

Original Article

Practice to introduce complementary foods to infants in Taiwan – changes from 1997 to 2008

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The purpose of the study was to understand present infant complementary foods eating and compare trends over the past 10 years in Taiwan. We investigated the methods used to introduce infants to complementary foods, difficulties encountered, sources of information and the principle caregiver's knowledge about infant feeding. This study focused on findings from the 2005-2008 Nutrition and Health Survey in Taiwan (NAHSIT) and compared with those from the 1997-1999 Child NAHSIT. Interviews in both surveys were carried out by trained interviewers. In 2005-2008 survey, 50% of infants aged 7-12 months had started eating baby cereals or juice at age 4-6 months as recommended. The proportions of infants aged 10-12 months who were introduced to particular complementary foods at recommended periods varied from biscuits (51.1%) to tofu (1.1%). The proportions were higher in 2005-2008 than in 1997-1999 for only 3 items. In both survey, more than 80% of mothers were the one who made the decision to introduce their children to complementary foods. More than 75% of caregivers fed baby cereals to their babies from milk bottles. In 2005-2008, the most commonly encountered problem was that the child wouldn't eat. Nutrition knowledge of the caregivers have improved since 1999, but still needs fostering. The timing to introduce complementary foods become later than ten years ago. Whether the delay will affect the normal dietary intakes of children after one year of age needs attention. The government should not only promote breastfeeding, but also reevaluate current evidence-based recommendation on complementary food introduction time.

Key Words: complementary foods, caregiver, encountered problem, nutrition knowledge, infant

INTRODUCTION

Balanced nutrition in infancy is an important foundation for establishing good lifelong health. Breast milk is the most ideal food source for infants. However, as the child continues to grow, breast milk no longer completely satisfies nutritional needs of infants and caregivers need to begin complementary feeding with complementary foods to provide the nutrients necessary for normal development. Regarding the timing of development and maturation of the digestive, metabolic and immune systems, the recommended timing for introducing complementary foods to the diet is around 4 to 6 months in most countries including Taiwan, Norway and the United States. Recommendations in Brazil, India and Canada advocate the introduction of complementary foods at 6 months.¹ In 2001, the World Health Organization (WHO) recommended that infants should be exclusively breast fed until six months of age and only commence intake of complementary foods after this time. These recommendations are

based on the principle that in the first six months of life breast milk can provide adequate nutrition for infants.²

Caregivers need to respond to their child's development by providing different forms (liquid, pureed, semi-solid or solid foods) and types of complementary foods. There are large differences between countries in the timing of introducing particular types of foods to infants. For example, some countries recommend introducing fish and eggs at 4-6 months, whereas other countries recommend 9-12 months. In Taiwan, the introduction of baby cereals and fruit (or vegetable) juice (referred to below as juice)

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is recommended at 4-6 months. The introduction of pureed or semi-solid foods is recommended at 7-9 months. The introduction of whole eggs is recommended after 9 months. The American Academy of Pediatrics (AAP) recommends the introduction of juice after 6 months.³ Switzerland recommends that vegetables, fruit, rice, corn and nuts should be added to the diet from 5 months of age; wheat, oats and bread should be added at 7 to 8 months of age; and poultry, veal and lamb, fish, and beef should be introduced at 6, 7, 9, and 11 months, respectively.⁴

Surveys of infants in many countries have shown that the timing of introduction to complementary foods in infants is different in each country. In European countries such as Germany the first complementary foods are usually vegetables, potatoes and meat mashed together.⁵ Already 12.2% of infants have starting eating this kind of mixed puree by 5 months. In Switzerland⁴ the first complementary foods eaten by infants are vegetables and fruit, only after which intake of rice (or oatmeal) cereal is commenced. In Italy,⁶ meat is the first type of food consumed by 13.7% of infants. In other countries such as South Africa,⁷ the first food given to infants is usually oatmeal cereal. In Brazil,⁸ infants have already being given soup, fruit and family foods by 4-6 months. In Vietnam,⁹ about 5% of infants are already eating complementary foods at one week of age and almost half of infants are already taking home-made foods at week 16.

There has been little research on the consumption of complementary foods by infants in Taiwan. It would be worthwhile to investigate the proportion of infants commencing intake of complementary foods at the ages recommended, the main decision maker for introducing complementary foods, the methods used to introduce complementary foods, caregivers' knowledge about infant feeding, and problems encountered by caregivers. Hopefully, the findings from this study could be used to design improved strategies for introducing complementary foods to infants in Taiwan.

