

The Impact of Introduction of Solid Foods on Infant Health - A Comprehensive Study

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ABSTRACT

There has been speculation that there is a "sensitive" or "critical" phase for the timing of the introduction of solid meals; however, there is no evidence to When solid foods are introduced too early, there is an increased risk of developing chronic diseases such as islet autoimmunity (the preclinical condition that can lead to type 1 diabetes), obesity, adult-onset celiac disease, and eczema; however, when solid foods are introduced too late, there is an increased risk of an increase in the amount of difficulty that is experienced when feeding. These results can be avoided by delaying the introduction of solid foods until later. is because the iron that is contained in breastmilk is replaced by the iron that is found in solid meals, and breastmilk provides a source of iron that is both high in energy and highly bioavailable.

Keywords: *Solid, Foods, Child*

INTRODUCTION

Because it has the potential to have an impact on a person's health throughout their whole life, the timing of the first introduction of solid meals during infancy is a crucial component of the management of paediatric health . When it comes to child feeding practises, success is measured by determining whether or not the food that is given to the child satisfies the nutritional requirements of the infant, protects the airway against the inhalation of foreign food substances, and does not exceed the functional capacity of the gastrointestinal tract and the kidneys . It has been hypothesised that there is a "sensitive" or "critical" phase for the timing of the introduction of solid meals; however, there is no evidence to support the hypothesis that the introduction of solid foods during the sensitive periods affects children's subsequent reception of food . There has been speculation that there is a "sensitive" or "critical" phase for the timing of the introduction of solid meals; however, there is no evidence to When solid foods are introduced too early, there is an increased risk of developing chronic diseases such as islet autoimmunity (the preclinical condition that can lead to type 1 diabetes), obesity, adult-onset celiac disease, and eczema; however, when solid foods are introduced too late, there is an increased risk of an increase in the amount of difficulty that is experienced when feeding. In addition, beginning solid meals too soon may lead to negative nutritional outcomes such as inadequate iron reserves and an increased risk of diarrheal illness . These results can be avoided by delaying the introduction of solid foods until later. is because the iron that is contained in breastmilk is replaced by the iron that is found in solid meals, and breastmilk provides a source of iron that is both high in energy and highly bioavailable. Recent studies have demonstrated that eating early in life has a significant role in the development of metabolic problems in adulthood. This is true not only in terms of the timing of meals but also the amount of food that is ingested. According to Cotrell and Ozanne, the programming for obesity and

adult metabolic diseases such as hypertension, diabetes, and coronary artery diseases may be possible results of either underfeeding or overfeeding in early infancy . These adult metabolic diseases include hypertension, diabetes, and coronary artery diseases. The coronary artery disease, diabetes, and high blood pressure are examples of these disorders. The timing of an infant's first experience with solid food is an important question that needs to be investigated, particularly in light of the rising attention that is being put on comprehending eating behaviours as a possible precursor to obesity. The American Academy of Pediatrics (AAP) recommends that women breastfeed their infants alone during the first six months of their children's life. This is in accordance with the recommendation that exclusive breastfeeding be practised. This is done in part to delay the introduction of solid foods until the age of six months because breastmilk meets all of the nutritional needs of a growing infant during the first six months of life .

Delaying the introduction of solid foods until the age of six months is another reason for doing this. Introducing solid meals beyond the appropriate age of six months is not ideal since it may produce shortages in zinc, protein, iron, and vitamins B and D, which in turn inhibit development and cause feeding issues. Introducing solid foods before the recommended age of six months is preferable. Introducing solid meals to an infant younger than the age of six months that is suggested is not ideal since it increases the risk of an allergic response. Building on previous recommendations for the timing of the introduction of solids a policy statement issued in 2005 by the Section on Breastfeeding of the American Academy of Pediatrics (AAP) encouraged delaying the introduction of solid foods (including cereal) until a child is 6 months of age for infants who are exclusively breastfed and between 4 and 6 months for infants who are formula-fed This recommendation was made in response to the fact that previous recommendations for the timing of the introduction of solids had been made This advice was created as a result of the fact that prior recommendations for the timing of the introduction of solids failed to meet the needs of the population. Pediatricians are in a position to provide guidance to new parents on how to begin feeding their infants solid foods since they have several opportunities to consult with new parents within the first month of a child's life. This recommendation may influence when parents start giving their infants solid meals for the first time. The Women, Infants, and Children (WIC) programme, which offers assistance to more than 8 million mothers and fathers of infants every month is another important source of nutrition information for parents of young children who live in households with incomes that are equal to or lower than 185% of the Federal Poverty Level (FPL). These households fall into the category of "low-income households" and have FPL incomes of 185% or less. It has been shown that parents are more likely to initiate breastfeeding after obtaining professional guidance and parents report that they place a high value on paediatric consultation throughout the early children years .

