# Breastfeeding practices, consumption of ultra-processed foods in complementary feeding and associated factors in premature children

Emanuelle Emília Ferreira Parreiras[I], Luciana Moreira Lima[I],
Ronaldo Cascelli Schelb Scalla Pereira[I], Tatiane Cristina Serafim[I],
Luiz Felipe Gonçalves de Figueiredo[I], Daniela Rezende Moreira[I],
Simone Cunha Magalhães Rodrigues[I],
Brunnella Alcantara Chagas de Freitas[I]

[I]Universidade Federal de Viçosa, Viçosa, MG, Brasil

## ABSTRACT

Breastfeeding and a suitable eating plan in the first years of life are crucial for the development of premature children. Early exposure to ultra-processed foods (UPF) can lead to an increased risk of chronic diseases. To analyze premature infants for breastfeeding practices, intake of ultra-processed foods, their health risks and other associated factors. Data on diet and sociodemographic variables were investigated using questionnaires. We used anthropometric assessment according to WHO growth curves and laboratory tests to analyze the lipid profile. From the whole sample, 51% never received exclusive breastfeeding, or received it for less than a single month; 29% received between four and six months; in 84% another food was introduced before six months. After the stratification of consumption between "none/one type" and "more than one type" of UPF, the variables "child's age" and "family history of overweight/obesity" were positively associated. After bivariate and multivariate analyzes, a greater diversity of UPF intake was associated with family income <2 minimum wages and employed mothers. Premature infants are at risk of early weaning and use of AUP before even six months of corrected age.

**Keywords**: Premature; Breastfeeding; Complementary feeding; Ultra-processed foods

## 1 INTRODUCTION

The World Health Organization (WHO) recommends exclusive breastfeeding in the first six months of life and regulates the introduction of complementary feeding after this period, maintaining breastfeeding. Thus, in the first year of life, infants are very vulnerable to dietary and nutritional inadequacies, especially with the inclusion of processed foods in their diet (WORLD HEALTH ORGANIZATION; PAN AMERICAN HEALTH ORGANIZATION; DIVISION OF HEALTH PROMOTION AND PROTECTION, 2003).

According to the NOVA classification, foods are divided into four groups according to their degree of industrial processing: fresh or minimally processed foods, processed culinary ingredients, processed foods and ultra-processed foods (MONTEIRO *et al*., 2018).

The group of ultra-processed foods are nutritionally unbalanced, as they have high amounts of fats, sugars and sodium and for providing high energy value and low amounts of micronutrients, and tend to be eaten in large quantities as they are more convenient and attractive to the population since they are ready for consumption, highly palatable and low cost (BATALHA *et al.*, 2017; MONTEIRO *et al.*, 2018).

A correct diet plan in the first year of life allows to prevent nutritional deficiencies responsible for serious and irreversible changes in areas such as psychomotor, behavioral, sensory and cognitive, as well as avoiding the excesses that may predispose to situations such as overweight, obesity and greater cardiometabolic risk (LONGO-SILVA *et al.*, 2017; SILVA; AGUIAR, 2011).

Infants should avoid excessive intake of salt, sugars and bad fats because it is associated with increased cardiovascular risk and the fact that the preference for certain flavors can be modified by not early exposure to this type of food. The specific taste for salt and sugar, when stimulated in several species of mammals, including man, leads to a future preference for foods with excessive content of this

Parreiras, E.E.F.;  Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 3

element (BATALHA *et al.*, 2017; LONGO-SILVA *et al.*, 2017; SOCIEDADE BRASILEIRA DE PEDIATRIA; DEPARTAMENTO CIENTÍFICO DE NUTROLOGIA, 2012).

The increased risk of cardiometabolic disorders in childhood and adulthood is even greater when it comes to premature and low birth weight children, including insulin resistance, high blood pressure, obesity and dyslipidemia (COELLI *et al.*, 2011; MOYER, 2013; SALGADO; CARVALHAES, 2003; SIPOLA-LEPPÄNEN *et al.*, 2014). In addition, they stand out as risk factors for obesity and high blood pressure: the shorter duration of breastfeeding, observed among mothers of premature babies; and the inadequate introduction of complementary food, consisting of fresh cow's milk, juices and the addition of salt and sugar in the preparations (DE FREITAS *et al.*, 2016; HEYMAN; ABRAMS, 2017).

Greater care for children born prematurely is due to its expressive prevalence and associated morbidities. A nationwide study conducted in 2011-2012 estimated a prevalence of premature births of 11.5% in Brazil, being distributed as: 1.8% under 32 weeks, 1.2% between 32-33 weeks and 8.5% between 34-36 weeks (LEAL *et al.*, 2016).

In addition to prematurity being the main cause of death in the first year of life in Brazil, those who are born prematurely and survive due to the immaturity of organs and systems, have a higher risk of changes in neurodevelopment and of chronic events in adult life such as hypertension, diabetes, dyslipidemia and obesity (MENEZES; STEINBERG; NOBREGA, 2018; SOCIEDADE BRASILEIRA DE PEDIATRIA; DEPARTAMENTO CIENTÍFICO DE NUTROLOGIA, 2012).

Thus, the transition from food to infants in an appropriate manner is essential for establishing healthy eating habits in adulthood. The early exposure of infants to ultra-processed foods, with a high content of salt, fats and sugars is associated with the persistence of their high consumption, leading to an increased risk of chronic diseases in adulthood, while intervention strategies aimed at reducing consumption of these contribute to reducing this risk (COSTA *et al.*, 2019).

In this context, the present study aims to analyze premature infants monitored at a secondary reference service regarding breastfeeding practices, consumption of ultra-processed foods, their health risks and factors associated with consumption.

## 2 METHODOLOGY

This is a cross-sectional study, which analyzed infants born prematurely, followed up at the State Center for Specialized Care (CEAE).

The sample consisted of all children born premature with CGA over 6 months up to 4 years old, followed up on an outpatient basis at CEAE during the data collection period. Considering an average of 1000 births in the HSS per year, prematurity rates of 10-11% and losses of 20%, an annual population of 80 preterm infants was estimated.

Infants with genetic syndromes, severe congenital malformations, congenital heart defects, severe chronic diseases that compromise nutritional status, regularly using medications that have an effect on blood pressure and patients whose parents or legal guardians refused to participate in the study were excluded.

The data for this research were collected at the CEAE upon invitation and acceptance to participate in the research through an adapted questionnaire, according to the foods described in the literature, the Guidelines for the Evaluation of Food Consumption Markers in Primary Care and the Protocols of the Food Surveillance System and Nutritional - SISVAN. The data were filled in by qualified professionals for this service, based on information from the parents and / or legal guardians of the children (nutritional history) (MINISTÉRIO DA SAÚDE, 2008, 2015).

The questionnaire on food was related to two moments: past food (referring to the first year of CGA) and current food, with emphasis on data on breastfeeding, salt consumption and ultra-processed foods.

Breastfeeding was categorized into exclusive breastfeeding, complementary breastfeeding and artificial feeding, and the total duration of breastfeeding considered CGA (WORLD HEALTH ORGANIZATION, 2008a).

Parreiras, E.E.F.;  Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 5

Through anthropometric nutritional assessment, height (cm), weight (g) and head circumference (cm) were measured and the body mass index (BMI) was obtained, which were analyzed and interpreted according to the curves recommended by the WHO (Annex 2), using the CGA (WORLD HEALTH ORGANIZATION, 2008b). In addition, blood pressure was measured and interpreted based on specific tables, according to sex, age and height percentile (Annex 3) (SOCIEDADE BRASILEIRA DE CARDIOLOGIA, 2016).