MATERIALS AND METHODS

Sample

The 2005-2008 Nutrition and Health Survey in Taiwan (2008 survey) used a multi-staged stratified sampling method. Throughout Taiwan, 358 counties and cities were divided into five strata based on geographical location and population density. In each stratum, three stages of sampling were carried out. In the 1997-1999 Child Nutrition and Health Survey in Taiwan (1999 survey), the study population included those living in Taiwan of Taiwanese nationality, aged between birth and six years. The 1999 survey used a stratified unequal probability sampling scheme. The 365 counties and cities in Taiwan were grouped as cities, provincial cities, level 1 urbanized area and level 2 urbanized areas based on the particular lifestyle and eating habits of residents and the level of local economic development according to research by Chaur-Shyan Lee.¹⁰ In each stratum, study subjects were sampled according to gender (male and female) and age.

Our study sample consisted of infants aged less than one year in the 2008 and 1999 surveys. For the 2008 survey, we used the health examination sample which provided a total sample of 71 infants. In the 1999 survey,

there were 578 participants aged less than one year. Samples used for statistical analysis were divided into three categories by the study topic:

- The introduction time of baby cereals and juice: since both surveys were cross-sectional, and the introduction time for baby cereals and juice is 4-6 months according to Taiwanese government recommendation. The age of infants should be older than 6 months. Therefore, samples of infants less than 6 months were excluded from both surveys, and only infants between 7 and 12 months of age were assessed for the introduction time of baby cereals and juice fruit. In the 2008 and 1999 surveys, the eligible subjects were 40 and 234 respectively.
- The introduction time of pureed foods: the introduction time of pureed foods is recommended at 7-9 months of age in Taiwan. Based on this recommendation, only infants between 10 and 12 months of age were used to assess the introduction time of pureed foods. The sample sizes were 22 and 87 in the 2008 and 1999 survey respectively.
- Decision maker on the methods, sources of information on complementary foods introduction, use of commercial baby foods, problems encountered, and caregivers' nutritional knowledge: data from infants under one year of age were used for analysis. The numbers of samples were 71 and 578. in 1999 and 2008 respectively.

Data collection methods

In the 1999 and 2008 surveys, questionnaires were designed to collect information on the timing of introducing infants to each type of complementary food, decision makers for starting complementary foods, methods of introducing complementary foods, principle caregivers' knowledge about infant feeding, problems encountered when introducing complementary foods and sources of information for caregivers. Interviews were all carried out by professionally trained interviewers.

Statistical analysis

In the 2008 survey, the sample was weighted according to the 2006 census population to create nationally representative estimates. We used the weighted health examination data in this study (the total population in each stratum/the size of the health examination sample in the stratum). When producing estimates for the entire sample, to ensure that the weights given to each stratum were equivalent, weights were based on the 1998 census population data for the local population of children in a particular age group, divided by the total population of children of that particular age in the 1999 survey. Since there were only 71 infants completed in the 2008 survey, the sample size would be too small to represent the specific stratum of sampled area. Therefore, we only presented percentages and mean values of study variables of infant feeding practices, and compared to that of the 1999 survey. We did not compare various study outcomes among different strata.

RESULTS

Demographic data

In both surveys, the numbers of male and female infants were roughly equal. In the 2008 survey, 12.3% of the samples were aged 0-3 months, 28.2% were aged 4-6 months, 25.2% were aged 7-9 months and 34.3% were aged 10-12 months. In the 1999 survey, 31.0% were aged 0-3 months, 28.0% were aged 4-6 months, 25.6% were aged 7-9 months, and 14.8% were aged 10-12 months (Table 1). In the 2008 survey, 39.7% of infants were the first born child and 60.3% were the second or later born child as compared to 43.6% and 56.4% in the 1999 survey, respectively. In the 2008 survey, 44.9% of fathers and 55.4% of mothers had a college or greater level of education which is an increase of 16.8% and 10.3%, respectively compared to the 1999 survey. In the 2008 and 1997 surveys, less than 50% of mothers were working, while more than 70% of caregivers were parents.

Timing of introduction of complementary foods to infants

We used data from 7-12 month old infants to estimate the timing of introduction to rice/oatmeal cereal and fruit/vegetable juice and data from 10-12 month old infants to estimate the timing of introduction to pureed foods.