Understanding patterns of professional advice is important because previous research suggests that the timing of the introduction of solid foods is associated with family factors such as maternal ethnicity, cultural beliefs, education, breastfeeding status and duration, participation in the Supplemental Nutrition Program for Women, Infants, and Children (WIC), and also whether a provider discussion of the introduction of solid foods had occurred [3, 18, 19]; this suggests that the timing of the introduction of solid foods is related to family factors such as maternal ethnicity, cultural beliefs, education; breastfeeding status and duration; This is due to the fact that previous studies have shown that the age at which a child is first given solid meals is related to aspects of the family, such as the mother's cultural background, religious views, and level of education. and Despite the fact that these guidelines are advised by experts, a significant number of parents do not follow them, according to studies that were carried out on a national scale. According to the findings of the third iteration of the National Health and Nutrition Examination Survey (NHANES III), which was carried out between

1988 and 1994, 25 percent of parents said they gave their infants their first solid meal before the age of 4 months. This includes roughly half (53%) of babies who were given formula and 29% of infants who were not exclusively breastfed. According to the findings of study carried out by Hendricks and colleagues on a nationally representative sample of babies and toddlers ranging in age from 4 to 24 months, nearly one-third of parents started their children on solid foods before the age of 4 months.

In addition, they discovered that a greater percentage of children who were provided with early introductions of complementary foods were African-American, lived in households with incomes that were lower than 185% of the federal poverty level, had a mother who was younger (in years), had married parents, and did not receive WIC.

In addition, there was a correlation between the mother having less than a college degree, younger maternal age, the kid not being the first born, and never nursing the infant if supplementary meals were given to the child before the age of four months. On the other hand, there was no correlation between it and the mother's race or ethnicity, marital status, or usage of the WIC programme. It is important to understand national patterns of child and family factors that are associated with either early or late introduction of solid foods and learn potential opportunities to modify factors in order to optimise the timing of the introduction of solid foods in infancy given the nutritional, allergic, developmental, and chronic disease risks that are associated with early or late introduction of solid foods. Additionally, it is essential to understand about possible chances to alter parameters in order to enhance the timing of the introduction of solid meals in newborns. This may be done by reading up on the subject. In order to assess the variables that are related with early or late introduction of solids, this research takes use of the sample that was gathered as part of the National Survey of Early Childhood Health (NSECH), which is representative of the whole country. There is a focus not just on racial and ethnic differences, but also on possible disparities within these subgroups that may be connected with characteristics like maternal education. This is because there is a correlation between maternal education and racial and ethnic differences. The amassing of this information is a vital first step in the process of creating successful therapies, the end objective of which is to raise the proportion of children who begin eating solid foods within the optimal window of time.

