The influence of breastfeeding on children's health, well-being and development: A theoretical and empirical review

La influencia de la lactancia materna en la salud infantil, el bienestar y el desarrollo: una revisión teórica y empírica

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Resumen

El objetivo fue examinar el efecto de la lactancia materna en la salud infantil, el bienestar y el desarrollo. La revisión de la literatura se acercó a varias dimensiones de la salud del niño y el desarrollo, a fin de evaluar en cuáles hay realmente beneficios de la leche materna y en cuáles no se encuentra una asociación positiva con la lactancia. La hipótesis general de la Organización Mundial de la Salud (OMS) de recomendar la lactancia materna durante los primeros seis meses de vida del niño no parece estar confirmada por la literatura, ya que los estudios disponibles se centran en los efectos benéficos muy específicos de la lactancia materna. Por otra parte, las limitaciones de la literatura incluyen la existencia de resultados incongruentes y aspectos metodológicos menos sólidos que deben ser resueltos en futuras investigaciones. Dadas las implicaciones clínicas, sociales y culturales de las políticas referentes a la lactancia materna, es necesario explicar las discrepancias encontradas entre los estudios, y confirmar si la lactancia materna se correlaciona significativamente con la salud de los niños y su bienestar o si en realidad son creencias de salud.

----------*Palabras clave*: Lactancia Materna, Salud, Bienestar, Desarrollo

Abstract

The objective was to examine the impact of breastfeeding on children's health, well-being and development. This literature review approached several dimensions of the child's health and development, in order to assess which ones actually benefit from the maternal milk, and which dimensions do not support a positive association with breastfeeding. The general assumption of the World Health Organization (WHO) of recommending breastfeeding during the first six months of the child's life does not seem to be confirmed by the literature, since the available studies are centred in very specific beneficial effects of maternal breastfeeding. Furthermore, the limitations of the literature include the existence of incongruent results and less solid methodological aspects that should be solved in future research. Given the clinical, social and cultural implications of the politics regarding maternal breast feeding, it is necessary to explain the discrepancies found between studies, and to confirm if maternal breastfeeding is significantly correlated with the children's health and well-being or if they actually are health beliefs.

----------*Keywords:* Breast feeding; Health; Welfare; Development

Introduction

The protection, promotion and support of breastfeeding are nowadays a priority for public health. These policies for the promotion and maintenance of the maternal breastfeeding have led to a series of political and legal implications (through the emergence of special prerogatives for women who breastfeed), introducing several changes in the healthcare system.

Therefore, there are some global guidelines for implementing programs directed to the promotion of breastfeeding, namely, the *Global Strategy for Infant and Young Child Feeding* [1], that launched the international focus on the protection, promotion and support of the breastfeeding, renewing what had been previously highlighted by the *Code of Marketing of Breast-milk Substitutes* [2], the *Innocenti Declaration on Protection, Promotion and Support of Breastfeeding* [3], the *Protection, promotion and supporting breastfeeding: The important role of maternity services* [4], and by the *Baby Friendly Hospital Initiative* [5].

Actually, several world organizations recommend that all women should have the opportunity to breastfeed during the first 6 months and, as complement, until the end of the 2nd year [6].

However, this movement on behalf of maternal breastfeeding has a fragile support from the research developed until the present date, regarding the fundamental reason for the breastfeeding practice: the child's health and well-being [7, 8). There are actually few studies in this area, and many are methodologically discussable, focus on very specific aspects, and many present contradictory results [9].

It is our goal to present general literature revision since 2000, examining in a substantial way the theoretical and empiric frame concerning the role and impact of the breastfeeding on the child's health, well-being and development.

Current status of knowledge

The Benefits of the Maternal Breast Feeding

Breastfeeding is considered in literature as the ideal food for the children, constituting a primary form of promoting the child's health and development, given that it is perfectly adjusted to the infant's nutrition necessities and growth, protecting babies from infections, due to the presence of antibodies and immunoprotective substances [3, 8, 10-15]. The studies also consider that no other nourishment has the same nutritional, protective, psychological and social benefits for the baby [7, 16].

Some authors report the advantages of maternal milk taking into account its immunological constitution and properties, and regarding its influence both on growth and weight in the first months of a child life [17], and on the prevention of illnesses in the short and long run. Also, other studies showed the existence of a positive association between maternal breastfeeding and the prevention of certain illnesses and medical conditions (table 1). Some examples are the prevention of: pain [18]; obesity [11, 14, 19-23], diabetes [11, 14, 19-21, 24, 25], buccal malformations [11], syndrome of the sudden death [11, 12, 15, 24], respiratory infections [12, 14, 20, 21, 24, 26-29], urinary infections [12, 14, 20, 21, 28], otitis [12, 14, 20, 23, 24, 26, 28], cardiac illnesses [23], atopic diseases, such as allergies and asthma [11, 14, 19, 20, 22-24, 26, 28, 30]; lymphomas [14, 20], gastrointestinal infections and diseases [12-14, 20-23, 25, 27-29, 31]; behavioural disorders [32, 33]; arteriosclerosis [34].

