Original article

DO THE OPINIONS OF PEDIATRICIANS INFLUENCE THEIR RECOMMENDATIONS ON COMPLEMENTARY FEEDING? PRELIMINARY RESULTS

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Word count (Text) = 2756

Word count (Abstract) = 213 words

Tables = 5

References = 30

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ABSTRACT

Complementary feeding practices are debated among pediatricians, primarily regarding whether nutritional needs or developmental readiness should be prioritized in recommendations for starting complementary feeding. The aim of the present study was to analyze the timing of the start of complementary feeding and the related motivations with an 8-item online survey administered to active members of the Italian Society of Primary Care Pediatricians. The participation rate was 43.3% (350 of 808), and 213 (60.9%) and 137 (39.1%) of the participants chose items related to developmental readiness and nutritional needs, respectively, as the criteria for starting complementary feeding. Approximately 74% of the participants reported that they recommended starting complementary feeding between 5 and 6 months of age, 17% recommended starting before 5 months, and 8% recommended starting after 6 months. Predefined schemes were proposed by 38% of the participants, and a responsive feeding modality was proposed by 13%, while the majority (49%) recommended both modalities depending on family characteristics. Regarding recommendations based on nutritional needs, 89% of pediatricians reported providing indications concerning the quantity of meat consumed during the first year of life, and 91% reported recommending introducing added salt only after 12 months of age. Compared to pediatricians who emphasized developmental readiness, those who prioritized nutritional needs suggested earlier complementary feeding start and a higher use of predefined schemes and were more likely to make recommendations regarding meat quantity and added salt ($p<0.0001$). *Conclusions*. Pediatricians who used a developmental readiness criterion for starting complementary feeding may less frequently provide nutritional advice to parents, even if a trend to harmonize the different positions regarding complementary feeding start time is emerging.

KEY WORDS

Prevention, nutritional advice, responsive feeding, developmental readiness, salt consumption.

ABBREVIATIONS

BLW	Baby-led Weaning
CF	Complementary Feeding

DR	Developmental Readiness
ESPGHAN	European Society for Paediatric Gastroenterology Hepatology and Nutrition
GNP	Good Nutritional Practice
NN	Nutritional Needs
RF	Responsive Feeding
SICuPP	Società Italiana delle Cure Primarie Pediatriche (Italian Society of Family Pediatricians)
WHO	World Health Organization

WHAT IS KNOWN

- Pediatricians make suggestions for introducing complementary feeding based on scientific evidence, local traditions and personal beliefs.
- Either infants' nutritional needs or their developmental readiness currently are used as determinants for the timing of complementary feeding.

WHAT IS NEW

- More than 60% of Italian pediatricians consider developmental readiness a priority for introducing complementary feeding.
- Pediatricians following the criterion of developmental readiness may less frequently give detailed nutritional advice.

INTRODUCTION

The introduction of complementary feeding (CF) occurs when exclusive milk feeding becomes insufficient to growing infants (1-2). Complementary feeding should be adequate in terms of the quantity, frequency, texture and variety of foods while milk feeding continues (2). Guidelines and recommendations from scientific societies describe the time to start CF and its characteristics based on the available evidence (3-4). In Italy, institutional indications (5, 6) are consistent as well.

Pediatricians may have different priorities for starting CF that are based not only on scientific evidence but also on their professional experience, local traditions and personal beliefs (7). The major focus on nutritional needs (NN) is supported by the vast amount of data in the literature, which is summarized in the WHO position that complementary feeding should be done with breastfed babies whose growth curves may not be satisfactory (1,2). Evidence of a high prevalence of excessive intake of proteins and salt in Italian children as early as during the first months of life (8) suggests the opportunity to provide timely nutritional advice to achieve efficient prevention of both overeating and excess sodium intake based on infants' NN. Accordingly, a relationship between CF and the risk of noncommunicable diseases later in life has been hypothesized (9-11).

More recently, there has been growing support for starting CF when certain fundamental motor and behavioral skills have been acquired (5,12-13). Within the responsive feeding (RF) approach, parents set an appropriate and nurturing feeding environment and provide appropriate healthy foods, while the child decides whether and how much to eat. Within this context, responsive parenting appears to be at the core of a healthy feeding relationship (14). Baby-led weaning (BLW) (15) is characterized by the sharing of foods and mealtimes with family members and the use of finger food, possibly facilitating the child's better control of his or her own food intake (16-17). Both of these approaches (RF and BLW) first consider the psycho-evolutionary level reached by the child (which we may refer to as the child's developmental readiness, DR) (18,19).

