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Research report

Baby-led weaning and the family diet. A pilot study ☆

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ABSTRACT

Baby-led weaning (BLW) is a style of solid food introduction that emphasizes self-feeding rather than spoon-feeding. The purpose of this cross-sectional study was to determine whether parents using BLW change their dietary intake during weaning, and if their babies are offered family foods. Participants kept diet diaries at baseline and three months later, post-BLW implementation. Wilcoxon tests revealed no significant changes in dietary intake during the first three months of weaning, however, parents offered their children 57% of the same foods they were consuming. Results suggest that BLW does not lead to dietary changes among parents during the weaning process.

Introduction

The definition of weaning is "to accustom to take food otherwise than by nursing" (Merriam-Webster, 2003), i.e., the introduction of solid foods to a baby. Baby Led Weaning (BLW) is a concept based on the observation that babies are able to feed themselves and choose the pace of solid food introduction at around six months of age rather than being spoon-fed by a caregiver (Rapley & Murkett, 2008), a weaning method that is reportedly gaining popularity in the United Kingdom (UK) (Brown & Lee, 2010b).

Several developmental changes occur in the digestive and immune systems at around six months of age that allow babies to cope more effectively with solid foods. These changes were detailed in a comprehensive review (Kramer & Kakuma, 2001), which prompted the World Health Organization (WHO) to change its recommendation on the introduction of solids from four to six months (WHO, 2001), followed by the American Academy of Pediatrics (Gartner, Morton, Lawrence, Naylor, O'Hare, & Schanler, 2005). A more recent review further validated this recommendation (Kramer & Kakuma, 2009). Physical changes also emerge around 6 months of age that enable the baby to self-feed, which include the ability to sit unaided, grasp objects and bring them to its mouth, chew, and move food from the front to the back of the mouth (Naylor & Morrow, 2001). BLW takes advantage of these changes using the following principles: babies join in with the rest of their family at meal times; babies are encouraged to explore food (and not expected to receive a large amount of nutrition in the earliest stages of weaning); food is offered to babies in chunks or pieces that they are able to grasp; babies feed themselves when they are ready; and babies choose how much and what to eat, while they continue to have breast milk or formula "on demand" until at least 12 months of age (Rapley & Murkett, 2008).

BLW may have important implications for how babies continue the self-regulation that is inherent in the process of either breast feeding or formula-feeding in which the caregiver responds appropriately to the infant's cues of hunger and satiety. Babies are able to regulate the amount they take from the breast (Dewey & Lonnerdal, 1986) and when self-feeding with finger food (Scaglioni, Salvioni, & Galimberti, 2008). Several studies have provided support for the importance of self-regulation throughout childhood and the potential negative implications in later feeding behavior and obesity resulting from early parental pressure to eat and restrictive child-feeding practices (Brown & Lee, 2011; Faith & Kerns, 2005; Webber, Cooke, Hill, & Wardle, 2010). As such, it has been suggested (Fomon, 2001) that infants be encouraged to discontinue eating at the earliest signs of wanting to stop, regardless of whether they are breastfed or formula-fed, and later when a predominantly solid foods diet is consumed.

One study that looked at maternal issues of control over food in those using BLW compared to traditional weaning methods (Brown & Lee, 2010a) demonstrated that mothers using BLW had a less restrictive feeding style, imposed less pressure on babies to eat, and showed less concern and monitoring of their children's

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weight compared to those using traditional weaning. The authors noted that a less controlled style may have beneficial effects on the child's future weight and eating patterns. The same authors published a descriptive study on individuals using BLW and how it is implemented (Brown, 2010b). In this study, BLW was associated with a later introduction of solids at a time closer to the WHO recommendations of 6 months, more milk feeds and a longer breast feeding relationship, greater participation in family meals, and reduced stress in the mother over solid food introduction.

While there is existing research supporting the theories behind BLW and analyzing the characteristics of those who use it, to date there has been no formal study on the effects of BLW on the nutritional quality of diets of families who implement it. Therefore, the purpose of this pilot study was to investigate whether implementation of BLW would affect the diets of parents, and whether infants would, in fact, be offered family foods, one of the principles behind the method.