The introduction time of baby cereals and juice

The 2008 survey showed that 52.1% of 7-12 month old infants had started consuming baby cereals and 44.6% had started drinking juice at 4-6 months of age. There were almost no infants who had consumed baby cereals or juice earlier than recommended. However, 48.0% of

infants had delayed introduction of baby cereals and 44.6% of infants had delayed introduction of juice. The timing of introduction of baby cereals demonstrated a statistically significant relationship with the timing of introduction of juice. This demonstrates that infant who had delayed introduction of baby cereals, are also more likely to have delayed introduction of juice (Figure 1). When compared to the proportion of infants being introduced to baby cereals (90.3%) and juice (78.0%) at the recommended ages in the 1999 survey, there was a large decrease in the proportion of infants being introduced to these complementary foods at the recommended age in the 2008 survey. This decrease was most likely due to the increase in the proportion of infants with delayed introduction to complementary foods in the later survey.

The introduction time of pureed food: fruit/vegetables, rice porridge, cakes and biscuits, egg yolk, tofu, pureed meat and pureed fish

The proportions of children being introduced to pureed foods at recommended ages in the 2008 and 1999 surveys showed that in 2008, the proportion of infants commencing pureed foods at the recommended age was highest for starch foods (cakes and biscuits: 51.1%, rice porridge: 48.5%), followed by fish (40.7%), fruit and vegetables (30.3%). The proportions of infants introduced to egg yolk, tofu and meat at recommended ages were the lowest (egg yolk: 13.1%, tofu: 5.8%, meat: 1.1%) (Figure 2). The proportion of children commencing pureed complementary foods at the recommended ages were only higher

Table 1. Problems encountered by caregivers when introducing their children to complementary foods in the 2005-2008 and 1997-1999 Surveys

Problem	2005-2008 (n=71)		1997-1999 (n=578)	
	n	weighted %	n	weighted %
No problems	43	58.7	180	49.5
Child won't eat	14	22.6	73	38.0
Adaptability to new foods	15	18.5	99	66.4
Quantity to add	4	8.6	21	9.5
Types of foods to add	4	1.9	20	12.3
Choosing complementary foods	2	2.0	14	10.4
Order of adding foods	1	0.2	16	9.6

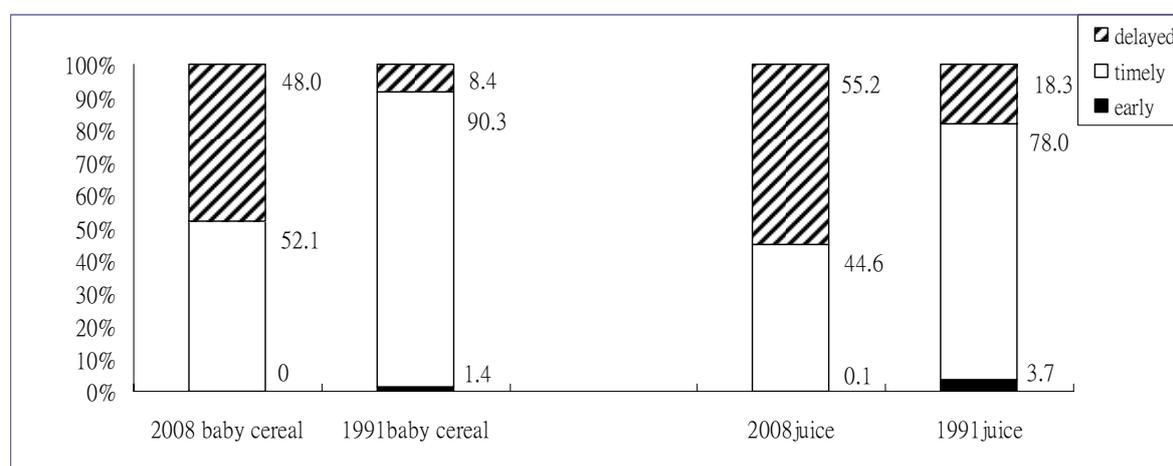


Figure 1. Comparison on timing of the introduction of baby cereals and fruit/vegetable juice to infants in the 2005-2008 (n=40) and 1997-1999 (n=234) Surveys