Because it has the potential to have an impact on a person's health throughout their whole life, the timing of the first introduction of solid meals during infancy is a crucial component of the management of paediatric health. When it comes to child feeding practises, success is measured by determining whether or not the food that is given to the child satisfies the nutritional requirements of the infant, protects the airway against the inhalation of foreign food substances, and does not exceed the functional capacity of the gastrointestinal tract and the kidneys. It has been hypothesised that there is a "sensitive" or "critical" period for the timing of the introduction of solid foods; however, there is no evidence to suggest that the introduction of solid foods during the sensitive periods influences children's later acceptance of food. The hypothesis that there is a "sensitive" or "critical" period for the timing of the introduction of solid foods has been around for quite some time. According to the findings of some studies, introducing solid foods too early can lead to an increased risk of chronic diseases such as islet autoimmunity, which is the pre-clinical condition that leads to type 1 diabetes; obesity; adult-onset celiac disease; and eczema; introducing solid foods too late can lead to an increase in feeding difficulties. On the other hand, delaying the introduction of solid meals for too long may also raise the likelihood of eczema developing. In addition, beginning solid meals too soon may lead to negative nutritional outcomes such as inadequate iron reserves and an increased risk of diarrheal illness. These results

can be avoided by delaying the introduction of solid foods until later. This is because the iron that is contained in breastmilk is replaced by the iron that is found in solid meals, and breastmilk provides a source of iron that is both high in energy and highly bioavailable.

Recent studies have demonstrated that eating early in life has a significant role in the development of metabolic problems in adulthood. This is true not only in terms of the timing of meals but also the amount of food that is ingested. According to Cotrell and Ozanne, the programming for obesity and adult metabolic diseases such as hypertension, diabetes, and coronary artery diseases may be possible results of either underfeeding or overfeeding in early infancy. These adult metabolic diseases include hypertension, diabetes, and coronary artery diseases. The coronary artery disease, diabetes, and high blood pressure are examples of these disorders. The timing of an infant's first experience with solid food is an important question that needs to be investigated, particularly in light of the rising attention that is being put on comprehending eating behaviours as a possible precursor to obesity.

THE IMPORTANCE OF NUTRITION

When it comes to young children, it is imperative that they get the appropriate nourishment. A child's brain goes through a period of fast growth over the first five to six years of their life, with the bulk of this development being completed by the age of two. The rate at which this development occurs is influenced by the child's genes as well as the environment in which they are raised. One of the most important factors is nutrition, which consists of things like vitamins and minerals; if the brain receives it in appropriate amounts, it could develop to its fullest potential (Nyaradi, Li, Hickling, Foster, & Oddy, 2013). Regrettably, youngsters do not consume the sufficient quantities of the nutrient-dense meals that are essential for the continuous development of their brains. According to research that was published by the Centers for Disease Control and Prevention (CDC) in 2015, the widespread availability of snack foods and quick meals in the United States means that youngsters are obtaining forty percent of their daily calorie intake from some sort of fast food. These meals are typically chosen to be offered to children since they can frequently be taken quickly and do not require a great deal of effort on the part of the consumer.

On the other hand, in order to make meals more accessible and fast, they are often high in salt content, include preservatives, and do not supply the essential quantity of nutrients for a balanced diet. This may lead to an unhealthy diet. According to the Center for Disease Control and Prevention (CDC), many of these meals are composed of empty carbs like sugar and hazardous fats, but they lack the nutritive components that are required for the body to perform its functions in an appropriate manner. Children who consume these items on a frequent basis face the danger of acquiring nutritional deficiencies over time since, in comparison to other kinds of meals, eating anything that is just a few bites long is less likely to include the required nutrients. An analysis examining the components of fast food meals that are regularly eaten by children aged 2 to 18 was carried out by Poti, Slining, and Popkin (2013). The participants in this study were children. They found that these foods typically contain more sodium than the amount that is recommended as a daily intake, and that they are composed of fillers such as corn, which is regarded as a carbohydrate that is devoid of any nutritional value. In addition, they found that these foods frequently contain more sodium than the amount that is recommended as a daily intake. The researchers also found that these meals had high amounts of sugar but lower quantities of other essential nutrients, such as fibre and protein. This was another finding made by the researchers.