The aim of this pilot investigation was to assess the type of priority, i.e., NN or DR, for starting CF among a sample of family pediatricians and determine the extent to which these priorities may be associated with different modalities and timing of CF and the dietary recommendations given during the first year of life.

METHODS

On March 15, 2018, all members of the "Società Italiana delle Cure Primarie Pediatriche" (Italian Society of Family Pediatricians [SICuPP]) were requested by e-mail to participate in a survey on CF; the email provided a direct link to a Google Form on Google Drive that contained the questionnaire to be completed. A second request to participate was sent at the end of March 2018, and the collection of data from the questionnaires was finished by April 17, 2018.

At the time of the invitation, the SICuPP included 808 active members of a total of approximately 7600 primary care pediatricians (20), that is, slightly more than 10% of the total number of primary care pediatricians in Italy. Members who participated in the survey were representative of the SICuPP primary care pediatricians in terms of age, gender, and distribution through all the Italian regions from the main Italian geographical areas (North, Center, and South/Islands).

The questionnaires were completed anonymously, and the participant age range (< 50 years, 50-60 years, > 60 years), gender and geographical area were recorded. It was not possible to complete the form more than once.

The questionnaire items and possible response options are reported in **Table 1**. All the questions/items were chosen by a scientific *ad hoc* board of the SICuPP; the questions were intended to be indicators of pediatricians' processes of providing recommendations for CF based on personal beliefs and scientific evidence and to be written in the simplest way to improve response rates. The first six items focused on attention to DR, RF/BLW modalities, the individual context, and attention to NN. The questions on food quantity (particularly of meat) and salt limitations were chosen as indicators of the overall propensity for mixed diets inclusive of either animal or vegetable proteins. The group of pediatricians who participated in the data collection and who selected response "c)" for Question n° 3 (*it depends on the individual case*) was asked to complete a supplementary questionnaire with additional questions (n° 7 and 8) in July 2018 to better define the social and personal contexts (**Table 1**).

Each pediatrician who selected response option "a)" for Questions n° 5 and 6 were considered to follow good nutritional practice (GNP).

Statistical analysis

All considered variables were categorical, excluding the age of the pediatricians and the age of the child at the start of weaning, which were both coded ordinal variables.

A descriptive analysis based on the frequency distributions (proportions) was performed for all variables. The chi-squared test was used to assess the associations between pairs of variables. When the expected frequencies were too low, where necessary, data aggregation was performed among two or more rows and/or columns. The p value was calculated for each test. In view of the high number of comparisons, a p value of < 0.001 was considered significant. The calculations were performed using Microsoft Excel ed. 2013.

A multivariate analysis was performed with a multiple logistic regression model to identify the factors independently correlated to the "good nutritional practice" outcome. The most parsimonious set of independent variables was obtained by a backward procedure. Goodness of fit was assessed by the Hosmer-Lemeshow test. The following variables were considered: gender of the pediatrician (female=1, male=0), age of the child at CF start (6-7 months = 2, 5-6 months = 1, 4-5 months = 0), priority for CF start (NN =1, DR=0), CF modality (schemes=2, depends=1, RF=0), and parents' diet introduction (after first year=1, as soon as possible=0). The associations between the variables that were considered predictive and "Good Nutritional Practice" were also estimated by the odds ratios and relative 95% confidence intervals.

RESULTS

The survey was completed by 350 pediatricians (252 females and 98 males from all Italian regions) representing 43.3% of the active SICuPP members. The complementary questions n° 7 and 8 were answered by 56 of the 170 pediatricians who were asked to complete them.

Table 2 reports the characteristics of the participants by age, gender and working area. Members who participated in the survey were representative of the SICuPP primary care pediatricians in terms of age, gender, and distribution throughout all Italian regions from the main Italian geographical areas (North, Center, and South/Islands). The gender and age distributions were consistent with those of the whole population of Italian primary care pediatricians (20), while there was a clear higher representation of the North than of the South/Islands.

For Question 1 (the most important criterion for starting CF), the majority of the participants prioritized the behavior/DR of the child instead of NN (**Table 3**).

Most pediatricians reported that they recommended starting CF between 5 and 6 months of age, while 25% started between 4 and 5 months or between 6 and 7 months. None indicated that they recommended starting before 4 months or after 7 months, whereas only 2 pediatricians left the decision up to the mother. Pediatricians working in the South/Islands more frequently advised an early start than those working in the North and Center.