Methods

Subjects and recruitment

Subjects were parents of infants approaching six months of age, who were about to begin introducing solids to their children and who had visited an online forum dedicated to BLW. Requests for volunteers were posted on a website dedicated to education about and assistance with BLW and the BLW group on Facebook®. Respondents were sent a screening questionnaire via email. Once eligibility was verified, they received a copy of the study protocol and informed consent document via email. Inclusion criteria were as follows: the respondent was the baby's primary caregiver who planned to use BLW techniques for their infant's solid food introduction; at least one parent was required to have read the book entitled, "Baby-Led Weaning: Helping Your Child Love Good Food" (Rapley & Murkett, 2008); the parents had no family history of severe food allergies; they had only one child in the household (i.e., to eliminate effects of older siblings on family food offerings); their age was between 18 and 45 years; and their babies were not in daycare or fed by another caregiver for more than one meal per week. Exclusion criteria included parents of babies born before 37 weeks gestation or with developmental delays due to the differing developmental timeline that these children may experience. Ethical approval for this study was granted by the Institutional Review Board at Bastyr University.

Research design and dietary intake

To assess the impact of BLW on the family diet, two cross-sectional surveys were used to determine the dietary intake of the parent participants (one parent per family) before (baseline) and three months after initiating BLW. Dietary intake was assessed using 3-day diet diaries that were sent (along with instructions) and returned via email, and completed by the parents in their homes. To assess whether infants were being offered "family food", (defined as food that was being consumed by the parent concurrently), during the second data collection, parents were also asked to keep a record of all the foods offered to their babies (but not necessarily consumed). The parent's diet diary and infant's food offer records were evaluated for similarity by comparing whether the food offered to the child was also being consumed by the parent participant at shared meal occasions (i.e., times when both parent and child were eating); thus, a percentage was derived of similar foods offered during the course of each day. Participants who completed the study received a retail gift card in the amount of $15 or £10. Participants were not informed as to the true purpose of the study and were, therefore, debriefed after study completion.

The 3-day diet diary was chosen as the best method of recording family food intake for the purpose of this study. Although there is no gold standard in dietary assessment, a variety of dietary assessment tools have been validated, including 24 h recalls, food frequency questionnaires (FFQ), and 3- and 7-day diet diaries; each with their own strengths and weaknesses (Willett, 1998). Diet diaries are more detailed than a FFQ and less prone to lapses in memory and under- or over-reporting (misclassification) of intake (Day, McKeown, Wong, Welch, & Bingham, 2001). In addition, diet diaries have the best statistical agreement with weighed food records (Bingham et al., 1994). While a 6- or 7-day diet diary may be an unnecessary burden on respondents, the 3-day diary has similar test–retest reliability (Eck, Klesges, & Klesges, 1996).

Diet diaries were analyzed using Food Processor® (ESHA Research Inc. Salem, OR). Baseline levels of total caloric intake, saturated and *trans* fats, sodium, sugars, vitamin C, folate and fiber were averaged over three days and compared to the second set of diet diaries, approximately three months later. These nutrients were selected since they reflect public health recommendations to limit sodium, unhealthy fats, and added sugars; and to increase consumption of fruits, vegetables, whole grains and fiber (USDA, 2011a,b).

Statistical analysis

Analyses were performed using IBM SPSS Statistics® (version 19, IBM Inc., Somers, NY). Descriptive statistics including mean age, gender and nationality were generated. Mean and median intakes for each nutrient of interest were recorded at baseline and three months. Changes were compared using the Wilcoxon signed rank test. The level of significance was set at $p < 0.05$.

Results

Twenty-five people responded to the online requests for volunteers. Of those, sixteen respondents were eligible for the study, and eleven agreed to participate by returning the signed consent form. Of those who were eligible but did not participate ($n = 5$), the main reason cited was the burden of having to complete the three-day diet diaries at two different time points. Complete data was obtained from ten participants who supplied both sets of diet diaries, which were used for all analyses. All study participants were female and the mothers of the babies being introduced to solids using BLW. Participants' age range was 29–35 years with an average age of 32 years (SD = 1.7). Six subjects resided in the UK and four were from the U.S. All participants were breastfeeding during the first diet diary collection period when the ages of their infants ranged from five to six months. Nine out of the ten participants were still breastfeeding during the second diary collection period when the infants were eight to nine months old. No further demographic information was obtained.