A scale was used to measure the weight, an anthropometer for height, a non-extensible tape measure to measure the head circumference and a sphygmomanometer with cuffs suitable for the circumference of the arm for the measurement of blood pressure (Annex 3) (SOCIEDADE BRASILEIRA DE CARDIOLOGIA, 2016; WORLD HEALTH ORGANIZATION, 2008c).

To analyze the lipid profile, laboratory tests (lipidogram) of the children were performed, with collection of 5 mL of blood and subsequent analysis in a specific laboratory. For the collection of the material, the children were not fasting. The collection after fasting for 12 hours was only necessary to confirm the lipidogram in cases of triglyceride values > 440 mg/dL (SOCIEDADE BRASILEIRA DE PEDIATRIA; DEPARTAMENTO CIENTÍFICO DE ENDOCRINOLOGIA, 2017).

Information on family history of risk factors for arterial hypertension was also collected (SOCIEDADE BRASILEIRA DE CARDIOLOGIA, 2016).

The socio-demographic variables were also analyzed: maternal and paternal age, race, maternal and paternal education, maternal occupation (working outside the home or not), maternal marital status (single / divorced, stable / married), family income in reais / minimum wages and per capita income (Appendix 1) (INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE), 2016).

The data for the research were also complemented with the records of the children's medical records, which are semi-structured, in order to increase the reliability of the information and reduce the memory bias.

Other variables were also analyzed. Premature: every newborn with a gestational age of less than 37 weeks. Chronological age: defined as the postnatal age. Corrected age for prematurity: difference between gestational age at birth and average duration of a full-term pregnancy (40 weeks). Those born before the 28th gestational week are classified as extremely premature, those between 28-31 weeks as very premature and those between 32-36 weeks as moderate premature (REDE BRASILEIRA DE PESQUISAS NEONATAIS, 2009; THE NATIONAL ACADEMIES PRESS, 2007).

Low birth weight is characterized when less than 2500g, regardless of gestational age. Very low birth weight newborns are those with birth weight <1500g and extremely low birth weight those with birth weight <1000g (THE NATIONAL ACADEMIES PRESS, 2007).

As for the adequacy of birth weight for gestational age, newborns are still classified as suitable for gestational age (AGA), small for gestational age (SGA) or large for gestational age (LAG), based on in the Intergrowth reference (VILLAR *et al.*, 2015).

This assessment is very suitable for monitoring weight gain and reflects the child's overall situation; however, it does not differentiate current or acute nutritional impairment from previous or chronic ones. Therefore, it is important to complement the assessment with another anthropometric index. The cutoff points for Nutrition Surveillance in Brazil, determined by the Ministry of Health, are based on internationally adopted recommendations, and the values of the growth curves between ≥ Z-score -2 and ≤ Z-score +2 indicate adequate weight for the age and below or above these values, low weight and high weight for age, respectively (MINISTÉRIO DA SAÚDE, 2011).

The body mass index (BMI) expresses the relationship between the child's weight and height. It is used to identify excess weight among children and has the advantage of being an index that will be used in other stages of life. SISVAN recommends the BMI classification proposed by the World Health Organization, for

Parreiras, E.E.F.; Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 7

children under 5 years old. (WORLD HEALTH ORGANIZATION, 2006) According to age, on the growth curve, children are classified as eutrophic when the values are between ≥ z-score -2 and ≤ z-score +1, with values of z-score less than -3 indicating marked thinness and values greater than +3, obesity (MINISTÉRIO DA SAÚDE, 2011).

The lipid profile was assessed according to the V Brazilian Guideline on Dyslipidemia and Atherosclerosis Prevention (2013), considering the reference values for children. Acceptable total cholesterol <170 mg / dL, borderline between 170 - 199 mg / dL and acceptable LDL below 110 mg / dL are considered. (XAVIER H T *et al.*, 2013) .

The collected data were tabulated in the Microsoft Excel 2016 software and processed by the IBM SPSS Statistics 23.0 and Stata 13.0 software, considering a significance level of 5%.

For descriptive analysis, the quantitative variables of the study were presented as mean, standard deviation, median and interquartile range, according to the parametric or non-parametric distribution, which was verified by the Shapiro-Wilk test. Qualitative variables were described in absolute and percentage values, considering valid data.

For the analysis of parametric variables, the following tests were used: T test for independent samples and one-way ANOVA. For the analysis of non-parametric variables, the following tests were used: Mann-Whitney and Kruskall-Wallis. Pearson's chi-square test, Fisher's exact test, was used to evaluate categorical variables.

To assess correlation, the Spearman test was used. For the correlation coefficient (r), it was considered: 0-19% - "very weak"; 20-39% - "weak"; 40-59% - "moderate"; 60-79% - "strong"; 80-100% - "very strong" (AKOGLU, 2018).

Prevalence ratios (PR) were obtained as a measure of effect by Poisson regression. To compose the modeling, the variables of family income, total cholesterol and LDL were dichotomized in the respective strata: ≥2 or <2 minimum

wages; <170mg / dL or ≥170mg / dL; <110mg / dL or ≥110mg / dL. The explanatory variables that presented p <0.20 on the bivariate analysis were included in the regression analyzes. The final model included the significant variables at the 0.05 level.

The research was developed respecting the ethical aspects according to Resolution 466/2012 of the National Health Council and approved by the Ethics Committee on Research with Human Beings of the Federal University of Viçosa (CAAE: 03091318.9.0000.5153).

## 3 RESULTS

The sample consists in 51 patients, comprising 63.4% of the estimated premature population, which were studied clinical, biochemical, sociodemographic and dietary variables, collected in a transversal way. Four patients failed to show biochemical variables. In the post-hoc sample evaluation, it was observed that the effect size of the significant variables in the T-type tests (Cohen's D) varied between 0.57 and 0.70, resulting in a sample power that varies between 50% and 55% for a given distribution. The effect size of the significant variables in the chi-square tests (Crammer's V) ranged from 0.29 to 0.50, resulting in a sample power ranging from 54% to 85%. The UPF variable showed sample power above 80% in the stratifications evaluated.

In general, the sample had a median corrected gestational age of 19.4 (13.1 - 26.14) months; average birth weight of 1684.7 ± 554.9 grams; mean BMI of 15.4 ± 1.6 kg / m2; mean maternal age of 31 ± 7 years and median number of individuals in the household of 4 (3-5) individuals.As médias e medianas dos dados bioquímicos gerais se mostram como: CT, 159 (133 – 179); HDL, 45 ± 10,8; LDL, 92,6 (70 – 107); VLDL, 19 (15 – 28); triglicerídeos 96 (75 – 138). The median diversity of periodic use of UPF is 1 (1 - 2). Table 1 shows the frequency distributions of the

Parreiras, E.E.F.;  Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.;
Rodrigues, S.C.M.; Freitas, B.A.C.

| 9

main variables studied. Figure 1 shows the frequency distribution of the main UPF in the general sample and in age stratifications.