As for modality advised for CF, “it depends on the individual case” was the most common response, followed by the use of predefined schemes and RF. Only one pediatrician reported allowing the mother to decide. In the South/Islands, a relatively higher frequency of the use of predefined schemes was observed, while in the North, the percentage of pediatricians who advised RF was quite higher than that in the other two areas. Pediatricians younger than 50 years of age were more than twice as likely to prefer RF than those older than 50, and there were no differences between males and females. A large majority of the pediatricians gave advice on food quantity by suggesting a precise quantity (e.g., of meat), whereas only slightly more than 10% do not give any recommendations about food quantity. In the North, this last percentage was slightly higher. Regarding added salt, the vast majority of pediatricians again advised parents to wait until after the first year of life, while less than 10% left the decision to the mother.

Finally, concerning the last two additional questions, most pediatricians reported basing their decisions on the educational level of the family, followed by the ethnicity of the family and then the type of milk feeding. Among the participants who answered the supplementary questions, approximately 60% affirmed that they had partially changed their attitudes, 30% that they had changed their attitudes substantially, and only 10% that they had not changed his or her attitude towards CF over the last 10 years.

Correlations between the answers

The responses to the items on the main criterion for starting CF were associated with other questionnaire responses (**Table 4**). In particular, participants who reported prioritizing nutritional needs tended to recommend an earlier start (rarely after 6 months) to CF, to use predefined schemes instead of RF, to recommend introduction of the parents’ diet and added salt to the infant’s diet after the first year of life, to provide precise indications for the amount of meat to be consumed and to generally follow the NN approach compared with those who favored the DR of the child as the main criterion for starting CF.

The group who chose RF as the main criterion to start CF was more likely than the other groups to wait until the age of 6 months (the ideal WHO limit) to start CF.

Multivariate analysis

The multiple logistic regression (**Table 5**) identified 3 variables that positively and independently correlated with the GNP outcome, female gender of the pediatrician, the use of predefined schemes for CF, and the introduction of the parents' diet after the first year of life. Together, these 3 factors had an estimated probability of being associated with GNP of 98.7%.

DISCUSSION

The main objective of the present pilot survey was to assess the motivations of pediatricians when providing advice about CF. The specific question in the questionnaire regarding pediatricians' priorities provided only two possible reply options, which required the pediatricians to carefully reflect upon the option they agreed most with. This may represent a partial limitation since it is likely that some pediatricians may have agreed with both motivations. Approximately 60% of the pediatricians chose the "behavioral" motivation, and the "nutritional" option was still quite frequent (approximately 40%). Both options are related to different recommendations on CF. Accordingly, pediatricians who prioritize nutritional needs generally advise an earlier starting age (mostly before 6 months), prefer to use predefined schemes, recommend introducing parents' food and added salt later, and give more detailed indications about the quantity of meat to add to the child's diet (and thus follow the generally acknowledged good nutritional practices more frequently) compared to those who consider the developmental readiness/acquired motor abilities of the child. The present study did not investigate the overall eating habits of children but only the attitudes of pediatricians considering two qualitative items (i.e., indications for meat quantity and added salt) as indicators for overeating and excess sodium intake.

On the other hand, those who opted for the "behavioral" criterion for starting CF more frequently chose an alternative strategy in terms of the CF modality (RF or BLW) and less often provided nutritional recommendations. Within this setting, a study conducted with Italian children between 6 and 36 months of age (8) showed that 80-100% children exceeded the recommended protein consumption and that 40-80% exceeded the recommended salt consumption defined by the National Institutions (6). Since the differences in infants' feeding habits among the 3 main regional areas of Italy found in the present pilot survey are consistent with previous observations (6, 21-22), we do not feel that the difference in the geographic distribution of the participants produced a meaningful bias.

Recommendations for CF based on behavioral considerations may therefore put children at a higher risk of unbalanced dietary intakes (15, 23). In addition, excessive salt intake can prematurely influence the taste and food choices of the infant (24). BLW also seems to direct food choices towards higher intake of proteins and fats when compared with a traditional CF regimen (25-26), while RF, when correctly applied in a more appropriate context, seems to be more promising in terms of preventive aspects, at least in the short term (27, 28).