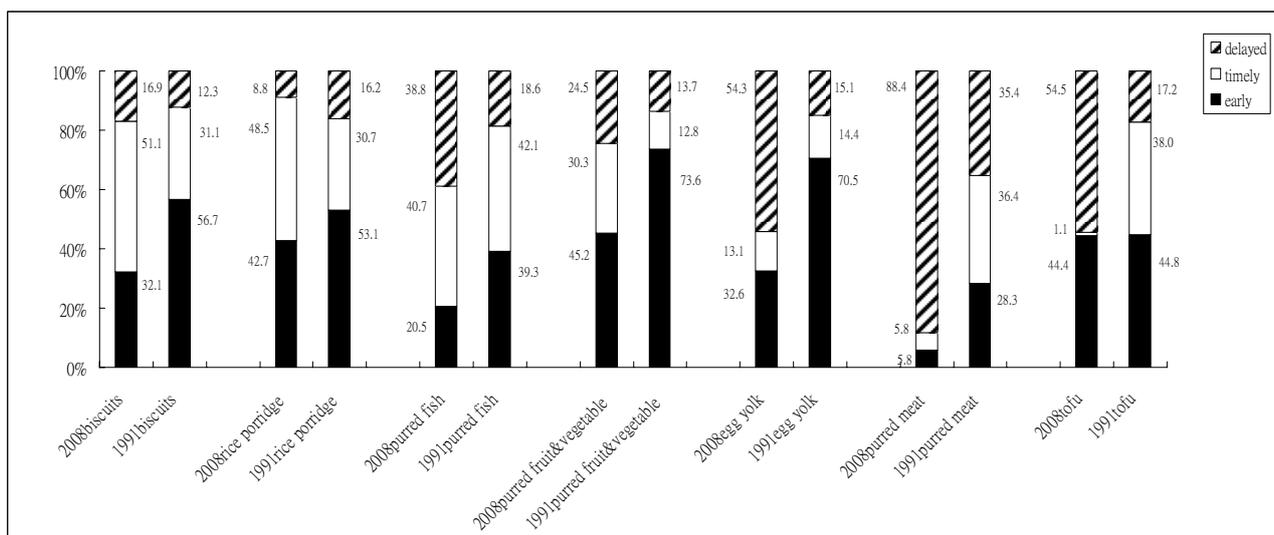


Figure 2. Comparison on the timing of introduction of pureed foods to infants in the 2005-2008 (n=22) and 1997-1999 (n=87) Surveys

in 2008 compared to 1999 for cakes and biscuits, rice porridge and pureed fruit/vegetables. There was a large decrease in the proportion of children introduced to tofu and meat at the recommended age compared to 1999. The proportion of infants introduced to fish and egg yolk at the recommended age was similar between the two surveys.

In the 2008 survey, the proportion of children introduced to pureed foods before the recommended age was highest for rice porridge (42.7%), pureed fruit/vegetables (45.2%) and tofu (44.4%). The proportion of children introduced to pureed foods after the recommended age was highest for pureed meat (88.4%). In the 1999 survey, the proportion of children introduced to pureed foods before the recommended age was highest for pureed fruit/vegetables (73.6%) and egg yolk (70.5%). The proportion of children introduced to pureed foods after the recommended age was also highest for pureed meat (35.4%) in the 1999 survey. In the 2008 survey, infants were more likely to be introduced to cakes and biscuits, rice porridge, and pureed fruit/vegetables before the recommended age than after the recommended age. In contrast, infants were more likely to be introduced to fish, meat, and tofu after the recommended age than before the recommended age. In the 1999 survey, with the exception of pureed meat, infants were more likely to be introduced to each type of complementary food before rather than after the recommended ages.

Comparing the timing of introducing pureed complementary foods between the 2008 and 1999 surveys, we found that the early introduction of infants to tofu was similar between the two surveys. However, for the other types of pureed complementary foods, infants were less likely to be introduced early in 2008 compared to 1999. In addition, infants were more likely to have delayed introduction to pureed complementary foods in 2008 compared to that in 1999, with the exception of rice porridge.

