 78.11% of parents and 85.31% of non-parents are also aware of the relation between its prolonged use and the development of malocclusions. 88.43% of children start using the pacifier at birth, and 50.92% of them continue to use it after the age of two.

Conclusions: Both the parents' and non-parents' group show a medium level of knowledge regarding the pacifier's habit and the consequences of its late withdrawal. Most children start using the pacifier at birth and half of them leave it after the age of two.

Keywords: Pacifier, malocclusion, habits, non-nutritive.

INTRODUCTION

Newborn babies are born with various adaptive reflexes that facilitate their development during the first weeks and months of life. Non-nutritive sucking (NNS) is developed during intrauterine life and is important for stimulating the coordination of breathing and deglutition. Thus, it is a precursor to nutritive sucking (NS). This last action occurs when the breastfed baby uses a feeding bottle or during maternal breastfeeding. (1–8)

Pacifier is the most common NNS device and 75-95% of the population uses it during the first years of life. (9–11) Its calming effect is the best-known beneficial aspect, but it has also been related to a protective effect

against Sudden Infant Death Syndrome (SIDS), to a lower risk of developing allergies, and to a decrease of the pain during some medical procedures such as venipuncture. (1–4)

Nevertheless, pacifier's use has been related to general pathology (shorter duration of the exclusive breast feeding, speech interference and caries), malocclusions or secondary habits. (12–16)

In terms of malocclusions, the use of pacifiers can damage the development of orofacial structures and, consequently, it leads to anterior open bite (AOB), posterior crossbite (PC), overjet (OJ) and class II malocclusion (CII). (1,2,17–21)

Likewise, secondary habits such as mouth breathing (MB), atypical deglutition (AD) and finger sucking (FS) have been found, which are a consequence of the morphological deformation caused by a primary habit like pacifier sucking is. (1,9,11)

All these negative effects of the pacifier's use depend largely on the duration and frequency of use. (2) Currently, the American Dental Association (ADA) (22) and the American Academy of Pediatric Dentistry (AAPD) (23) recommend the to withdraw the pacifier before the age of 48 months, but it has been proves that its prolonged use beyond the age of 24 months is related to a higher prevalence of malocclusions and secondary habits. Moreover, it has been noted that self-correction is possible when the stimulus is removed before the age of two. (24,25)

There are pediatric information campaigns of the "Generalitat de Catalunya" that deal with the importance of breastfeeding, vaccines, nutrition and

Section I. Socio-demographic data

oral health problems such as dental caries. Even though, there are no specific programs on the correct use of the pacifier.

Therefore, the aim of this study is to determine the parents' and non-parents' level of awareness regarding the pacifier's habit and the consequences associated with its late withdrawal. As a secondary objective, it has been proposed to evaluate the age of onset and withdrawal of the pacifier in the children of the studied sample.

MATERIAL AND METHODS

Pacifier's Habit Form

A cross-sectional descriptive study has been conducted in the city of Barcelona, Spain, during the months of April and May 2020. *(Figure 1)* All participants have been informed about the aims and procedures of the study and they all have signed the informed consent form.

T	Cay	Man	
1.	JEA	Maman	
	-		
		Indefinite	
11.	Age	16 - 20	()
		21 - 40	()
	_	41 - 60	()
		> 60	()
III.	Are you father or mother?	Yes	()
	-	No	()
IV.	Number of children		
Sec	tion II. Age of onset and age of withdrawal of the pac	rifier for each child	
V.	Has your child used a pacifier?	Yes	()
		No	()
VI.	At what age did he/she start using it?	From birth	()
		From 2 months	()
VII.	At what age did he/she stop using it?	Before 2 years old	()
		After 2 years old	()
(Th	is section is shown as many times as the number of child	lren parents refer to having.)	
Sec	tion III. Knowledge about the pacifier habit		
1.	From what age do you think pacifier can be used?	From birth	()
		From 2 months*	()
		It should not be used*	()
2.	What is the age at which it is recommended to stop	Before 2 years old*	()
	using the pacifier?	After 2 years old	()
З.	Do you think there is a relation between the prolonged use of the pacifier and the position of teeth?	Yes*	()
		No	()