Figure 1 - Distribution of ultra-processed foods in the age groups: ≤ 12 months (n = 11), between 12 and 24 months (n = 22), ≥ 24 months (n = 18) and all ages (n = 51)
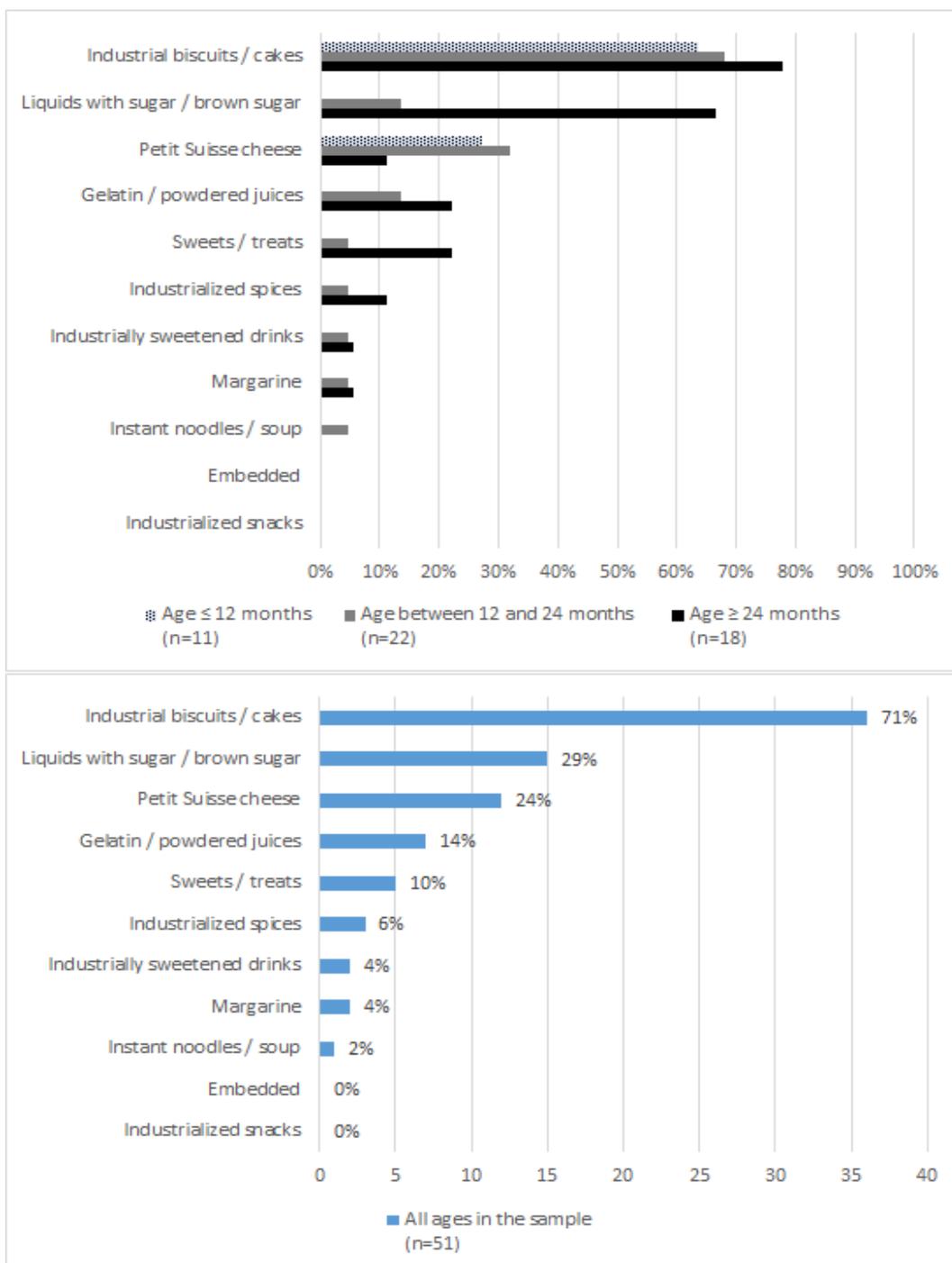


Source: Authors (2020)

Table 1 - Frequency distribution of clinical, sociodemographic and food data of the interviewed patients (n = 51)

| Variable | N | % | Variable | N | % |
|---|---|---|---|---|---|
| **Clinical variables** | | | Family income in MW | | |
| Sex | | | ≤ 1 | 31 | 61 |
| Male | 28 | 55 | > 1 e ≤ 3 | 13 | 26 |
| Female | 23 | 45 | > 3 | 7 | 14 |
| GA at birth | | | Maternal occupation | | |
| ≤ 30 weeks | 13 | 26 | Work out | 15 | 29 |
| Between 30 e 34 weeks | 21 | 41 | Does not work outside | 36 | 71 |
| > 34 weeks | 17 | 33 | Education of the head of the household | | |
| Birth weight for GA | | | Do not know | 5 | 10 |
| AGA | 9 | 18 | Illiterate | 2 | 4 |
| SGA | 42 | 82 | Incomplete elementary school | 12 | 24 |
| LAG | 0 | 0 | Complete elementary school | 7 | 14 |
| Corrected age | | | Incomplete high school | 2 | 4 |
| ≤ 12 months | 11 | 22 | Complete high school | 13 | 26 |
| Between 12 e 24 months | 22 | 43 | Graduated | 10 | 20 |
| > 24 months | 18 | 35 | **Food variables** | | |
| BMI for age | | | AI before 6 months of CGA | | |
| Thinness | 7 | 14 | Yes | 43 | 84 |
| Eutrophy | 42 | 82 | No | 8 | 16 |
| Overweight | 2 | 4 | EBF time | | |
| Obesity | 0 | 0 | Less than 1 month or never | 26 | 51 |
| Positive family morbid history | | | Between 1 to 4 months | 4 | 8 |
| Overweight or obesity | 26 | 51 | Between 4 to 6 months | 15 | 29 |
| Arterial hypertension | 42 | 82 | More than 6 months | 6 | 12 |
| Dyslipidemia | 20 | 39 | | | |
| Diabetes | 26 | 51 | | | |
| Kidney disease | 8 | 16 | | | |

Continuation…

Conclusion

Parreiras, E.E.F.;  Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 11

| Variable | N | % | Variable | N | % |
|---|---|---|---|---|---|
| **Sociodemographic variables** | | | | | |
| Maternal age | | | | | |
| ≤ 19 years | 3 | 6 | | | |
| Between 20 e 30 years | 23 | 45 | | | |
| > 30 years | 25 | 49 | | | |
| Maternal marital status | | | | | |
| Single or divorced | 11 | 22 | | | |
| Married or stable union | 40 | 78 | | | |

Source: Authors (2020)
In were: MW = minimum wage; SGA = small for gestational age; AGA = suitable for gestational age, GA = gestational age, CGA = corrected gestational age, BMI = body mass index, EBF = exclusive breastfeeding, AI = food introduction.

The periodic consumption of UPF was evidenced in 82% (n = 42) of the individuals and the diversity of foods varied from 1 to 6 in concomitant use. In order to evaluate the association of the studied variables with the diversity of UPF that are periodically ingested, the sample was stratified in patients who use none or 1 type of UPF periodically (n = 26) and more than 1 type of UPF periodically (n = 25). The results are shown in Table 2.