THE IMPACT OF DIETARY CHOICES ON DEVELOPMENT

Children's caloric intake should be exactly perfect, with neither too little nor too many calories being consumed on a daily basis. If a child does not take meals that are high in nutrients, it is possible that their development may be slowed down. The implications of an early-life calorie shortage or excess may stay long after the person reaches maturity, and these repercussions may persist even after dietary modifications have been made (Khan, Raine, Donovan, & Hillman, 2014). Malnutrition is especially dangerous for children in the first five years of their lives since this is the period when their bodies are still developing. Because the majority of a child's brain development takes place in the first few years of life, it is imperative that a young child's diet include a large quantity of foods that are rich in nutrients. This is primarily due to the fact that a young child's diet must include a large quantity of nutrient-dense foods (Rosales, Reznick, & Zeisel, 2009). Children who are malnourished and have a calorie deficit for an extended period of time are at an increased risk of having significant cognitive impairments later in life.

The results of a study that looked at children living in poverty found that those children who had meals early in life that were low in calories and nutrients had lower IQ levels, impaired cognitive function, and greater levels of behavioural issues later in life (Prado & Dewey, 2014). According to the findings that were discovered by Mohd Nasir and his colleagues (2012), skipping meals, whether breakfast or supper, leads to a reduction in the quantity of food that is consumed, which in turn leads to a reduction in the amount of energy that is consumed overall, which contributes to a reduction in cognitive performance. According to the results of this study, children who take less calories throughout the day have less energy available for cognitive processing, and as a consequence, they are less attentive throughout the day. This is especially true for children who consume fewer calories in the morning. These affects may have a knock-on effect on the child's ability to pay attention in class, recall newly acquired information, and effectively complete homework assignments, all of which are vital to the child's ability to do well academically as a whole.

Diets that are high in calories may be problematic because they may lead to excessive weight gain and obesity, both of which may have detrimental impacts on the development of a kid. Diets that are low in calories may be beneficial because they may help prevent these health issues (Khan et al., 2014). Problems with a person's metabolism might arise if they consistently give their body an excessive amount of calories over a protracted period of time. These problems include, among others, poor signalling of insulin receptors, low levels of leptin in the brain, and abnormal glucose metabolism. It is thought that these problems may be to blame for the cognitive deficiencies that are seen in obese children (Farr, Banks, & Morley, 2006). Mond, Stich, Hay, Kraemer, and Baune (2007) carried out a longitudinal research on children ranging in age from four to eight years old.

The duration of the study was nine years. They evaluated the children's skills in areas relating to motor, verbal, cognitive, and psychosocial development, and compared those results to the body mass index (BMI) ratings of the children. The investigation of the possible effects that being overweight may have on children was the reason for doing this research. The findings indicated that obese male children had a greater impairment in their gross motor abilities than those of a normal weight, and that obese female children had a reduced capacity to concentrate their attention when compared to obese female children of a normal weight.

Additionally, the findings indicated that obese male children had a greater impairment in their fine motor abilities than those of a normal weight. In spite of the fact that young men and women seemed to be suffering from separate deficiencies, it was found that an excessive amount of calories consumed in the diet over a protracted period of time had a negative impact on both genders in general. Other research has demonstrated a link between prolonged consumption of high-calorie meals in children of school age and deficits in cognitive performance, particularly in terms of mathematics comprehension as well as impaired visual spatial organisation. This association was found in children who had consumed these meals over a longer period of time.

CARBOHYDRATES

In addition to proteins and amino acids, it has been shown that carbohydrates also contribute to the proper functioning of the brain. Glucose, a kind of carbohydrate, is the principal source of fuel for the human brain. Glucose is produced by the liver. The human brain requires around twenty percent of the total glucose energy that the body uses every day in order to function properly (Sokoloff, 1999). It has been shown that consuming carbohydrates may improve cognitive capabilities when concentrating on non-memory cognitive tasks. However, glucose may also be a factor that contributes to this effect. In a study that was carried out by Allen et al. (1996), 28 healthy older adults (with an average age of 73) were given a beverage that contained 50 milligrammes of glucose, and then 15 minutes later, they were tested on a variety of cognitive abilities.