Approximately half of the pediatricians had flexible attitudes towards the CF modality, i.e., they adapted their own opinions to the different family situations and the needs of the individual child. It is thus possible that the dual approach to starting CF is in fact overcome in daily practice. A study performed in New Zealand (29) confirmed the inconsistency of the implementation of different CF approaches since approximately 60% of the parents who reported implementing BLW did not truly carry out this approach strictly according to its definition. Regarding a "behavioral" approach, it may also be difficult to distinguish among concepts such as RF, BLW and DR. Although our survey had a cross-sectional design, and we consequently cannot make conclusions about any changes over time, pediatricians' approaches towards CF are prone to change, as 90% of the pediatricians declared that they had substantially or partially changed their attitudes towards CF over the last 10 years. This might also reflect a generational change in nutritional practices that is not limited to complementary feeding introduction (30, 31).

We recognize that in this pilot survey, we had a limited sample with a cross-sectional design, allowing only the description of simple statistical associations and not conclusions about causal relationships. Within the limited sample, the pediatricians who participated were all members of a single, homogeneous scientific society and had accepted the invitation spontaneously, possibly causing participant self-selection bias. Nevertheless, a trend is emerging towards the harmonization of differing "behavioralist" and "nutritionist" positions on starting CF. A convergence of pediatricians' approaches towards the use of shared and complementary procedures for infant feeding could prevent a sense of confusion among parents, which can lead to improper "do it yourself" attitudes. New studies including a larger number of pediatricians from different European countries would be of great interest to investigate motivations for CF introduction.

Authors' Contributions

- Concept of the manuscript: P.B. and C.A.

– Study conduction: M.G., M.P., G.B., P.B

- Statistical analysis: R.B.

– Drafting of the manuscript: P.B.

– Critical revision of the study and manuscript: G.P.M. and C.A.

- Final manuscript: all authors have approved the final draft as submitted

Compliance with ethical statements

The study has been performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments.

Conflict of interest: the authors declare that they have no conflict of interest.

Funding: there is no funding source

Ethical approval: not applicable

Informed consent: not applicable

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Table 1. Questionnaire questions and response options.

Questions	Reply options:
1) "When you decide to recommend starting CF, do you consider the nutritional needs or the behavior/the developmental readiness of the child to be more important?"	a) the behavior/the developmental readiness of the child b) the nutritional needs of the child
2) "At what age do you generally advise starting CF (in months)?"	a) <4 months b) 4-5 c) 5-6 d) 6-7 e) >7 f) I do not advise any age, I let the mother decide
3) "Which modality do you use most frequently for CF?"	a) predefined schemes b) baby-led weaning or responsive feeding c) it depends on the individual case d) I let the mother decide
4) "At what age do you advise offering parents' food to the child?"	a) as soon as possible b) after the first year of life
5) "What do you advise regarding the quantity of food (e.g., meat) during the first year of life?"	a) I indicate a precise quantity b) I do not indicate a precise quantity
6) "And regarding the addition of salt to the diet?"	a) after the first year of life b) I let the mother decide
7)* "If your reply to Question 3, "Which modality do you use most frequently for CF?", was "it depends on the individual case", could you specify which variables influence your choice? (you can choose 1 or more options)	a) breast-feeding or formula feeding (type of milk feeding) b) presence of siblings c) educational level of the family d) ethnicity of the family e) none of the above
8)* "Have you changed your attitude towards CF over the last 10 years?"	a) no b) yes, partially c) yes, substantially

* Questions only for those who replied "c)" to Question 3.

Table 2. Characteristics of the participating pediatricians (n 350) by age and working area for males and females. Percentages are calculated by column. *Chi-squared test

	Females n (%)	Males n (%)	**Total n (%)**	P value*
Age (years)				**<0.0001**
<50	27 (10.7)	0 (0.0)	**27 (7.7)**	
50-60	127 (50.4)	32 (32.7)	**159 (45.4)**	
>60	98 (38.9)	66 (67.3)	**164 (46.9)**	
Working area in Italy				**0.016**
North	173 (68.7)	61 (62.2)	**234 (66.9)**	
Center	69 (27.4)	25 (25.5)	**94 (26.9)**	
South and Islands	10 (3.9)	12 (12.2)	**22 (6.3)**	

Table 3. Questionnaire responses according to the geographical working area. Percentages are calculated by column. *Chi-squared test; ** to perform the chi-squared test, it was necessary to aggregate the South/Islands and Center.