Decision makers for the introduction of complementary foods to infants, methods of introducing complementary foods and use of commercial baby foods

Mothers most commonly made the decision to introduce infants to complementary foods in both surveys, although a slightly greater proportion of decision makers were mothers (88.8%) in 2008 compared to that (83.9%) in 1999. In 2008 we found that although the proportion of caregivers who added rice/oatmeal cereal to milk bottles for feeding showed an improvement from that of 84.5% observed in 1999, it was still as high as 76.3%. The use of commercial baby foods increased to 21.7% in 2008 from 19.9% in 1999.

Problems encountered when feeding infants complementary foods

In 2008, 58.7% of caregivers reported experiencing no problems when introducing infants to complementary foods. The most commonly encountered problem was that the child wouldn't eat (22.6%) (Table 1). The caregivers of the infants of 4-6 months old and 7-9 months old are more likely concerned about infants' adaptability to new foods while the caregivers of the infants of 10-12 months old are more likely to worried that the infants won't eat. The types of problems experienced by caregivers when introducing their infants to complementary foods in 1999 were different to those reported in 2008. In 1999, 49.5% of caregivers had not experienced any problems when adding complementary foods to their baby's diet. The most common problem encountered was being worried that the child was not adapted to the new foods (66.4%).

In the 2008 survey, comparisons by the infant's age showed that caregivers of 0-3 month olds had not experienced any problems, whereas 15.7% of caregivers of 4-6 month olds, 38.1% of caregivers of 7-9 month olds and 79.6% of caregivers of 10-12 month olds had experienced problems when introducing complementary foods (Table 2). This demonstrated that the likelihood of caregivers experiencing feeding problems with their children increased as their child's age in months increased. Similar to the later survey, the proportion of caregivers experiencing problems increased as the child increased in age from 0-3, 4-6, and 7-9 months. However, caregivers of 10-12 month olds were less likely to have experienced problems than caregivers of 7-9 month olds.

Table 2. Whether caregivers have encountered problems or obtained information. by children's age and by surveys

Age (months)	Have encountered problems				Have obtained information			
	2005-2008 (n=71)		1997-1999 (n=578)		2005-2008 (n=71)		1997-1999 (n=578)	
	n	weighted %	n	weighted %	n	weighted %	n	weighted %
0-3	0	0	4	30.9	0	0	6	2.3
4-6	3	15.7	52	44.1	7	37.4	114	76.6
7-9	9	38.1	71	56.8	14	62.5	142	94.2
10-12	16	79.6	42	48.4	22	100	84	93.9

Table 3. Caregivers' sources of information about complementary foods in the 2005-2008 and 1997-1999 Surveys

	2005-2008 (n=71)		1997-1999 (n=578)	
	n	weighted %	n	weighted %
No sources of information	28	39.4	229	39.9
Health professionals	14	24.8	64	18.7
Family and friends	25	23.9	144	38.7
Infant feeding books	10	16.4	116	35.6
Newspaper and magazine	6	13.2	70	20.1
Television ads and reports	3	5.8	26	17.3
Advertisements	2	5.5	41	15.2
The Internet	2	2.9	0	0
Other	4	6.1	27	0.7

Table 4. Proportion of caregivers providing correct responses to knowledge questions in the 2005-2008 and 1997-1999 Surveys

Item (answer)	2005-2008 (n=71)		1997-1999 (n=578)	
	number correct	weighted %	number correct	weighted %
It is best to mix several kinds of complementary foods together (false)	61	95.6	474	82.5
Harmful effects from food can be detected by looking at feces or skin (true)	63	95.3	499	87.3
When adding complementary foods, you should start with meat (false)	61	94.2	439	78.4
Babies can start taking juice from 1 to 3 months (false)	63	91.5	442	78.1
When making baby foods, you should add seasoning (false)	53	78.4	450	81.3
Adding high protein milk powder can improve your child's growth and development (false)	45	68.3	259	46.3
Infants under one year of age can't have cow's milk (true)	47	68.2	332	56.6
Complementary foods should be added from 4 to 6 months of age (true)	48	64.7	452	78.0
When adding egg, you should start from the egg white (false)	39	59.0	278	50.0
breastfeeding can postpone the time of complementary foods introduction (false)	31	44.5	217	37.5
when introducing baby cereals, it is more convenient to mix it together with milk powder and add it to the milk bottle (false)	22	39.8	126	20.9

Sources of information for caregivers about introducing infants to complementary foods

In the 2008 survey, the proportion of caregivers who had obtained information increased with the age of the child from 37.4% in caregivers of 4-6 month olds, 62.5% of 7-9 month olds and 100% of caregivers of 10-12 month olds (Table 2). Apart from caregivers of 10-12 month olds, caregivers of 0-3 month olds, 4-6 month olds and 7-9 month olds in 2008 were less likely to have obtained information about feeding infants complementary foods than in 1999.