Table 2 - Distribution of clinical, biochemical, sociodemographic and dietary characteristics according to the diversity of ultra-processed foods used periodically by patients

| Variables | Diversity of UPF used periodically | | p |
|---|---|---|---|
| | None or only 1 type n (%) | More than 1 type n (%) | |
| **Clinics** | **(n=26)** | **(n=25)** | |
| Corrected age | 16.5 (11.8 - 20.8) | 25.3 (16.4 - 32.7) | **0,001[Ψ]** |
| Family history | | | |
| Overweight / obesity | | | |
| No | 18 (69) | 7 (28) | |
| Yes | 8 (31) | 18 (72) | **0,003[q]** |
| Dyslipidemia | | | |
| No | 18 (69) | 13 (52) | |
| Yes | 8 (31) | 12 (48) | 0,208[q] |

Conclusion

| Variables | Diversity of UPF used periodically | | p |
|---|---|---|---|
| | None or only 1 type n (%) | More than 1 type n (%) | |
| Diabetes | | | |
| No | 11 (42) | 14 (56) | |
| Yes | 15 (58) | 11 (44) | $0,328^q$ |
| **Biochemicals** | **(n=25)** | **(n=22)** | |
| Total cholesterol | 153 (122 - 170) | 165 (140 - 187) | $0,056^\Psi$ |
| HDL | 44.3 ± 10.7 | 45.7 ± 11.1 | $0,660^T$ |
| LDL | 80 (67 - 104) | 96 (79 - 110) | $0,103^\Psi$ |
| VLDL | 22 (17 - 27) | 17.6 (13.7 - 29) | $0,370^\Psi$ |
| Triglycerides | 113 (87 - 136) | 88 (68 - 145) | $0,579^\Psi$ |
| **Sociodemographic** | **(n=26)** | **(n=25)** | |
| Number of individuals in the household | 4 (3 – 5) | 4 (3 – 5) | $0,998^\Psi$ |
| Maternal occupation | | | |
| *Does not work outside* | 21 (81) | 15 (60) | |
| *Work out* | 5 (19) | 10 (40) | $0,104^q$ |
| Family income (MW) | | | |
| *< 2* | 12 (46) | 19 (76) | |
| *≥ 2* | 14 (54) | 6 (24) | $0,029^q$ |
| **Food** | | | |
| Use of complementary feeding before 6 months of corrected age | | | |
| *No* | 6 (23) | 2 (8) | |
| *Yes* | 20 (77) | 23 (92) | $0,248^f$ |

Source: Authors (2020)
In were: [T]Independent T test; [Ψ]Mann-Whitney; [q]Pearson's Chi-Square; [f]Fisher's exact test; [R]Odds Ratio; [C]Confidence Interval;

Table 3 - Bivariate and multivariate analyzes between the variables included in the model to predict the diversity of periodic use of ultra-processed foods (UPF).

| Variables | PR gross (IC95%) | p* | PR adjusted (IC95%) | p* |
|---|---|---|---|---|
| FH Overweight / obesity | | 0,002 | | 0,004 |
| *Não* | 1 | | 1 | |
| *Sim* | 1,32 (1,11-1,57) | | 1,24 (1,10-1,43) | |

Parreiras, E.E.F.; Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 13

Conclusion

| Variables | PR gross (IC95%) | p* | PR adjusted (IC95%) | p* |
|---|---|---|---|---|
| Maternal occupation | | 0,084 | | 0,002 |
| *Does not work outside* | 1 | | 1 | |
| *Work out* | 1,18 (0,98-1,41) | | 1,25 (1,10-1,44) | |
| Family income (MW) | | 0,247 | | <0,001 |
| ≥ 2 | 1 | | 1 | |
| < 2 | 1,14 (0,92-1,41) | | 1,34 (1,16-1,55) | |
| *Total cholesterol* | | 0,109 | | - |
| *< 170 mg/dL* | 1 | | - | |
| *≥ 170 mg/dL* | 1,17 (0,97-1,42) | | - | |
| *LDL* | | 0,108 | | - |
| *< 110 mg/dL* | 1 | | - | |
| *≥ 110 mg/dL* | 1,20 (0,96-1,51) | | - | |

Source: Authors (2020)
In were: FH: family history; PR: prevalence ratio; 95% CI: 95% confidence interval. * Poisson regression. The model was adjusted for age corrected.

When assessing the behavior of variables with the periodic use of specific UPF, the sample was stratified into periodic non-use and periodic use. The periodic use of cakes and biscuits (71%, n = 36) showed significantly higher values of TC (p = 0.020) and LDL (p = 0.038) in relation to non-use. The periodic use of Liquids with sugar / brown sugar (29%, n = 15) presented a higher median corrected age (p <0.001). The periodic use of petit suisse cheese (24%, n = 15) was not significant with clinical or biochemical variables in relation to non-use. The other UPF did not show significance in the evaluations.

The sample was stratified into two groups of patients considering the values of total cholesterol with values below (66%, n = 31) and above (34%, n = 16) of 170 mg / dl. There was a significant difference with a higher median of the amount of UPF diversity consumed periodically (p = 0.049) and average maternal age (p = 0.024) in the cholesterol group above 170 mg / dl.

The sample was also stratified into 2 age groups [<19 months (n = 22) and ≥19 months (n = 25)] considering the median age in months. In this stratification, there was no significant difference in the levels of TC (p = 0.949), HDL (p = 0.842), LDL (p = 0.915), VLDL (p = 0.685) and TGL (p = 0.647).

In the correlation analysis, the amount of UPF diversity was positively correlated with the corrected age at moderate intensity (r = 0.435; p = 0.001) and with total cholesterol at low intensity (r = 0.349; p = 0.016); and negatively with BMI at low intensity (r = -0.281; p = 0.046) and family income in MW at low intensity (r = -0.331; 0.018). Maternal age correlated positively with total cholesterol at low intensity (r = 0.361; p = 0.013), HDL (r = 0.394; p = 0.006) and family income in MW at low intensity (r = 0.324; p = 0.020). The graphical presentation of the significant correlations is shown in figure 2.

Figure 2 - Graphical representation of the correlations of the variables GA, BMI, TC and MW with the diversity of ultra-processed foods and maternal age. CGA = Corrected gestational age; BMI = body mass index; TC = total cholesterol; MW = Income in minimum wages. R and p values obtained by Spearman correlation
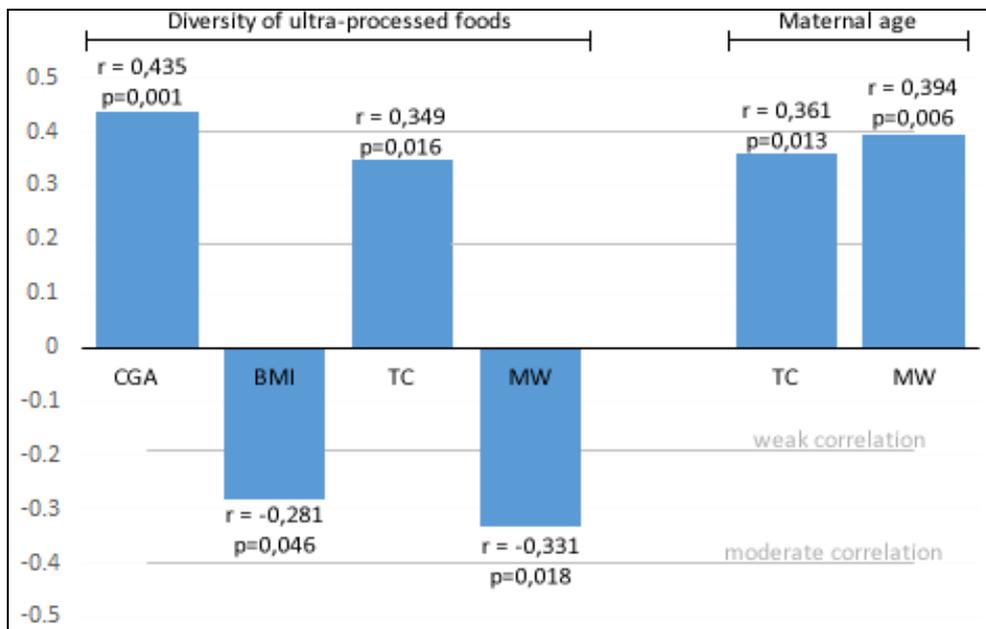


Source: Authors (2020)

The clinical, biochemical, sociodemographic and dietary characteristics of preterm infants were subjected to bivariate analysis due to the diversity of ultra-

Parreiras, E.E.F.; Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 15

processed foods used by them. Those with p <0.20 were included in the Poisson regression model, adjusted for the corrected age, and are shown in Table 3. In the final model, the family history of overweight / obesity (PR 1.24; 95% CI 1.10-1.43; p = 0.004), the mother works outside the home (PR 1.25; 95% CI 1.10-1.44; p = 0.002) and the family income is less than two minimum wages (PR 1.34; 95% CI 1.16-1.55; p <0.001) were associated with a 1.3 times greater chance of diversity in the consumption of ultra-processed foods by premature infants.