Table 1. Experimental research about the benefit of breast milk for children's health, well-being, and development

Authors	Health and Development Dimensions	Measures	Sample: N, age, etc.	Results/Conclusions
Ahiadeke, 2000	Gastrointestinal disorders	Database: Demographic and Health Survey in Ghana and Nigeria	From 0 to 11 months	Children who were fed with mixed milk present a higher risk for gastrointestinal disorders than those fed exclusively via breastfeeding.
Alvarado *et al*., 2005	Growth (weight and length)	Anthropometrics measures, reviews of monthly feeding practices	133; from 5 to 6 months; Afro-Colombians	Breastfeeding is positively correlated with weight increase ($p = 0.04$). For mothers with lower educational levels, breastfeeding has a positive effect on weight increase ($p = 0.04$).
Angelsen *et al*., 2001	Cognitive development	Bayley`s Scale of Infant Development; WPPSI-R; Peabody Development Scale	345; Scandinavia	A long breastfeeding duration benefits the child's cognitive development.

Continuación tabla 1

Authors	Health and Development Dimensions	Measures	Sample: N, age, etc.	Results/Conclusions
Arifeen *et al*., 2001	Growth	Anthropometrics measures and query surveys (feeding and morbidity)	1,207; Bangladesh	At 12 months of age, it is observed that exclusive breastfeeding over the first 3-5 months of life has a positive impact on children's growth. Meanwhile, the child's size at birth also plays an important role in growth.
Armstrong & Reilly, 2002	Obesity / fatness	Body mass indicator	32,200; Scottish children; 39-42 months	The results suggest an association between breastfeeding and a reduction of the risk for childhood obesity.
Çakaloz & Akay, 2005	Attention Deficit Disorder (ADD) and Disruptive Behavior Disorder (DBD)	Socio-demographic data; DSM-IV criteria; ADD and DBD scales; Conners Teacher Rating Scale	21 boys with ADD diagnosis, 26 with ADD and position defying disorder, and 27 healthy	History of breastfeeding is significantly inferior for children with ADD than for those in the control group. Breastfeeding could prevent the development of deficit of attention disorders.
Chulada *et al*., 2003	Asthmatic breathing and asthma	Asthma diagnosis and recurrent asthmatic breathing (≥ 3 times in the past 12 months)	Data from 3rd National Health and Nutrition Examination Survey (1988-1994); ages > 72 months	Breastfeeding could delay the appearance of asthma or could have a protective effect on children younger than 24 months. Breastfeeding could reduce the incidence of asthmatic breathing in children exposed to a tobacco smoking environment.
Clark *et al*., 2006	Development	Test battery on cognitive, language, and motor indicators	484; 5(1/2) years; Chile	In this sample, children who were breastfed only until 2 months of age or beyond 8 months of age demonstrate a poorer developmental level than children who were breastfed between 2 to 8 months of age.
Dewey *et al*., 2001	Motor development	Data of 2 studies; breastfeeding duration (4, 6 months)	141; 119; Honduras	Children who were breastfed exclusively start crawling sooner (both studies) and have a higher expectation to walk at 12 months (1 study).
Dubois & Girald, 2005	Physical health	Face-to-face interviews and queries; antibiotic consumption as general health measure	1,841; children from Quebec	Breastfeeding has a positive effect on health until the second year of life and generates a reduction in the number of treatments with antibiotics before two and a half years of age.
Eckhardt *et al*., 2001	Growth	Anthropometrics measures	185; Mexico; exclusive or predominant breastfeeding	Children who were exclusively breastfed between birth and 6 months present higher growth indicators when compared to other children.
Gómez-Sanchiz *et al*., 2004	Cognitive development	Bayley's Infant Development Scale	238; born between 1995 and 1998	Breastfeeding until 4 months of age presents a positive effect on mental development in children at 24 months of age.
Gómez-Sanchiz *et al*., 2003	Cognitive development	Bayley's Infant Development Scale	249 babies evaluated at 18 months	There is a statistically significant and linear correlation between the duration of breastfeeding and the Bayley scale scores. Breastfeeding for more than 4 months presents a positive effect on the mental development of the baby at 18 months of age.
Gray *et al*., 2002	Prevention of pain	Crying, cardiac rhythm	30; new-born; term	Breastfeeding is a powerful analgesic in babies during a blood sample collection process.
Gustafsson *et al*., 2004	IQ	WISC-III; PUFA (polyunsaturated fatty acids)	Children with 6,5 years	Breastfeeding duration contributes significantly to total IQ ($p = 0.021$), verbal IQ ($p = 0.040$), and performing IQ ($p = 0.056$).

