Milk Cereal Drink Feeding Practices: A Descriptive Study Among Swedish Cohort of the IDEFICS Family Study.

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ABSTRACT

Background: Childhood overweight is an increasing public health concern and has recently been associated with the consumption of a traditional Swedish milk cereal drink (MCD) known as välling. Therefore, understanding the consumption pattern of MCD could help with the control of childhood overweight.

Method: A cross-sectional study among the Swedish cohort of the IDEFICS family study was conducted. Swedish participants were asked to complete a questionnaire aimed at understanding the prevalence of consumption, timing, feeding modality and rationale for offering MCD.

Results: Most children (74.7%) reportedly consumed MCD. Of those who consumed MCD, a larger part of participants consumed MCD two or more times a day with a higher proportion of participants (87%) who showed preference for bottle-feeding.

Conclusion: This study described the MCD feeding practices among participants. A greater number of participants were reported to have consumed MCD two or more times a day and though bottle feeding is not recommended, we found that in practice it is very common.

Keywords: Milk cereal drink, Obesity, Complementary food, Feeding practice, I. Family, Sweden.
1. INTRODUCTION
The burden of childhood overweight including obesity in the 21st century is alarming and presents a huge global health challenge that requires more attention and priority due to increased risk for adult obesity and other health conditions such as cardiovascular diseases and diabetes[1–3]. An overall increase in the prevalence of obesity and overweight among children has been observed in both developed and developing countries over the last three decades[4]. According to the World Health Organization, about 41 million children under-five years of age were obese globally in 2016[4, 5]. Imbalance between calorie intake and calories required for growth has been identified as the major cause of childhood obesity[6] alongside other risk factors such as parental and gestational weight[7].

In Sweden, the prevalence of childhood obesity has increased by 2 to 3 folds in the last decade[8]. Results from the Halland Health and Growth study[9] and among the Swedish cohort of the “Identification and prevention of Dietary and lifestyle-induced health Effects In Children and infants (IDEFICS) Family study”[10] attributes this in part to milk cereal drink (MCD) given to children. A study conducted to examine the association between MCD and overweight revealed a positive association between MCD and childhood overweight, suggesting a 2 fold increase in risk for overweight at 5 years of age among children consuming MCD daily at 12 months[11]. In that study, 11.6% prevalence of overweight and 2.3% obesity among Swedish children was reported.

MCD is mostly purchased as a ready-made mix composed of dehydrated skimmed milk and grains to which only the addition of hot water is required[12]. The grain content may include wheat, oat, rice, corn or a blend of grains and the product is often fortified with iron and other micronutrients[13]. According to findings from the IDEFICS Family study, MCD consumers were about 5 times more likely to be overweight than the non-consumers[10].

According to the Swedish Food Agency, introduction of small amounts of food containing gluten such as MCD made from gluten containing cereals such as wheat and barley[14] is recommended for children between 4-6 months old in order to reduce the risk of gluten intolerance. Further recommendations include introducing small food portions using a spoon rather than bottle feeding to avoid over consumption. After 6 months of age, the portion size of gluten containing foods can slowly be increased but never exceeding three portions a day to ensure a varied diet[13]. Since research has found an association between increased weight status and MCD consumption[9, 10], understanding the practices surrounding the consumption of MCD in Swedish children is therefore relevant. Hence, this cross-sectional study investigates MCD consumption patterns including duration, frequency and mode of delivery as well as the rationale for offering MCD.

2. METHODS
2.1. Study Design
A cross-sectional study was conducted in 2013/14 with participants of the Swedish IDEFICS. Family cohort (I.Family) to assess MCD practice patterns. The IDEFICS study began in 2006 with the aim to investigate lifestyle and health in children from eight countries. The I.Family study, a continuation of the IDEFICS study investigated the determinants of food choice, lifestyle and health in European children, adolescents, and their parents. At baseline, the Swedish I.Family cohort consisted of 1837 children. The families with children (n=522) aged between 2 to 10 years old at baseline from three municipalities of Västra Götalands province were asked to complete the MCD questionnaire.

2.2. Data Collection
An MCD questionnaire to understand the consumption pattern of MCD among children was administered to parents. Questions answered included age of MCD introduction, duration, frequency, and rationale for MCD consumption. The MCD questionnaire was presented in Swedish and later translated into English for analysis.

Age at MCD introduction was given in whole months and categorized as early introduction (< 4 months of age), in line with recommendations (4-6 months of
Duration of consumption was calculated by subtracting age at introduction from age at discontinuation and further classified as short duration (≤ 12 months) or long duration (≥13 months).