## 4 DISCUSSION

This study sought to identify the food and nutritional profile of premature children, regarding breastfeeding practices and the use of ultra-processed foods in complementary feeding, clinical and cardiometabolic implications and sociodemographic data.

Most were moderate premature infants, with gestational age between 30 and 34 weeks. 18% of premature infants were SGA. Regarding BMI, most were eutrophic as the literature reports. Children born SGA or born before 37 weeks tend to have a low average BMI (GUERRERO et al., 2015; JABAKHANJI *et al.*, 2018).

It is noteworthy that the maternal age is predominantly adult, with an average of 31 ± 7 years, which contrasts with some evidence in the literature that points out that the risk of prematurity is greater in extremes of fertile life, that is, between 15-19 years and older than 35 years (OLIVEIRA; LUCIA; BONILHA, 2016).

When analyzing breastfeeding practices, most of the sample (51%) had been breastfed exclusively for less than a month or never and only 29% had been breastfed for between 4 and 6 months. In the study by Luz et. al. (2018) the data are also worrying. At the time of discharge, 81.4% of premature infants were exclusively breastfed and that number dropped to 66.4% in the second week afterwards. Lima et. al. (2019) also confirm this result, with prevalence of exclusive

breastfeeding among premature infants of 85.2% at hospital discharge, 75% after 15 days and 46.3% after 30 days (LIMA et al., 2019; SILVA LUZ *et al.*, 2018).

When it comes to premature babies, several factors can influence these data. Breastfeeding for this population can be difficult due to physiological immaturity and the hospitalization of infants. The early onset and permanence of this practice can be impaired due to the instability of the babies' health, the difficulty of sucking due to motor-oral immaturity, the constant non-permanence of mothers in the inpatient units, the non-incentive of the kangaroo method, lack of support professional and time on mechanical ventilation (CHIANG *et al.*, 2019; IKONEN; PAAVILAINEN; KAUNONEN, 2015; SILVA LUZ *et al.*, 2018).

Exclusive breastfeeding is of paramount importance, especially for premature infants, due to its impact on reducing infant mortality, nutritional and immunological properties, establishing the mother-child bond and positive impacts on neuropsychomotor growth and development (CHIANG *et al.*, 2019; J.M.S. *et al.*, 2018; MENEZES; STEINBERG; NÓBREGA, 2018).

Another factor associated with the duration of exclusive breastfeeding and the early introduction of food is family income. In the population studied, 61% had a family income less than or equal to a minimum wage. However, the prevalence of exclusive breastfeeding up to five months is higher in low-income and low-middle income countries when compared to high-middle income countries. Brazil is an upper middle-income country, but there is great heterogeneity between its regions, which contrasts with the findings of the study (VICTORA *et al.*, 2016).

When questioning those responsible for the children about the introduction of complementary feeding, the vast majority (84%) reported that their babies would have already consumed some type of food before the six months of corrected age. These data contrast with the study by Gianni et. al. (2018), who analyzed the timing of complementary feeding in a cohort of 57 late preterm infants, whose mean age of food introduction was 5.7 ± 0.7 months (GIANNÌ *et al.*, 2018).

Parreiras, E.E.F.; Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 17

There are still several gaps with regard to the introduction of preterm infants, since they are part of a population that needs an increased nutritional supply, are at risk of delayed postnatal growth and inadequate nutrition early in life can lead to potential negative health effects throughout life (GIANNÌ et al., 2018).

Grupta et. al. (2017), conducted a randomized clinical trial in low-middle income countries, with the objective of evaluating the effect of starting complementary feeding at four versus six months of corrected age in babies born with gestational age less than 34 weeks. As a result, they found no difference in the BMI Z score at the age of one year, but observed more episodes of hospitalizations in the group that started at four months, when compared to the six-month group. However, they recommend starting complementary feeding at six months of corrected age in infants under 34 weeks.

On the other hand, Yrjänä et al. (2018) concluded in their cohort study with retrospective data from 464 preterm infants, that the early introduction of semi-solid foods, at the average 1.4 months of corrected age, did not increase the incidence of food allergies or atopic dermatitis in preterm infants, even extremely premature babies (J.M.S. et al., 2018).

In the systematic review published in 2018 by Vissers et. al., including five articles, addressing the time to start complementary feeding in preterm infants and the effect on excess weight, the result is also controversial. Among the five, two articles conclude that premature infants can benefit from an early feeding introduction, around 13 weeks postnatal. This result, which was corroborated with previous studies suggesting that three months of corrected age (that is, 13 weeks after the term) would be an appropriate age for such practice (KING, 2009; PALMER; MAKRIDES, 2012; VISSERS et al., 2018).

In the midst of so many discussions, our results show the difficulty and misinformation of mothers of premature infants regarding breastfeeding practices and the most convenient time to start complementary feeding, given the

peculiarities of this population of infants and the lack of specific guidelines for premature babies.

As for the biochemical findings, the sample median is below the borderline level (170 mg / dL), that is, acceptable, and more than 75% (3rd quartile in 179 mg / dl) of the sample is in an acceptable or borderline range. The same is true of LDL, since more than 75% (3rd quartile at 107 mg / dl) is in an acceptable range (XAVIER H T *et al.*, 2013).

In other words, the biochemical aspect of the general population was not a worrying finding. However, due to the lack of guidelines for preterm infants, these parameters are based on the term population and for children from two years of age, differing in terms of the sample studied, since the median corrected gestational age was 19.4 (13.1 - 26.14) months and most were younger than two years.

Even though there is no statistical difference, some results suggest the harmful effects of UPF on cardiovascular health. The periodic use of cakes and biscuits (71%, n = 36) showed significantly higher values of TC (p = 0.020) and LDL (p = 0.038) in relation to non-use and when the sample was stratified into values of total cholesterol with values below (66%, n = 31) and above (34%, n = 16) of 170 mg / dl, maternal age was associated with a greater diversity of use of UPF in the group above 170 mg / dl.

The cardiovascular health of premature babies is something that deserves attention. Both fetal growth restriction and prematurity have been associated with increased cardiovascular risk in young people and adults. In the study by Posod et. al. (2016), with premature children of preschool age and term controls of the same age, ex-premature children had higher systolic and diastolic blood pressure, higher levels of fasting blood glucose and total and LDL cholesterol. These data had already been confirmed by Sipola-Leppänen *et. al.* (2014) in their cohort study with 6642 adolescents, where premature birth was associated with high BP in girls and atherogenic lipid profile in boys (POSOD *et al.*, 2016).