PARENTAL INFLUENCES

The manner in which parents choose to bring up their offspring has a significant bearing on the extent to which their offspring are able to comprehend the world in which they live. This influence may be positive or negative, depending on the parents' priorities. Due to the fact that parents have a huge influence on their children's development, it is necessary for parents to teach their children about nutrition and instil in them appropriate eating habits at an early age. This is because parents have a significant effect on the growth of their children (Adamo & Brett, 2014). Even while parents may have the best of intentions when it comes to encouraging their children to eat healthily, they are not always aware of particular concerns that should be addressed to their children and might be missing opportunities to teach them important lessons. For instance, parents may not be aware of which vitamins are absolutely necessary for a diet or which foods cause children to put on an unhealthy amount of weight. Children pick up their routines by observing and mimicking the acts of their parents at the beginning of their lives. Brown and Ogden (2004) interviewed 112 pairs of parents and children ranging in age from 5 to 12 years old as part of their study to determine the impact that parents have on the eating behaviours of their children.

LITERATURE REVIEW

It turned out to be Neal Halfon. (2011) The age at which a kid is introduced to their first meal consisting of solid food has the potential to have an impact on their general health for the rest of their life. The purpose of this research is to get a knowledge of the factors that are associated with the age at which neonates are given their very first solid meal. The National Survey of Early Childhood Health (NSECH), which was carried out in the year 2000, was a telephone survey that was nationally representative. Its purpose was to assess the level of care provided to young children in terms of both its scope and its quality. It was completed by 2,068 parents

whose children ranged in age from 4 months to 35 months at the time of the survey. In the sample, there was a disproportionate number of families who were of African-American and Latino origin. Several other kinds of analysis, such as bivariate tests and logistic regressions, are included in this study. Sixty-two percent of parents said that they started feeding their infants solid meals between the ages of four and six months. White mothers with more than a high school education (odds ratio = 0.5 [0.2, 1.0]), African-American mothers (odds ratio = 0.5 [0.3, 0.9]), English-speaking Latino mothers (odds ratio = 0.4 [0.2, 0.7]), and mothers who breastfed for four months or longer (odds ratio = 0.4 [0.3, 0.7]) were less likely to introduce solids to their children at an early age.

The majority of parents, or 92%, of children who were between the ages of 4 and 9 months old said that their paediatrician had addressed the introduction of solid foods with them since the birth of the child. These children ranged in age from 4 months to 9 months. However, the provider did not mention anything about the appropriate time to start giving the child solid foods while they were discussing feeding. Certain subgroups of mothers start giving their children solid foods earlier than the 4–6 month mark that is recommended by the American Academy of Pediatrics (AAP). This is despite the fact that the vast majority of parents can recall discussing the introduction of solid meals with their child's paediatrician at some point. It is probable that an effective discussion of the introduction of solid foods, related to breastfeeding counselling and support provided by the primary health care practitioner, can reduce the occurrence of the early introduction of solid foods.

The age at which a kid is introduced to their first meal consisting of solid food has the potential to have an impact on their general health for the rest of their life. The purpose of this research is to get a knowledge of the factors that are associated with the age at which neonates are given their very first solid meal. The National Survey of Early Childhood Health (NSECH), which was carried out in the year 2000, was a telephone survey that was nationally representative. Its purpose was to assess the level of care provided to young children in terms of both its scope and its quality. It was completed by 2,068 parents whose children ranged in age from 4 months to 35 months at the time of the survey. In the sample, there was a disproportionate number of families who were of African-American and Latino origin. Several other kinds of analysis, such as bivariate tests and logistic regressions, are included in this study. Sixty-two percent of parents said that they started feeding their infants solid meals between the ages of four and six months.

RESEARCH MYTHOLOGY

During the information sessions for parents, the following topics were emphasised: cognitive development in the first five years of life, the impact foods make on a diet and which are best for consumption, the significance of parental input and modelling on a child's diet, as well as other influences on diet and nutrition such as the media, peers, and school programmes. The links to the online seminars were sent to the parents who decided to participate, and they then followed the link provided to them. In all, there were four separate seminars, each lasting one hour, that parents attended to learn more about the aforementioned themes. Information about the sessions was delivered twice a week for the duration of an hour at each session, with a different subject being discussed at each and every session. Before attending the first session, parents were asked to take a quick online survey covering their general health knowledge as well as their ideas on food, their child's diet, and their own diet. A second online survey was sent to parents after the programme was finished (or after they

had participated in all four online sessions), and the purpose of this survey was to evaluate the level of cognitive and nutritional awareness that had increased among the parents. The sessions are listed in Table 1 with their numbers, themes, and a brief explanation of each one.