In the 2008 survey, 39.4% of caregivers had not obtained any information about introducing infants to complementary foods. The most common sources of information were health professionals (24.8%) and family and friends (23.9%) (Table 3). A large proportion of caregivers (36.8%) only used one type of information source. Only 9.7% of caregivers obtained information from two sources and 14.0% obtained information from three or more sources. When compared by different ages of in-

fants, no caregivers of 0-3 month olds had obtained any information.

In 2008, the proportion of caregivers obtaining information from health professionals demonstrated an increase from the third most common source to the most common source of information. In addition, the number of caregivers obtaining information from other sources decreased. The internet was a new source of information in the 2008 survey.

Caregivers' nutritional knowledge

Table 4 shows that correct responses to knowledge questions by caregivers were higher in 2008 compared to 1999. However, it was important to note that in 1999, 81.3% of caregivers correctly answered "when preparing complementary foods for the baby, I should add seasoning", as opposed to only 78.4% in 2008. In addition, 78.0% of caregivers in 1999 correctly answered "babies 4-6 months and over can start consuming complementary foods", as opposed to only 64.7% in 2008. In 1999 and 2008 correct

responses were lowest for the questions “when introducing babies to eggs, you should start with the egg white”, “when introducing baby cereals, it is more convenient to mix it together with milk powder and add it to the milk bottle”, and “breastfeeding can postpone the time of complementary foods introduction”.

DISCUSSION

During the 10 years period between the two surveys, changes were observed in the timing of introduction of infants to complementary foods, difficulties faced by caregivers, sources of information used by caregivers and caregivers' nutritional knowledge. These findings emphasize the importance of updating strategies for improving intakes of complementary foods by infants and the information provided to caregivers.

Timing of infants' introduction to complementary foods

After comparing the results from the 2008 and 1999 surveys, we found that over this 10 years period the proportion of infants introduced to rice/oatmeal cereals and fruit/vegetable juice at the recommended age has decreased and the proportion of infants with delayed introduction to these foods has increased. In 2008 there were no infants that were still breast feeding after 3 months of age. As a result, breast feeding was not a factor contributing to the delayed introduction of complementary foods. Furthermore, in 2008 there was a decrease in correct responses to the knowledge about adding complementary foods from 4 to 6 months of age. Our findings indicated that the main problem in regards to feeding infants complementary foods in Taiwan was delayed introduction of complementary foods. This finding was similar to those observed in mainland China and India. In mainland China¹¹ 49.7% of infants had delayed introduction of complementary foods after 7 months of age, which was higher than the proportion with early introduction of complementary foods before 4 months of age (26.8%). In India¹² only 6.5% of infants started complementary foods early before 6 months of age, whereas a much larger proportion (44%) started complementary foods at 6-12 months of age. Nevertheless, the proportion of infants commencing complementary foods at recommended ages was higher in Taiwan than in China and India.

Compared to Australia, Canada, the United States and Norway,¹³⁻¹⁶ early introduction to complementary foods before 4 months of age was relatively uncommon in Taiwan. However, the proportion of infants introduced to complementary foods at the recommended age (4-6 months) is also lower in Taiwan compared to these other countries and delayed introduction of complementary foods is much more common. In Australia,¹³ 17.6% of infants have started complementary foods by 16 weeks of age, and as many as 93% of infants have started complementary foods by 26 weeks. In Canada,¹⁴ 77% of infants aged 4-6 months have already started eating baby cereals and 18% of infants have starting eating these foods before 4 months of age. In the United States,¹⁵ based on a 2005-2007 survey, 18% of infants have already started eating baby cereals at 3 months of age and 86% have started eating these foods by 6 months of age. In Norway,¹⁶ 90% of infants were eating baby cereals by 6 months of age.