Parreiras, E.E.F.;  Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 19

When analyzing the quality of complementary feeding for premature infants, we found that a large majority (82%) made frequent use of ultra-processed foods (UPF). In order to also identify the introduction of UPF in complementary feeding, Longo-Silva et. al. (2017) concluded that by the sixth month of their preschoolers aged 17 to 63 months, 75% had already received one or more UPF in their diet (LONGO-SILVA *et al.*, 2017).

These findings are still confirmed by Giesta et. al. (2019). In their study of 300 children aged between 4 and 24 months of age, it was found that only 21% of the children had not yet received any type of UPF, with 56.5% receiving any of these foods before the age of six months (GIESTA *et al.*, 2019).

These results are worrying because adequate nutrition in the first years of life is essential for healthy growth and development and eating habits acquired in childhood tend to persist in adolescence and adulthood. However, the high palatability combined with the aggressive marketing of these products, have contributed to their early introduction in childhood and perpetuation of use throughout life (BATALHA *et al.*, 2017).

Sabe-se que o consumo periódico deste tipo de alimento está associado ao maior risco de sobrepeso e obesidade, além de doenças cardiovasculares e renais. Quando se trata de crianças prematuras este risco pode ser ainda maior devido a características fisiológicas que já contribuem naturalmente para alguns destes desfechos, como a imaturidade do sistema cardiovascular e renal, resultando em artérias mais estreitas e rígidas e um número reduzido de néfrons (MARTINS *et al.*, 2017; SOLÍS; CERDA; GONZÁLEZ, 2018).

In our results, the industrialized biscuit or cake was one of the first UPF used periodically to supplement food in children, in addition to being the most used at any age; followed by Petit Suisse cheese, being most consumed in strata 1 and 2 of age.

In the cross-sectional study by Ortelan *et. al.* (2020) and in the cohort of Rauber et. al. (2015), the results are similar. In the first, the most consumed UPF, by infants born with low weight and aged between 6 and 12 months, was the biscuit / cracker or snack, as well as preschoolers aged 3 to 4 years, in the second. In the latter, consumption was still positively associated with an increase in total cholesterol and LDL.(RAUBER *et al.*, 2015)

In the study by Batalha *et al.* (2017), which analyzed the consumption of UPF in children aged 13 to 35 months, the foods responsible for the highest daily energy intake were petit suisse cheese (3.7%) and cookies / cakes (2.3%), with the entire UPF group being responsible for 24.5% of the children's daily energy intake. These data, which corroborate our findings (BATALHA *et al.*, 2017).

A curious feature is that the use of petit suisse cheese increased in layers 1 and 2 of age and decreased in layer 3 (age> 24m). It is known that petit suisse is a relatively more expensive food than the others and its use may be more frequent, only, in the first and second year of life due to the influence of marketing and parental misinformation for assuming that the nutritional values are adequate for age, in addition to its high palatability and practicality.

When stratifying the studied population regarding the periodic use of UPF in the categories "no use until one type of UPF" and "more than one type of UPF", we found an association with the variables age of the child, family history of overweight / obesity (FHOO), income below two minimum wages and the fact that the mother works outside the home.

As for the child's age, we observed that, as the age advanced, other UPF were added to the child's diet.

This finding is corroborated by Longo-Silva *et al.* (2017), who found an increase in the likelihood of introducing UPF into children's food, as age advances. While the probability in the third month varies between 0.15 and 0.25, in the sixth month there is an increase to between 0.6 and 1.0 in the variation. (LONGO-SILVA *et al.*, 2017)

Parreiras, E.E.F.;  Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 21

As clear as the harms of UPF are clear, due to its high energy supply, large amount of sugars, sodium and industrial additives, this scenario is increasingly widespread in society, especially among children *(COSTA et al., 2018; MONTEIRO et al.*, 2018).

In our study, the prevalence of UPF use periodically and in greater diversity was 24% (p = 0.004) higher in children with FHOO, suggesting that parents or close family members with nutritionally unbalanced food, often due to the use of UPF, tend to encourage this practice in their offspring, and may lead them to overweight or obesity in the future.

In the study by Xu *et al.* (2019) with Chinese parents and children aged 6 to 14 years, revealed that maternal obesity was associated with an increase in their children's body fat percentage during follow-up, when compared to the children of eutrophic mothers and that maternal obesity and paternal was also associated with an increase in their BMI and waist circumference. (XU *et al.*, 2019) In addition, they also observed that lifestyle factors, such as diet and physical activity, changed this association. The association of obesity between parents and children was stronger in children with a less healthy diet and less physical activity.

Parents are primarily responsible for structuring their children's food environment, especially those children who depend on their permissions to determine the "when", "what" and "how much" of food they will be provided with. While babies and young children are generally very good at self-regulating their energy intake, they are believed to be more attuned to external stimuli as they develop, and parents can play an eminent role in this development. (LARSEN *et al.*, 2015).

Therefore, it is evident that parental eating habits tend to be perpetuated in their children. In an era of great global dietary change, where consumers' lack of time to eat their meals generates the choice of ready-to-eat foods that can be eaten

anywhere and anytime, children, especially the youngest, are also stimulated to eating habits that can damage your health in the future (BAKER; FRIEL, 2016).

In addition, after bivariate and multivariate analyzes, having an income of less than two minimum wages (PR 1.34 (1.16-1.55) p <0.001) and the fact that the mother works outside the home (PR 1.25 (1.10-1.44) p = 0.002) also increased the chance of greater diversity in UPF consumption by premature infants.

The UPF are often at the table of low-income families, due to their cost-benefit characteristics. They generally contribute to greater energy supply and have a large shelf life. These attributes alleviate the fear of wasting money on food that can be rejected by children or spoiled quickly. Many families buy this type of food when they receive their monthly benefits and store it before food shortages at the end of the month. (MORAN *et al.*, 2019)

These data are consistent with the study by Giesta et. al. (2019), where, among other factors, family income was positively associated with the introduction of UPF in complementary food. The higher the income, the less food was presented to the children (GIESTA *et al.*, 2019).

Previous studies have also predicted this association. Vilela *et al.* (2015), in their cohort of 808 2-year-old children, concluded that a higher intake of energy-dense foods, especially soft drinks and sweets, is inversely associated with family income. However, this intake was also inversely associated with maternal occupation, but this referred to more specialized jobs and, therefore, higher incomes (VILELA *et al.*, 2015).

The factor mother working outside the home, contributing to increase the chance of greater diversity in the intake of UPF, suggests that often, to return to work, the mother is faced with the situation of having to leave her children with third parties, who often they do not have the care and concern with the child's food, offering them more convenient, practical foods with less nutritional value, or for the simple fact of associating these highly palatable foods with affection (MOUBARAC *et al.*, 2014).

Parreiras, E.E.F.;  Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 23

## 5 CONCLUSION

Premature infants are vulnerable to early weaning and the use of UPF even before six months of corrected age. The lipid profile was not associated with the consumption of UPF, however, the diversity of periodic consumption of UPF was positively associated with the child's age and family history of overweight and obesity. Both maternal occupation (mother working outside the home) and family income of less than two minimum wages were associated with a greater chance of diversity in UPF consumption by premature infants.

Therefore, the findings can support health professionals to establish actions to promote and prevent the adequate infant feeding of premature infants.

## REFERENCES

AKOGLU, H. User's guide to correlation coefficients. **Turkish Journal of Emergency Medicine**, v. 18, n. 3, p. 91–93, 2018.

BAKER, P.; FRIEL, S. Food systems transformations, ultra-processed food markets and the nutrition transition in Asia. **Globalization and Health**, v. 12, n. 1, 2016.