4.	Do you think the pacifier is related to late eruption of	Yes	()
	teeth?	NO*	()
5.	Do you think the pacifier habit may be related to the	Yes*	()
	finger sucking habit?	No	()
6.	Do you think the use of the pacifier and the duration of	Yes*	()
	breastfeeding are related?	No	()
7.	Do you think that the use of the pacifier has a protective	Yes*	()
	effect against Sudden Death Syndrome?	No	()
8.	Which type of pacifier do you think is better?	Conventional pacifier	()
		Anatomical pacifier*	()
		I do not know	()

Fig1. Online form

An online questionnaire has been used to determine the knowledge of two groups (parents and non-parents) living in Catalunya, Spain, regarding the pacifier's sucking habit and the consequences associated with its late withdrawal.

It is a questionnaire with three sections and multiple answer. In the first section, demographic data has been collected. The second section has only been answered by the parents' group, and it has been asked, for each child, whether or not the pacifier was used, at what age it started to be used and at what age it was withdrawn. The third section contains eight questions and aims to evaluate the knowledge of parents and non-parents about the pacifier's habit and the consequences of its late withdrawal. The majority response of each group has been taken in order to be able to compare the awareness between both groups.

STATISTICAL ANALYSIS

A descriptive analysis has been conducted to define the characteristics of the groups and the data obtained from the questionnaire. Categorical variables are described by absolute frequencies (n) and relative frequencies (%).

The obtained data has been entered into the Microsoft Excel (Microsoft®, Redmond, Washington) and statistical analysis has been done with SPSS-PC version 25 (SPSS Inc., Chicago, USA).

RESULTS

515 answers have been obtained from the questionnaire. In Table 1, demographic characteristics of the studied population can be observed. The majority age range was between 21 and 40 years old (73.98%), followed by the group between 41 and 60 years old (17.88%), the over 60 years old group (4.47%) and the group between 16 and 20 years old (3.69%). 86.80% of the obtained answers came from the female sex and 13.20% came from the male sex. Finally, a total of 338 parents (65.63%) and 177 non-parents (34.37%) responses were obtained.

		n (%)
Parents	Yes	338 (65,63)
	No	177 (34,37)
Sex	Male	68 (13,20)
	Female	447 (86,80)
	Total	515 (100)
Age	16-20 years old	19 (3,69)
	21-40 years old	381 (73,98)
	41-60 years old	92 (17,88)
	>60 years old	23 (4,47)

 Table 1. Demographic characteristics of the studied population

Table 2 presents data related to the use of pacifiers by the children of the surveyed parents. Out of a total of 525 children, 436 of them (83.05%) have used pacifiers. Of these, the majority (88.43%) started using it at birth, and 12.38% started using it after the age of two months. On the other hand, 49.08% of them have had their pacifiers withdrawn before the age of two years and 50.92% have had them withdrawn after the age of two years.

Table2. Age of onset and withdrawal of the pacifier of the children in the studied population

		n (%)
Onset	From birth	382 (88,43)
	> 2 months	54 (12,38)
Withdrawal	< 2 years old	214 (49,08)
	> 2 years old	222 (50,92)

Finally, table 3 shows the answers of parents and non- parents among the pacifier use.

Table3. Population survey. Questions and answers from parents and non-parents about the pacifier's habit and the consequences associated with its late withdrawal.