Timing of introduction of pureed foods

The proportion of infants introduced to pureed foods at the recommended age only increased for cakes and biscuits, rice porridge and pureed fruit/vegetables between surveys. The timing of introduction to other pureed foods either demonstrated minimal change or a decrease in the proportion of infants commencing intake at the recommended age. This indicates that the introduction of pureed foods to infants at the recommended age has actually worsened in Taiwan. About 20% of infants in 2008 began eating fish early and about 40% began eating tofu before the recommended age. This finding emphasized the importance of developing a deeper understanding of whether or not the early introduction of protein leads to allergic problems in later life. In addition, 50% of infants had delayed introduction of fish, 38% had delayed introduction of tofu and 88% had delayed introduction of meat. Therefore, it would also be important to investigate whether or not infants in Taiwan have sufficient protein intakes. The rate of early introduction of meat at 4-6 months in Taiwan was comparable to that found in Sweden (<5%) but is lower than that found in Canada (16%).¹⁴ However, in Canada¹⁴, 60% of infants aged 7-9 months have already started eating meat, which is far greater than the proportion of infants in Taiwan starting intake of meat at the recommended age.

In general, it is recommended that infants aged 6 months and older need to have additional iron intake. In 2008, more than 88% of infants had delayed introduction of meat and 55% had delayed introduction of egg yolk. Moreover, there was a high correlation between delayed introductions to these two types of complementary foods. Further investigation is needed to determine whether Taiwanese infants have sufficient iron intakes.

The proportion of infants introduced to fish early at 4-6 months of age was greater than that observed for meat. In addition, infants were more likely to have delayed introduction of meat intake than fish. This finding was different to that observed in many other countries. In Norway¹⁶, the rate of meat intake is greater than that of fish at age 6 months (45% vs. 3%). In Switzerland⁴ the intake of fish in infants in each month age group is lower than that of meat. In Italy⁶ fish intake also starts later than that of meat. Intake of fish starts at 6-12 months with an average age of 9 months and a median age of 9.1 months. In contrast, meat intake starts at 3-12 months with a mean age of 5.6 months and a median age of 5.5 months.

Commercial baby foods

In both the 1999 and 2008 surveys, approximately 20% of caregivers used commercial baby foods. This is a lower rate than that observed in the United States¹⁶ where 73% of infants aged 4-6 months are fed commercial baby foods. Furthermore, Grazywacz¹⁷ found that approximately 90% of mothers working full-time use commercial baby foods. Our finding indicated that in Taiwan the majority of complementary foods are still home made. As a result, the preparation of complementary foods for infants is a key skill required by caregivers. However, relevant information about the principles and methods of use of commercial baby foods should be provided to the 20% of caregivers who use these products.

Methods used to introduce complementary foods

In addition to supplementing nutrition in infants, eating complementary foods helps infants to develop their chewing and swallowing abilities. In the Taiwanese recommendations for introducing complementary foods to infants it is emphasized that caregivers should use a spoon to feed infants pureed complementary foods and that they should avoid mixing complementary foods with milk in a bottle. However, in both the 1999 and 2008 surveys, more than 75% of infants were given baby cereals from a milk bottle. Similarly, the knowledge test found that the majority of caregivers considered that it was correct to add baby cereals to milk powder in the milk bottle. Therefore, both knowledge and behavior with regards to the methods of introducing complementary foods to infants need to be improved.

Information sources

In the 2008 survey, the likelihood of caregivers obtaining information about feeding infants complementary foods increased as the age of their child increased. This finding was similar to that observed for encountering problems related to introducing complementary foods. Almost no caregivers of infants aged less than 4 months had encountered problems related to complementary foods and almost none had obtained information about introducing complementary foods. However, despite a lack of self-perceived problems with infant feeding at young ages, it is important that caregivers are provided with appropriate information early, before introducing complementary foods at the recommended time (4 months of age). This will enable caregivers to provide their child with various types of complementary foods at the appropriate time. The provision of appropriate information could also increase the use of correct feeding methods by caregivers. In 1999 the most common sources of information for caregivers on introducing complementary foods were family, friends, and books. This was similar to the findings of Sakashita¹⁸ in Japan that books were the main source of information for caregivers. However, in 2008 health professionals replaced books as an important information source, indicating that health professionals were becoming an increasingly important source of information on introducing complementary foods.