BATALHA, M. A. et al. Consumo de alimentos processados e ultraprocessados e fatores associados em crianças entre 13 e 35 meses de idade. **Cadernos de Saude Publica**, v. 33, n. 11, p. 1–16, 2017.

CHIANG, K. et al. Receipt of Breast Milk by Gestational Age – United States, 2017 (P11-060-19). **Current Developments in Nutrition**, v. 3, n. Supplement_1, 2019.

COELLI, A. P. et al. Prematuridade como fator de risco para pressão arterial elevada em crianças: uma revisão sistemática. **Cadernos de Saúde Pública**, v. 27, n. 2, p. 207–218, fev. 2011.

COSTA, C. S. et al. Consumption of ultra-processed foods and body fat during childhood and adolescence: A systematic review. **Public Health Nutrition**, v. 21, n. 1, p. 148–159, 2018.

COSTA, C. S. et al. Ultra-processed food consumption and its effects on anthropometric and glucose profile: A longitudinal study during childhood. Nutrition, **Metabolism and Cardiovascular Diseases**, v. 29, n. 2, p. 177–184, 2019.

DE FREITAS, B. A. C. et al. Duration of breastfeeding in preterm infants followed at a secondary referral service. **Revista Paulista de Pediatria** (English Edition), v. 34, n. 2, p. 189–196, jun. 2016.

GIANNÌ, M. L. et al. Complementary feeding practices in a cohort of Italian late preterm infants. **Nutrients**, v. 10, n. 12, p. 1–12, 2018.

GIESTA, J. M. et al. Associated factors with early introduction of ultra-processed foods in feeding of children under two years old. **Ciencia e Saude Coletiva**, v. 24, n. 7, p. 2387–2397, 2019.

GRUPTA, S. et. al. Complementary feeding at 4 versus 6 months of age for preterm infants born at less than 34 weeks of gestation: a randomised, open-label, multicentre trial. **Lancet Glob Health**, v. 5, p. e501-11, may 2017.

GUERRERO, A. D. et al. Racial and ethnic disparities in early childhood obesity: Growth trajectories in body mass index. **Journal of Racial and Ethnic Health Disparities**, v. 3, n. 1, p. 129–137, 2015.

HEYMAN, M. B.; ABRAMS, S. A. Fruit Juice in Infants, Children, and Adolescents: Current Recommendations. **Pediatrics**, v. 139, n. 6, p. e20170967, 22 jun. 2017.

IKONEN, R.; PAAVILAINEN, E.; KAUNONEN, M. Preterm Infants' Mothers' Experiences with Milk Expression and Breastfeeding: An Integrative Review. **Advances in Neonatal Care**, v. 15, n. 6, p. 394–406, 2015.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). **Dados sociodemográficos**. Disponível em: <http://www.ibge.gov.br>.

J.M.S., Y. et al. Very early introduction of semisolid foods in preterm infants does not increase food allergies or atopic dermatitis. Annals of Allergy, **Asthma and Immunology**, v. 121, n. 3, p. 353–359, 2018.

JABAKHANJI, S. B. et al. Body Mass Index Changes in Early Childhood. **Journal of Pediatrics**, v. 202, p. 106–114, 2018.

KING, C. An evidence based guide to weaning preterm infants. **Paediatrics and Child Health**, v. 19, n. 9, p. 405–414, 2009.

LARSEN, J. K. et al. How parental dietary behavior and food parenting practices affect children's dietary behavior. Interacting sources of influence? **Appetite**, v. 89, p. 246–257, 2015.

LEAL, M. DO C. et al. Prevalence and risk factors related to preterm birth in Brazil. **Reproductive Health**, v. 13, n. S3, p. 127, 17 out. 2016.

LIMA, A. P. E. et al. Exclusive breastfeeding of premature infants and reasons for discontinuation in the first month after hospital discharge. **Revista gaucha de enfermagem**, v. 40, p. e20180406, 2019.

Parreiras, E.E.F.; Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 25

LONGO-SILVA, G. et al. Age at introduction of ultra-processed food among preschool children attending day-care centers. **Jornal de Pediatria** (Versão em Português), v. 93, n. 5, p. 508–516, 2017.

MARTINS, A. M. et al. Elderly patients on hemodialysis have worse dietary quality and higher consumption of ultraprocessed food than elderly without chronic kidney disease. **Nutrition**, v. 41, p. 73–79, 2017.

MENEZES, L. V. P.; STEINBERG, C.; NOBREGA, A. C. Complementary feeding in infants born prematurely. **CoDAS**, v. 30, n. 6, p. e20170157–e20170157, out. 2018.

MENEZES, L. V. P.; STEINBERG, C.; NÓBREGA, A. C. Complementary feeding in infants born prematurely. **CoDAS**, v. 30, n. 6, p. 1–7, 2018.

MINISTÉRIO DA SAÚDE. Protocolos do Sistema de Vigilância Alimentar e Nutricional - **SISVAN**. In: [s.l: s.n.].

MINISTÉRIO DA SAÚDE. Orientação para a coleta e análise de dados antropométricos em serviços de saúde: Norma Técnica do Sistema de Vigilância Alimentar e Nutricional **SISVAN**. [s.l: s.n.].

MINISTÉRIO DA SAÚDE. **Orientações para avaliação de marcadores de consumo alimentar na atenção básica**. [s.l: s.n.].

MONTEIRO, C. A. et al. The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing. **Public Health Nutrition**, v. 21, n. 1, p. 5–17, 21 jan. 2018.

MORAN, A. J. et al. What factors influence ultra-processed food purchases and consumption in households with children? A comparison between participants and non-participants in the Supplemental Nutrition Assistance Program (SNAP). **Appetite**, v. 134, n. 2019, p. 1–8, 2019.

MOUBARAC, J. C. et al. Processed and ultra-processed food products: Consumption trends in Canada from 1938 to 2011. Canadian Journal of Dietetic Practice and Research, v. 75, n. 1, p. 15–21, 2014.

MOYER, V. A. Screening for Primary Hypertension in Children and Adolescents: U.S. Preventive Services Task Force Recommendation Statement. **PEDIATRICS**, v. 132, n. 5, p. 907–914, 1 nov. 2013.

OLIVEIRA, L. L. DE; LUCIA, A.; BONILHA, D. L. Fatores maternos e neonatais relacionados à prematuridade*. **Rev Esc Enferm USP**, v. 50, n. 3, p. 382–389, 2016.

ORTELAN, N.; NERI, D. A.; BENICIO, M. H. D. Práticas alimentares de lactentes brasileiros nascidos com baixo peso e fatores associados. **Revista de Saúde Pública**, v. 54, n. 14, 2020.

PALMER, D. J.; MAKRIDES, M. Introducing solid foods to preterm infants in developed countries. **Annals of Nutrition and Metabolism**, v. 60, n. SUPPL. 2, p. 31–38, 2012.

POSOD, A. et al. Former very preterm infants show an unfavorable cardiovascular risk profile at a preschool age. **PLoS ONE**, v. 11, n. 12, p. 1–13, 2016.

RAUBER, F. et al. Consumption of ultra-processed food products and its effects on children's lipid profiles: A longitudinal study. **Nutrition, Metabolism and Cardiovascular Diseases**, v. 25, n. 1, p. 116–122, 2015.

REDE BRASILEIRA DE PESQUISAS NEONATAIS. Relatório anual 2009. Disponível em: <http://www.redeneonatal.fiocruz.br/pdf/rbpn2009.pdf>.

SALGADO, C. M.; CARVALHAES, J. T. DE A. Arterial hypertension in childhood. **Jornal de Pediatria**, v. 79, n. 7, p. 115–24, 15 maio 2003.