Parents' dietary intake

Participants' intake of energy and key nutrients at baseline and at follow-up, with comparison to U.S. and UK government recommendations, is displayed in Table 1. Sugar comprised 19% of total calories and saturated fat made up 12% of total calories. Only two participants consumed at least 400 mcg of folate. Three months after initiation of BLW, parental intake of total calories and key nutrients decreased (including sugar at 17% of total calories) except for saturated fat, which increased to 14% of total calories. However, none of these changes were statistically significant. Although one participant reported a large decrease in calorie intake from the first to second diet diary (1688 calories), it was deter-

Table 1
Dietary intake and percent of U.S. and UK government recommendations at baseline and follow-up, three months after baby-led weaning commenced.

Nutrient	Baseline	Follow-up	Change
Kilocalories	2211.5 ± 495.9	2034.5 ± 407.6	−177.0 ± 763.3
Sugar (g)	103.7 ± 30.8 (75, 170)	86.5 ± 33.2 (68, 155)	−17.2 ± 44.9
Saturated fat (g)	29.4 ± 10.2 (120, 109)	31.5 ± 12.3 (139, 123)	2.1 ± 19.4
Trans fat (g)	0.65 ± 0.78 (0.3)	0.59 ± 0.52 (0.3)	−0.06 ± 1.01
Sodium (mg)	2837.5 ± 771.2 (123, 118)	2793.5 ± 731.4 (121, 116)	−44.0 ± 1239.2
Fiber (g)	24.9 ± 7.8 (86, 138)	22.9 ± 7.1 (79, 127)	−2.0 ± 8.2
Vitamin C (mg)	115.9 ± 55.6 (97, 290)	111.5 ± 105.5 (93, 279)	−4.4 ± 114.4
Folate (mcg)	288.8 ± 115.2 (58, 111)	250.7 ± 114.8 (50, 96)	−38.1 ± 88.9

Note: Values reported as Mean ± SD (% U.S. recommendation, % UK recommendation, based on adult lactating females); none of the changes were statistically significant at $p < 0.05$.

mined not to be an outlier using Grubbs' Test (Graphpad Software, 2005).

Foods offered to infants

Diet diaries and food offer records indicated that parent participants offered their babies food on average 3.5 times per day, and approximately 3 of these daily meal occasions occurred at the same time that the parent was eating. A wide range of foods were offered to infants including fruits (fresh and dried), vegetables (cooked and raw), sandwiches, bread, toast, crackers, rice, yogurt, tofu, cheese, eggs, hummus (and other bean spreads), nut butters, rice cakes, biscuits, hot cereal, soups, pasta, pork, beef, lamb, chicken, and fish. Babies continued to receive an average of 5 breast milk feedings ($n = 9$) or formula feedings ($n = 1$) daily.

Similarity of parent and infant diets

The second aim of the study was to assess whether parents were offering their infants family foods during the second dietary survey period since this is one of the principles of the BLW method. Of the food that was consumed by parent and child at the same meal occasion, the range of percent similarities was 44–86%, with an average similarity of 57%. In most cases, the additional foods offered to babies consisted of extra fruits and vegetables, often offered as a snack when parents were not eating. Even the participant with the lowest percent similarity was still offering the same family foods but at different times of the day (for example, offering the baby some pasta in the evening which had been eaten by the parent at lunchtime). However, those foods were not considered "similar" to what the parent was eating concurrently.

Discussion

The results of this study suggest that there was no significant change in the diets of families using the BLW method of introducing solid foods, when parent diet was assessed for total energy and key nutrient intake before weaning and at approximately three months after solid foods were initially introduced. Thus, the implementation of BLW had no significant effect on the diets of the parents in the families involved.

There may be several reasons why participants' diets did not significantly change. For example, parents may have decided to prepare completely different meals for themselves compared to their children in order to maintain their usual eating style, especially if they were concerned with the potential for allergies or they didn't wish to change their eating habits. Some parents may have been unaware of the importance of offering low sugar and low sodium foods to their babies, and may have continued to consume foods high in sugar and sodium while introducing solids to their children using family meals. Participants' general nutritional knowledge or knowledge about recommended types of foods (e.g., low sodium, low sugar) to offer infants was not assessed. In addition, some participants may have perceived that they had a high quality diet before weaning their baby and decided to eat in a similar fashion.