Education

Research in China¹¹ has pointed out that infants in rural areas have insufficient protein intakes. Moreover, this insufficient intake was not due to a lack of local food sources but rather due to a lack of knowledge by caregivers. As a result, they advocated a strengthening of nutritional education in these areas. Kruger pointed out that incorrect knowledge by people in South Africa could result in excessive cooking or dilution of food.⁷ Over the past 10 years, Taiwan's national income has increased and the government has increasingly focused on providing assistance to low income households. Food availability has greatly improved alongside better transportation. However, in 2008 a high proportion of caregivers delayed their child's introduction of complementary foods. Obviously this was not an economic issue nor was it due to a lack of local food resources. The main reason is likely to

be a lack of correct nutritional knowledge. Therefore, we recommend improving education about complementary foods introduction.

In recent years there has been great progress by the Taiwanese government in carrying out research, passing legislation and actively promoting breast feeding. However, infant nutrition cannot rely on breast feeding alone. Complementary foods can provide infants with the nutrients that they are not receiving from breast milk in sufficient quantities after their continued growth and development. Moreover, complementary foods help infants to develop their chewing and swallowing abilities. The timing and choice of complementary foods given to infants will have an influence on their later nutritional status and the establishment of dietary habits. In both the 2008 and the 1999 surveys, mothers were the main decision makers for when to introduce complementary foods in more than 80% of the cases and as a result education programs should be targeted at mothers. We recommend that education about introducing complementary foods should be carried out at the same time as education about breast feeding which will enable mothers to have a more complete understanding about the nutritional care of their baby.

LIMITATION

For the 2008 survey, we used the health examination sample which only provided a total sample of 71 infants. Therefore, the inference of the result from this study should be drawn with care.

CONCLUSION

The study found that the main caregivers of infants have improved their knowledge of complementary food feeding over the past ten years. However, caregivers have to expand their knowledge on food selection and feeding techniques. In recent years, the WHO recommends that babies under 6 months should be breastfed exclusively. In response to the suggestion, our government should reconsider the introduction time of complementary foods. In addition, the government has to extend education on complementary foods. This study showed that over the past decade the percentage of people who do not comply with the suggestion from the government is decreasing. In order to carry out policy the government formulated, education and advocacy should be promoted.

This study found that the delay in addition of complementary foods is the major problem in Taiwan. Whether or not training in chewing and swallowing, and the establishment of eating habit will be affected by this problem is worth further investigation.

This study found that mothers were the main group who decide on complementary foods. Therefore, education and advocacy should be targeted at mothers. In order for mothers to comprehensively learn about complementary foods, we suggest that complementary food education should be simultaneous with breast feeding advocacy.

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AUTHOR DISCLOSURES

Jia-Rong Lin, Min-Su Tzeng, Mei-Ding Kao, Yi-Hsin Yang, and Wen-Harn Pan, no conflicts of interest.

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Original Article

Practice to introduce complementary foods to infants in Taiwan – changes from 1997 to 2008

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臺灣地區 1997 至 2008 年嬰兒副食品餵食狀況之變遷

本研究旨在了解目前臺灣嬰兒副食品餵食狀況並比較過去10年來的變遷。探討層面包括嬰兒副食品添加方式、嬰兒主要照顧者餵食副食品遭遇的問題、解決問題及嬰兒餵食知識資訊來源。研究方法以「2005-2008臺灣營養健康家戶調查」為探討主軸，並與「1997-1999臺灣地區嬰幼兒營養調查」結果比較，兩份調查皆由專業訓練訪員進行問卷訪談。結果顯示，2005-2008年間，7-12個月的嬰兒，於建議的4-6個月齡開始吃米(麥)糊或果(菜)汁者都佔約50%。10-12個月的嬰兒符合建議時間攝取的比例差異很大，從餅乾(51.1%)到豆腐(1.1%)。與1997-1999年調查結果相比較，2005-2008年嬰兒符合建議時間攝取的比例中，只有糕餅、稀飯及果(菜)泥等三項高於1997-1999年。兩份調查中，副食品的添加超過80%由母親決定；超過75%嬰兒從奶瓶中攝取米(麥)糊。2005-2008年調查常遭遇的問題以「嬰兒不吃」最多。嬰兒主要照顧者在嬰兒餵養知識雖有提升，但部分觀念的改善仍有加強之必要。近十年來臺灣地區嬰兒副食品的添加有延遲的現象，是否會影響1歲以上幼兒食物的正常攝取值得注意。同時建議政府機關在推廣母乳哺育之餘，應適時考慮修正嬰兒副食品添加之時間。

關鍵字：副食品、嬰兒照顧者、營養知識、嬰兒