SILVA, A. I.; AGUIAR, H. G. Diversification in the first year of food life. **Acta medica portuguesa**, v. 24 Suppl 4, p. 1035–40, 2011.

SILVA LUZ, L. et al. Fatores preditivos da interrupção de aleitamento materno exclusivo em prematuros: coorte prospectiva. **Revista Brasileira de Enfermagem**, v. 71, n. 6, p. 3049–3055, 2018.

SIPOLA-LEPPÄNEN, M. et al. Cardiovascular risk factors in adolescents born preterm. **Pediatrics**, v. 134, n. 4, p. e1072–e1081, 2014.

SOCIEDADE BRASILEIRA DE CARDIOLOGIA. 7o Diretriz Brasileira de Hipertensão Arterial. [s.l.] **Arquivos Brasileiros de Cardiologia**, 2016.

SOCIEDADE BRASILEIRA DE PEDIATRIA; DEPARTAMENTO CIENTÍFICO DE ENDOCRINOLOGIA. **Novas orientações sobre o jejum para determinação laboratorial do perfil lipídico**. 2017.

SOCIEDADE BRASILEIRA DE PEDIATRIA; DEPARTAMENTO CIENTÍFICO DE NUTROLOGIA. **Manual de Orientação**. [s.l: s.n.].

SOLÍS, A.; CERDA, J.; GONZÁLEZ, C. Monitorización ambulatoria de presión arterial en escolares con antecedente de prematurez extrema. **Revista chilena de pediatría**, v. 89, n. 1, p. 18–23, fev. 2018.

THE NATIONAL ACADEMIES PRESS. Preterm Birth: Causes, **Consequences and Prevention**. Disponível em: <https://www.nap.edu/catalog/11622/preterm-birth-causes-consequences-and-prevention>.

VICTORA, C. G. et al. Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. **The Lancet**, v. 387, n. 10017, p. 475–490, 2016.

Parreiras, E.E.F.; Lima, L.M.; Pereira, R.C.S.S.; Serafim, T.C.; Figueiredo, L.F.G.; Moreira, D.R.; Rodrigues, S.C.M.; Freitas, B.A.C.

| 27

VILELA, S. et al. The influence of socioeconomic factors and family context on energy-dense food consumption among 2-year-old children. **European Journal of Clinical Nutrition**, v. 69, n. 1, p. 47–54, 2015.

VILLAR, J. et al. Postnatal growth standards for preterm infants: the Preterm Postnatal Follow-up Study of the INTERGROWTH-21 st Project. **The Lancet Global Health**, v. 3, n. 11, p. e681–e691, nov. 2015.

VISSERS, K. M. et al. The Timing of Initiating Complementary Feeding in Preterm Infants and Its Effect on Overweight: A Systematic Review. **Annals of Nutrition and Metabolism**, v. 72, n. 4, p. 307–315, 2018.

WORLD HEALTH ORGANIZATION. **Child growth standards**: lenght/height-for-age, weight-for-age, weight-for-lenght, weight-for-height and body mass index-for-age. [s.l: s.n.].

WORLD HEALTH ORGANIZATION. **Indicators for assessing infant and young child feeding practices**: conclusions of a consensus meeting held. In: [s.l: s.n.].

WORLD HEALTH ORGANIZATION. Interpreting Growth Indicators. **Training Course on Child Growth Assessment**. [s.l: s.n.].

WORLD HEALTH ORGANIZATION. Measuring Child's Growth. **Training Course on Child Growth Assessment**. [s.l: s.n.].

WORLD HEALTH ORGANIZATION; PAN AMERICAN HEALTH ORGANIZATION; DIVISION OF HEALTH PROMOTION AND PROTECTION. **Guiding Principles for Complementary Feeding of the Breastfed Child.** [s.l: s.n.].

XAVIER H. T., IZAR M. C., FARIA NETO J. R., ASSAD M. H., ROCHA V. Z., SPOSITO A. C., FONSECA F. A., DOS SANTOS J. E., SANTOS R. D., BERTOLAMI M. C., FALUDI A. A., MARTINEZ T. L. R., DIAMENT J., GUIMARÃES A., FORTI N. A., MORIGUCHI E., CHAGAS A. C. P., CO, R. J. A. F. . S. B. DE C. V. D. B. DE D. E P. DA A. A. B. C. 2013. **V Diretriz Brasileira De Dislipidemias E Prevenção**. v. 101, 2013.

XU, R. Y. et al. A two-year study of parental obesity status and childhood obesity in China. **Nutrition, Metabolism and Cardiovascular Diseases**, v. 29, n. 3, p. 260–267, 2019.

## Authorship contributions

**1 – Emanuelle Emília Ferreira Parreiras**
Universidade Federal de Viçosa, Viçosa, MG, Brasil. Departamento de Medicina e Enfermagem. Mestre em Ciências da Saúde.
https://orcid.org/0000-0003-3216-2955 - manuparreiras89@gmail.com
Contribuição: Conceptualização, curadoria de dados, análise formal, investigação, metodologia, escrita – rascunho original, escrita – revisão e edição.

**2 – Luciana Moreira Lima**

Universidade Federal de Viçosa, Viçosa, MG, Brasil. Departamento de Medicina e Enfermagem. Doutorado em Ciências Farmacêuticas.

https://orcid.org/0000-0001-5349-1577 - lucianamoreiralima@yahoo.com.br

Contribuição: Conceptualização, metodologia, supervisão, escrita – revisão e edição.

**3 – Ronaldo Cascelli Schelb Scalla Pereira**

Universidade Federal de Viçosa, Viçosa, MG, Brasil. Departamento de Medicina e Enfermagem. Mestre em Ciências da Saúde.

https://orcid.org/0000-0002-2376-7955 - ronaldocssp@hotmail.com

Contribuição: Escrita- rascunho original.

**4 – Tatiane Cristina Serafim**

Universidade Federal de Viçosa, Viçosa, MG, Brasil. Departamento de Medicina e Enfermagem. Mestre em Ciências da Saúde.

https://orcid.org/0000-0003-1377-6214 - tatiane.serafim@ufv.br

Contribuição: Conceptualização, escrita- rascunho original.

**5 – Luiz Felipe Gonçalves de Figueiredo**

Universidade Federal de Viçosa, Viçosa, MG, Brasil. Departamento de Medicina e Enfermagem. Graduando em Medicina.

https://orcid.org/0000-0001-5791-7598 - luiz.felipe.g.figueiredo@gmail.com

Contribuição: Investigação.

**6 – Daniela Rezende Moreira**

Universidade Federal de Viçosa, Viçosa, MG, Brasil. Departamento de Medicina e Enfermagem. Graduanda em Medicina.

https://orcid.org/0000-0001-5455-8390 - danielarezendemoreira@gmail.com

Contribuição: Investigação.

**7 – Simone Cunha Magalhães**

Centro Estadual de Atenção Especializada, CEAE, Viçosa, MG, Brasil. Graduação em Enfermagem.

https://orcid.org/0000-0001-9726-0578 - simonecunham@yahoo.com.br

Contribuição: Investigação.

**8 – Brunnella Alcantara Chagas de Freitas**

Universidade Federal de Viçosa, Viçosa, MG, Brasil. Departamento de Medicina e Enfermagem. Doutora em Ciência da Nutrição.

https://orcid.org/0000-0002-7863-0681 -brunnella.freitas@ufv.br

Contribuição: Conceptualização, análise formal, metodologia, administração de projeto, supervisão, escrita- revisão e edição.