	Parents n (%)	Non-parents n (%)				
1. From what age do you think the pacifier can be used?						
From birth	214 (63,31)	74 (41,81)				
From the age of 2 months*	63 (18,64)	82 (46,33)				
It should not be used*	61 (18,05)	21 (11,86)				
2. What is the age at which it is recommended to stop using the pacifier?						
Before the age of 2*	256 (75,74)	146 (82,49)				
After the age of 2	82 (24,26)	31 (17,51)				
3. Do you think there is a relation between the prolonged use of the pacifier and the position of teeth?						
Yes*	264 (78,11)	151 (85,31)				
No	74 (21,89)	26 (14,69)				
4. Do you think the pacifier is related to	the late eruption of teeth?					
Yes	25 (7,40)	65 (36,72)				
No*	313 (92,60)	112 (63,28)				
5. Do you think that pacifier's habit may	be related to the finger sucki	ng habit?				
Yes*	112 (33,14)	154 (87,01)				
No	226 (66,86)	23 (12,99)				
6. Do you think that the use of the pacifi	er and the duration of breast	feeding are related?				
Yes*	57 (16,86)	86 (48,59)				
No	281 (83,14)	91 (51,41)				
7. Do you think that the use of paci Syndrome?	fier has a protective effect	against Sudden Infant Death				
Yes*	154 (45,56)	15 (8,47)				
No	184 (54,44)	162 (91,53)				
8. Which type of pacifier do you think is better?						
Conventional pacifier	19 (5,62)	18 (10,17)				
Anatomical pacifier*	220 (65,09)	53 (29,94)				
I do not know	99 (29,29)	106 (59,89)				
The asterisk represents the correct answer, not visible at the time of the questionnaire by the participants.						

Taking as valid the majority answer of each group, both parents and non-parents have correctly answered four out of eight questions.

Regarding the first question related to the appropriate age to start using pacifiers, 63.31% of parents and 41.81% of non-parents think that it can be used from the moment of birth.

By contrast, 18.05% of parents and 11.86% of nonparents think that it should not be used. On the other hand, 18.64% of parents and 46.33% of non-parents believe that the appropriate age to start using pacifiers is from the age of two months.

In terms of the maximum age for pacifier's withdrawal, 75.74% of parents and 82.49% of non-parents think that it should be withdrawn before the age of two years, while 24.26% of parents and 17.51% of non-parents consider that they can remove it after that age.

For what concerns the question about the relation between the time of pacifier's use and the position of the teeth, 78.11% of parents think that there is a relation. In the non-parents' group, 85.31% of them also consider this to be the case.

About the question that relates the pacifier's use with the late eruption of teeth, 92.60% of parents and 63.28% of non-parents think that it is not related.

Regarding the use of the pacifier and the appearance of the finger sucking habit, only 33.14% of parents consider that there is a connection. By contrast, the majority of the non-parents' group (87.01%) think that there is.

On the other hand, regarding the use of the pacifier and the relation with the duration of maternal breastfeeding, only 16.86% of parents and 48.59% of non-parents consider that there is a relation.

In terms of the pacifier's protective effect against SIDS, 45.56% of parents are aware of this protective effect, whereas only 8.47% of the non-parents are aware of it.

Finally, for what concerns the question about which type of pacifier is best, most parents (65.09%) believe that the anatomical pacifier is best. For non-parents' group, most of them (59.89%) do not know which pacifier is best.

DISCUSSION

Regarding the population's knowledge of the pacifier's habit and the consequences of its late withdrawal,

In terms of the pacifier's withdrawal, a maximum age of four years of life has been reported, in order to prevent ear infections, recurrent gastroesophageal problems (26) and to avoid speech interference (12). In addition to prevent the appearance of dental malocclusions and secondary habits, it should be ideally removed before the age of two, so that selfcorrection is allowed. (24,25)

Among the malocclusions associated with the pacifier's use, AOB, PC, OJ and CII stand out. (1,2,17–21) Also, the negative effects of the pacifier's use depend largely on the duration and frequency in which it is used. It has been shown that the longer the duration of the habit is, the higher the frequency of malocclusion is. (11)

Both the majority of parents and non-parents demonstrate to be aware of the maximum recommended age for the pacifier's withdrawal, as well as its connection with malocclusions. Even so, the prevalence of children using it for longer than recommended remains still high. In the present study, 50.92% of children continue to use the pacifier after the age of two.