To determine frequency, respondents were asked to indicate servings per day or week. Parents were instructed to indicate all responses that applied to their child in regards to the time of day MCD was consumed. In addition to the traditional breakfast, lunch, and dinner, the Swedish culture incorporates a meal time referred to as “kvällsmat” (supper). This is typically a snack eaten before bedtime. We also included between meals and night to indicate MCD consumption between two common meal times and at night in the MCD questionnaire.

Parents indicated MCD delivery by bottle, mug, or bowl with a spoon and further specifying the regularity as always, often, sometimes, seldom, or never.

Parents were asked to state the reason of consumption from the following options: the child thinks it tastes good, so that the child will be full, so that the child will fall asleep, so that the child will calm down, so that the child will get enough nutrition, and other, in which open ended responses were accepted. Lastly, parents were asked to designate the type of MCD most often consumed by their child.

2.3. Data analysis
Data was analyzed using SPSS version 25 and results summarized as percentages and presented in tables.

2.4. Ethical Consideration
This study was conducted as part of the I.Family study in Sweden and adhered to the ethical standards of the I.Family study which obtained its ethical approval from the Regional Ethics Committee of the University of Gothenburg Sweden with ethics number 927-12.

3. RESULTS
A total of 256 parents accepted to participate in the survey, giving a response rate of 49%. However, the responses of 19 participants were excluded during analysis due to incomplete information.

A total of 237 participants’ responses were analyzed and based on the information provided, the majority 177 (74.7%) of children were reported to have consumed or were still consuming MCD while 60 (25.3%) of children were reported not to have consumed any MCD. Among the 177 children who were reported to have consumed MCD, the median age at start of MCD consumption was 6 months, while the median age at which the children stopped consuming MCDs was 36 months. 46.9% of children who consumed MCD started consumption between 4-6 months, 44.6% started after 6 months while a smaller (8.5%) proportion started consuming MCD at less than four months of age.

The duration of MCD consumption among study participants ranged from 1 month to 139 months (11 years 7 months). Among participants who were reported to have consumed MCD, 80.8% consumed MCDs for longer than 12 months while a lower proportion 16.4% consumed MCDs for a period shorter than 12 months. However, 2.8% of the participants were still consuming MCD at the end of data collection.

Based on the responses provided, most parents (66.7%) offered MCD to their children mainly to ensure satiety. The mode of delivery of MCDs among participants revealed an overall preference to bottle-feeding. Overall, 94% of study participants always or often used bottle-feeding as the mode of delivery of MCD. Based on the results of this study, 86.3% and 97.7% of study participants reported they never used a mug or a bowl with a spoon respectively as the mode of delivery of MCD. Among the participants that consumed MCD, approximately 4% reported consuming MCD four or more times per day while the majority (53%) consumed MCD two times per day. A high percentage of study participants (84%) showed preference to consuming MCD containing wheat followed by oat (23%). Based on the time of MCD consumption, the majority of participants showed preference to consuming MCDs during supper (81.4%) and breakfast (68.9%).
Table 1: Milk cereal drink feeding practices.

| Timing of consumption. | Between meals (%) | Breakfast (%) | Dinner (%) | Lunch (%) | Supper (%) | Night (%) |
|------------------------|-------------------|---------------|-----------|-----------|------------|----------|
| Yes                    | 23(13)            | 122(68.9)     | 17(9.6)   | 12(6.8)   | 144(81.4)  | 24(13.6) |
| No                     | 154(87)           | 55(31.1)      | 160(90.4) | 165(93.2) | 33(18.6)   | 153(86.4) |

Frequency of MCD consumption

| ≥4 times Per day (%) | 3 times Per day (%) | 2 times Per day (%) | 1 time Per day (%) | 4-6 Times Per week (%) | 1-3 times Per week (%) | ≤1 time Per week (%) |
|---------------------|---------------------|---------------------|--------------------|------------------------|------------------------|----------------------|
| 7(4)                | 23(13)              | 94(53.1)            | 42(23.7)           | 1(0.6)                 | 1(0.6)                 | 9(5.1)               |

Type of MCD consumed

| Välling (gruel) (%) | Havrevälling (gruel from oat) (%) | Risvälling (gruel made from rice) (%) | Majsvälling (gruel made from corn) (%) | Mjölk (Milk) (%) | Annan (Others) (%) |
|---------------------|----------------------------------|--------------------------------------|----------------------------------------|-----------------|-------------------|
| Yes                 | 149(84.2)                        | 41(23.2)                             | 10(5.6)                                | 20(11.3)        | 5(2.8)            |
| No                  | 28(15.8)                         | 136(76.8)                            | 167(94.4)                              | 157(88.7)       | 172(97.2)         |