	North n (%)	Center n (%)	South/ Islands n (%)	**Total** **n (%)**	p value*
Priority for CF start					0.07
nutritional needs (NN)	84 (35.9)	40 (42.6)	13 (59.1)	137 (39.1)	
developmental readiness (DR)	150 (64.1)	54 (57.4)	9 (40.9)	213 (60.9)	
Age at CF start (months)					**0.047****
4-5	40 (17.1)	11 (11.7)	8 (36.4)	**59 (16.9)**	
5-6	170 (72.6)	76 (80.9)	14 (63.6)	**260 (74.3)**	
6-7	22 (9.4)	7 (7.4)	0	**29 (8.3)**	
no advice given	2 (0.9)	0	0	**2 (0.6)**	
Modality used					**0.001**
RF	40 (17.1)	4 (4.3)	1 (4.5)	**45 (12.9)**	
depends on the individual case	117 (50.0)	47 (50.0)	6 (27.3)	**170 (48.6)**	
predefined schemes	77 (32.9)	42 (44.7)	15 (68.2)	**134 (38.3)**	
let the mother decide	0	1 (1.0)	0	**1 (0.3)**	
Timing of the introduction of parents' diet					0.31
as soon as possible	116 (49.6)	40 (42.6)	8 (36.4)	**164 (46.9)**	
after the first year of life	118 (50.4)	54 (57.4)	14 (63.6)	**186 (53.1)**	
Quantity of food (meat)					**0.044**
indicate a precise quantity	201 (85.9)	89 (94.7)	21 (95.5)	**311 (88.9)**	
do not indicate a precise quantity	33 (14.1)	5 (5.3)	1 (4.5)	**39 (11.1)**	
Timing of the addition of salt					0.41
after the first year of life	210 (89.7)	88 (93.6)	21 (95.5)	**319 (91.1)**	
let the mother decide	24 (10.3)	6 (6.4)	1 (4.5)	**31 (8.9)**	
Good nutritional practice					0.09
yes	191 (81.6)	85 (90.4)	20 (90.9)	**296 (84.6)**	

no	43 (18.4)	9 (9.6)	2 (9.1)	**54 (15.4)**	

Table 4. Relationship between priority for starting CF and other questionnaire responses. Percentages are calculated by column. *Chi-squared test

	Nutritional needs of the child (NN)	Developmental readiness of the child (DR)	p value*
Total	137	213	
Age at CF start (months)	(n, %)	(n, %)	**0.012**
4-5	26 (19.0)	33 (15.5)	
5-6	107 (78.1)	153 (71.8)	
6-7	4 (2.9)	25 (11.7)	
Modality used			**<0.0001**
RF	2 (1.5)	43 (20.2)	
depends on the individual case	51 (37.2)	119 (55.9)	
predefined schemes	84 (61.3)	50 (23.5)	
let the mother decide	0	1 (0.4)	
Timing of the introduction of parents' diet			**<0.0001**
as soon as possible	35 (25.5)	129 (73.2)	
after the first year of life	102 (74.5)	84 (26.8)	
Quantity of food (meat)			**<0.0001**
indicate a precise quantity	133 (97.1)	178 (83.6)	
do not indicate a precise quantity	4 (2.9)	35 (16.4)	
Timing of the addition of salt			**<0.0001**
after the first year of life	135 (98.5)	184 (86.4)	
let mother decide	2 (1.5)	29 (13.6)	
Good nutritional practice			**<0.0001**
yes	131 (95.6)	165 (77.5)	

no	6 (4.4)	48 (22.5)	

Table 5. Results of the multiple logistic regression (most parsimonious model with 3 variables)

	Beta coefficient	Standard error	95% CI		Odds ratio	95% CI		p
Intercept	-0.849	0.399	-1.631	-0.068				0.033
CF modality (schemes vs others)	1.273	0.275	0.733	1.813	3.571	2.082	6.126	< **0.0001**
Female gender	1.040	0.357	0.340	1.741	2.830	1.405	5.701	**0.004**
Introduction of parents' diet after first year of life	1.623	0.427	0.787	2.459	5.068	2.196	11.695	**0.000**

Multiple logistic regression considered the following variables: gender of the pediatrician (female=1, male=0), age at CF start (6-7 months = 2, 5-6 months = 1, 4-5 months = 0), priority for CF start (nutritional needs =1, developmental readiness=0), CF modality (schemes=2, depends=1, RF=0), and introduction of the parents' diet (after first year=1, as soon as possible=0). CF = complementary feeding; CI = confidence interval; RF = responsive feeding.