The Spanish Pediatrics Association (AEP for its acronym in Spanish) and the AAP recommend avoiding the use of pacifiers until maternal breastfeeding is well established, generally between the first and the second month of life. (27) However, both the majority of parents and non-parents believe that it can be used from the moment of birth. In fact, the children in the studied population have started using it from the moment of birth in 88.83% of cases.

By contrast, other sources such as the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) believe that pacifiers should not be offered to babies because they are one of the main causes of early weaning. (15) According to this idea, it has been observed that there is a certain tendency (18.05% for the parents' group and 11.86% for the non-parents' group) not to use the pacifier.

If the pacifier's habit starts when maternal breastfeeding is not yet established, that is, before the age of two months of life, it can interfere with proper

sucking and cause nipple confusion, leading to early weaning. (4,6)

Most of parents believe that the pacifier's use and the duration of maternal breastfeeding are not related. By contrast, non-parents have obtained a very equal percentage between those who think that there is a connection and those who do not think so.

In recent years, the so-called orthodontic or anatomical pacifiers have been introduced on the market. Its design intends to simulate the anatomy of the mother's nipple by replicating the patterns of muscle contraction, tongue's position and nasal breathing, actions that occur during maternal breastfeeding. In this way, neither the growth nor the development of the face and occlusions are interfered. (17,25,28) In fact, a lower prevalence of AOB has been detected in children who have used the anatomical pacifier in contrast to the traditional one. (20)

In the present study, most of the parents are aware of the advantages of this device, as opposed to the nonparents, most of whom are unaware of them.

On the other hand, the use of the pacifier is accepted during the first year of life since it decreases the risk of SIDS due to its influence on the control of the autonomic nervous system and the cardiovascular system in the baby. (4,29) In the present study, the majority in both groups is not aware of this relation.

Regarding secondary habits associated with pacifier's use, it has been asked about the FS habit, since it is sometimes initiated to replace sucking needs when the pacifier is suddenly removed. (6,13,30)

It is curious how only half of the parents think that there is a relation between the pacifier's habit and the FS habit, whereas the majority of non-parents seem to be aware of this relation.

Both the use of pacifier and FS have been related to an increase of AOB, which prevents the downgrowth of the maxillary bone base and creates an appearance of infraocclusion. Even so, there are no studies that affirm that pacifiers interfere in the late eruption of teeth. (2) Both groups demonstrate to be aware that this relation does not exist.

Besides, children's dental health is one of the main objectives of modern health policies. Still there is a lack of information and promotion on the correct establishment and use of the pacifier, as well as its withdrawal to minimize general problems, malocclusions and secondary habits that are originated.

The population studied belongs to Catalunya and can access to several pediatric information campaigns concerning oral health. Even though, there are no specific programs on the correct use of the pacifier.

Scarpelli et al. evaluate a specific malocclusion prevention program by means of instructions, followup visits and motivation in a university environment. As a result, it is observed that the percentage of people who prolong the pacifier's habit after the recommended withdrawal age is only 10.90%. Conversely, the present study and other studies in population without specific programs report a percentage between 40 and 50%. (24)

This proves that an educational and assistance program addressed to parents can help identify the risk factors involved in the growth and development of the child, also ensuring the compliance with the recommendations for pacifiers' use and withdrawal.



Fig2. Anterior Open Bite caused by late pacifier's withdrawal.

CONCLUSIONS

- Both the parents' and the non-parents' group demonstrate to have a medium level of knowledge regarding the pacifier's habit and the consequences of its late withdrawal.
- Most children start using the pacifier from birth and half of them leave it after the age of two years.
- An educational and assistance program can help identify the risk factors involved in the child's growth and development and minimize the appearance of the resulting malocclusions and secondary habits.

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