Dietary analyses revealed that participants' intake of some key nutrients was either excessive or inadequate, according to both U.S. and UK government standards. Saturated fat and sodium intake exceeded recommended limits for both countries, which could have negative implications for cardiovascular health (Nishida & Uauy, 2009). Sugar intake exceeded the UK limit of 11% of food energy (Pheasant, 2008). In contrast, reported energy intake was inadequate. U.S. guidelines indicate that women ages 19–50 should consume 1800–2400 calories per day, with an additional 500 kcal/day to cover the energy costs of lactation (USDA, 2011a). By these guidelines, the lactating participants (100% at baseline and 90% at follow-up) were under-consuming energy by 89–866 calories daily. Also concerning was the inadequate intake of folate according to U.S. recommendations (USDA, 2011b), which is a nutrient considered to be important for reducing the risk of neural tube defects in unborn children (USDA, 2011a). The nutrient values in this study reflected only food and beverage intake; it is possible that the participants were taking vitamin and/or mineral supplements since supplementation is often recommended by doctors in the postpartum period, particularly for lactating women (ARHP, 2011), but this information was not obtained.

Although the results did not demonstrate significant changes in participants' diets, approximately 85% of infants' meals were consumed when parents were also eating, and 57% of the foods offered to babies were also being consumed by their parents at the same meal occasion. Therefore, it can be considered that the participants in this study were following key principles of BLW by offering family foods when at least one other person in the family was eating, which may be beneficial for several reasons. First, it may be convenient for parents to offer their babies the same food they are eating rather than preparing separate purees, which were a rare feature in the diets of these participants' babies. Even when soft or runny foods were offered, it was noted to be on a pre-loaded spoon with which the child was able to feed themselves. In addition, offering infants separate foods may establish the idea that there is "kid food" and "grown-up food," which may promote "pickiness" and rejection of "adult" food by the child in later years. Second, families who use BLW are presumably able to eat together since the child self-feeds, rather than a parent needing to feed the child at a separate time. This allows children to model the eating behaviors of their parents. Diet diaries indicated that some parents occasionally ate main meals at separate times from their babies perhaps due to their child having an early bedtime or parental work commitments. In other cases, it was evident that the parent was consuming a snack, such as coffee and biscuit, while the baby was breastfeeding. Thus, there are multiple reasons why an infant

may not be eating at the same time as the parent, yet may be introduced to solids using other BLW principles such as self-feeding.

Previous work has noted that early complementary feeding practices have long-term effects on children's diets (Brown, Ogden, Vogele, & Gibson, 2008; Coulthard, Harris, & Emmett, 2010). For example, if parents expose infants to a wide variety of tastes and textures early in the weaning process, acceptance of fruit and vegetables may be higher later in childhood. However, there has been very little research regarding parental diet and nutrient intake during this period and none on the effects of BLW on the diets of either parents or children. This is of particular importance in reference to the findings of the present study in which the parents' diet diaries reflected higher than desirable intakes of saturated fat, sodium and sugar; but inadequate calories or folate, as described previously. If parents who follow BLW are not choosing foods that are calorie and nutrient dense with little added sugar or sodium, yet are still offering family foods to their infants, then this may result in negative consequences for the child. Therefore, public health efforts may need to be focused on encouraging parents to adopt a more healthful family diet prior to infant weaning.

There are several limitations to this study, including the small sample size, that prohibit the generalization of results to the population. Since the study methods included the exchange of information across the internet, demographic information such as ethnicity and socioeconomic status was not obtained in order to protect the privacy and confidentiality of subjects. Therefore, we were unable to verify whether the sample was representative of parents who use the BLW method. In addition, errors in the accuracy of the dietary analyses may have been generated by the participants and/or the investigators. Participants self-recorded their dietary intake and, therefore, may have made errors in completing the diet diaries by omitting certain foods or by documenting inaccurate amounts, for example. The investigators may have made errors during input, which was exacerbated by the fact that both American and British foods were being reported, yet a database centered on American foods was used to analyze the diaries. This may have led to inaccuracies if products were not identical or if suitable substitutes could not be found in the database. However, any inaccuracies due to differences in national diets were minimized by using a British National with extensive experience in the U.S. to analyze the diets.

In conclusion, while not generalizable, the results of this study showed that there were no significant changes in families' energy and nutrient intake over the course of the study. The findings did indicate that infants introduced to solid foods using BLW and sharing most meals with a parent may be offered a majority of "family foods," or the same foods that parents are eating. However, if family foods are offered, they may be high in sodium, sugar and saturated fat, yet low in energy density and folate, which may be cause for health concern. These findings provide a point of reference for further study into the diets and nutritional intake of both those practicing Baby Led Weaning and their infants as the primary beneficiaries of this method.

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