What is the reason for consuming MCD

| Child thinks it tastes good (%) | To calm the child (%) | So the child is full (%) | To sleep (%) | Nutrition (%) |
|--------------------------------|-----------------------|--------------------------|--------------|---------------|
| Yes                            | 87(49.2)              | 29(16.4)                 | 118(66.7)    | 32(18.1)      | 63(35.6)        |
| No                             | 90(50.8)              | 148(83.6)                | 59(33.3)     | 145(81.9)     | 114(64.4)       |

How does your child eat MCD

| Always (%) | Often (%) | Seldom (%) | Never (%) | Never (%) |
|------------|-----------|------------|-----------|-----------|
| *In a bowl with spoon | 2(1.2) | 0(0)       | 1(0.6)    | 1(0.6)    | 168(97.7) |
| *Mug       | 5(2.9)    | 5(2.9)     | 9(5.1)    | 5(2.9)    | 151(86.3) |
| Bottle feeding | 154(87) | 12(6.8)    | 5(2.8)    | 0(0)      | 6(3.4)    |

4. DISCUSSION

The aim of this study was to describe the consumption pattern of MCDs among study participants in relation to the recommendations by the National Food Agency in Sweden. According to the National Food Agency in Sweden, breast milk or infant formula is the only recommended food for children less than 4 months of age[15]. However, based on the results of this study, 8.5% of study participants started MCD consumption before 4 months. This result is consistent with other studies which reported early introduction of complementary food to children below this age[16, 17]. The results of a study conducted in Norway to determine the timing of complementary food and associations between maternal and infant characteristics showed that 5% of children were introduced to complementary food before the age 4 months[16]. Similar results were obtained from a study conducted in the USA where in 16.3% of study participants were introduced to complementary food before the age of 4 months[17]. Though this huge disparity could be as a result of differences in the representativeness of the studies, differences in study population, overall difference in the feeding habits between the USA and Sweden or other factors not mentioned, both studies reveal a deviation to a somewhat similar recommendation regarding the time of introduction of complementary food.

Parents indicated that when serving MCD, the large majority always used the bottle, and almost none used the bowl with spoon method as recommended. Serving by bottle increases the risk of overeating and the body receiving more than the amount of calories...
Bottle-fed children have a decreased ability to self-regulate intake and have a slowed satiety sensation, thus encouraging children to consume more than needed[20].

According to findings from this study, 68.9% of children were fed MCD at breakfast and 81.7% at supper. Consuming a caloric beverage before bed in addition to dinner has been linked to childhood obesity, although with some inconsistency in findings[21]. The consumption of food or snacks before bedtime among children has been associated with parental eating habits[22].

Furthermore, this study showed that 66% and 49% of participants reported to serve their children with MCD so that the children are full and because their children think it tastes good, both of which stand as the most common rationale for serving MCD. The rationale for serving MCD clearly relates to the frequency of consumption and the timing of consumption. Serving MCD to ensure satiety for instance coupled to the fact that the majority of participants used bottle-feeding which makes regulation of the quantity of intake difficult, could result in the child getting more calories than needed for growth and development[23]. Although this study is unable to establish any evidence between the times of consumption of MCD and overweight, future research should explore this. Further investigation could reveal novel results and provide insights and recommendations to effectively control childhood overweight.

To our knowledge, this is the first study to document findings with regards to frequency, age of introduction, feeding time and rationale of MCD use. Previous research revealed that MCD consumers are more likely to become overweight[11]. This could be attributed to eating habits reported in this study with regards to MCD consumption. Early introduction, frequency of consumption, the use of bottle feeding coupled with the time of feeding are likely risk factors for becoming overweight in childhood in relation to MCD. These results yield opportunities for further research.

Retrospective studies are contingent on the participants’ memory. This presents a weakness as some participants had not served MCD for several years and have a lengthy recall period. A larger study population would strengthen the results; however, our findings are consistent with similar previous literature. This study was also subject to a relatively low response rate of 49%. Though the authors did not find any differentiating characteristic between non-responders and responders, the authors however think that a higher response rate would have provided a similar but better understanding of MCD feeding practices in the population.

5. CONCLUSION

The findings of this study revealed a high prevalence of MCD consumption with majority of participants consuming MCD for longer than 12 months coupled to a high preference to bottle feeding as opposed to a bowl and spoon as recommended by the Swedish national guidelines. Early feeding habits, timing and frequency of MCD consumption may significantly influence future overweight. However, research aimed at elucidating the implication of early introduction of MCD and frequency of MCD consumption to future overweight and obesity is recommended.

Conflict of Interest

The authors declare that there is no conflict of interest.

Author’s contribution

CHN, MP, analyzed the data and drafted the manuscript, MR, GE and MH assisted in conceptualizing the study, all assisted with data interpretation, MH assisted with data interpretation and supervision. All authors read and approved the final manuscript.

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