DATA ANALYSIS

This project's goals were to 1) educate parents about the impact of healthy nutrition on children's cognitive functioning and 2) raise awareness about the various factors that impact children's eating and healthy nutrition. The primary goal of the project was to educate parents about the impact of healthy nutrition on children's cognitive functioning. The purpose of the information sessions was to highlight topics of child nutrition and cognitive functioning such as the development of cognition in the first five years of life, the way in which diet and development are impacted by food and which foods are best to eat, the importance of parental input and modelling on a child's diet, as well as other influences on diet and nutrition such as the media, peers, and school programmes. The purpose of the information sessions was to assist parents in acquiring knowledge on the aforementioned themes, as well as strengthening their self-assurance in the realm of communicating facts on food and health nutrition to their children. The Pre-Session Questionnaire On a scale from 1 to 5, with 5 denoting "strongly agree," prior to the sessions, participants rated their own ability to encourage healthy nutrition and eating in their children, as well as their understanding of influences on healthy eating outside the home, on a total of 7 questions. The participants used a scale from 1 to 5 to indicate how strongly they agreed or disagreed with each statement. In general, parents reported feeling educated about providing their children with a good diet and enough nutrition ($M=4.4$). The majority of participants stated that they had "confidence" in their capacity to educate their children about healthy eating (mean = 4.2), and this was the area in which they rated themselves highest. There was a widespread concern among the participants ($M=4.2$) when they were asked whether or not they were worried about the knowledge children are acquiring in school about health. Accordingly, participants said that they were not certain about the knowledge that teachers had on the subject of health and nutrition ($M=3$). Parents also claimed that they were not sure that children would learn about healthy eating and nutrition on their own as they develop ($M=3.2$). In conclusion, the results of the pre-session survey revealed that the majority of respondents were worried about their children's dietary preferences and believed that the influence of the media on a child's desire to consume certain foods may be a factor ($M=4.6$; $M=4.8$). (See Table 1)

Table 1 Pre-Session Survey Means

Q7 - I feel knowledgeable about healthy eating and nutrition for my children	4.4
Q8 - I feel confident that I can teach my children about healthy eating	4.2
Q9 - I am concerned about the	4.2

information my children are learning/ will learn in school on health	
Q10 - I believe teachers are generally knowledgeable in terms of health/nutrition	3.0
Q11 - I believe children will learn about healthy eating/nutrition on their own as they grow	3.2
Q12 - I feel the media can play a role in what children want to eat	4.6
Q13 - I am concerned about my child's food choices	4.8

During the pre-session survey, in addition to the questions that were detailed above, participants were asked what they intended to gain from the sessions as well as what information would be most beneficial about this subject.

CONCLUSION

In general, the differences in the pre- and post-session survey results scores indicated that participants reported an increase in knowledge and understanding regarding the significance of child nutrition. This was indicated by the fact that participants reported higher scores on the pre-session survey. It is possible to draw the conclusion from the findings that the participants felt better educated about the subject of child nutrition and more confident in their capacity to teach healthy food to their own children. It is noteworthy to note that prior to attending the sessions, parents did not indicate in their responses to the open-ended survey questions that they were interested in learning about particular areas of child nutrition. This may be the case either because the parents believed that they already had sufficient knowledge on the subject at hand or because they did not give any regard to the possibility of acquiring further information. On the post-session survey, parents said that they enjoyed learning more about particular nutrition issues like as proteins and vitamins, which provides some evidence that this is accurate. It's possible that the sessions opened their eyes to the fact that there is more to eating well than they had previously believed. Additionally, it would suggest that the parents improved both their knowledge and their sense of self-efficacy (as indicated by their confidence in being able to teach their children about nutrition).

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