Continuación tabla 1

Authors	Health and Development Dimensions	Measures	Sample: N, age, etc.	Results/Conclusions
Khadivzadeh & Parsai, 2004	Gastrointestinal disorders, breathing infections	Evaluation and registry	100 children with exclusive breastfeeding until 6 months and 100 with mixed milk between 4 and 6 months; Iran.	The rate of dysentery and breathing infections between 4 and 6 months is significantly lower in children who are exclusively breastfed than in children fed with food complements.
Khedr *et al*., 2004	Neuro-development	Physical and neurological exams and neurophysiological studies	53; healthy children; 1 year of age	Breast milk contributes to faster development and maturation of some aspects of the nervous system than adapted milk.
Kramer *et al*., 2003	Gastrointestinal infections	Data on feeding, illness (infections, eczema), and growth (weight, length, and cephalic perimeter) obtained at 1, 2, 3, 6, 9, and 12 months	2,862 children with exclusive breastfeeding during 3 months and 621 children with exclusive breastfeeding during 6 months or more	Exclusive breastfeeding up to 6 months is linked to a lower risk of gastrointestinal infections.
Kramer *et al*., 2002	Growth	Weight, length, and cephalic perimeter measured at 1, 2, 3, 6, 9, and 12 months	17,046; healthy; weight ≥ 2,500g	The average weight is significantly higher in the experimental group (which was subject to intervention by WHO/UNICEF) than in the control group. The difference in weight tends to increase until the 3rd month; however, it decreases after that, disappearing at 12 months.
Laubereau *et al*., 2004	Local dermatitis	Queries; physical diagnosis	3,903 children	Exclusive breastfeeding has a protective effect on the development of topic dermatitis in comparison with cow's milk.
Leung, 2005	Resource of health services by jaundice gastrointestinal, breathing/febrile illness	Medical visits; hospital internment	8,327 children followed for 18 months; born in 1997; China	In general, breastfed children visit the doctor fewer times during their first 18 months. The results assume higher relevance in the case of exclusively breastfed children at 2-3 months and at 4 or more months.
Liu *et al*., 2006	Behavior problems; development of temperament	Achebach Child Behavior Checklist; query of temperament; and Self-designed Inventory Questionnaire	737 (399 men, 338 women); 4-5 years; term; weight at born ≥ 2,5 kg	Short breastfeeding duration (< 9 months) constitutes a risk factor for behavioral problems that occur in children of both genders between the ages of 4 and 5 years. Development of temperament is correlated with the standards of feeding and breastfeeding duration.
Martin *et al*., , 2002	Growth	Anthropometrics measures (weight and IMC); historical study	2,995 children	Compared to children fed by baby bottle, breastfed children are taller in childhood and as adults.
Oddy *et al*., 2006	Health problems, doctor visits and mother health assessment	Feeding; socio-demographics aspects; and health-related data	Research of Australian mothers during 52 weeks	Children fed with breast milk up to 1 month, in comparison to those breastfed for 1 month or more, present more health problems ($p = 0{,}048$) and visit the doctor more ($p = 0{,}032$). In addition, a poorer maternal evaluation of their children's health is verified ($p = 0{,}001$).
Oddy *et al*., 2004	Asthma, atopic eczema, weight	Medical diagnosis; skin test; corporal mass indicator	2,195 children followed until the 6 years of age	Less incidence of exclusive breastfeeding is associated with an increase of asthma and atopic illnesses.

Continuación tabla 1

Authors	Health and Development Dimensions	Measures	Sample: N, age, etc.	Results/Conclusions
Oddy *et al.*, 2003	Asthmatic breathing	Concentration of TGF-β 1, IL-10, TNF-α, CD14	243; average age: 11 days after birth; Arizona	The protective effect of breastfeeding regarding asthma is due to the presence of TGF - beta in breast milk. The dose of TGF- β1 received through breast milk, associated with asthmatic breathing, seems to have some protective effect. An increase in the duration of breastfeeding is significantly associated with a decrease of asthma perpetuation ($p = 0,039$); an inverse association exists between the dose of TGF-β1 received through the milk and the severity of asthma ($p = 0,017$).
Oddy *et al.*, 2003	Cognitive development	Peabody Picture Vocabulary Test: PPVT – R; WISC – block design	2,393; 4 breastfeeding type categories: none, 0-4 months, 4-6 months, and > 6 months	The sudden stop of exclusive breastfeeding is associated with a reduction of verbal IQ and realization test performance. Even so, the mother's education also intervenes in cognitive development.
Quinn *et al.*, 2001	Cognitive development	Query and Peabody Picture Vocabulary Test Revised	3,880 children followed from birth to 5 years of age	The results suggest that breastfeeding is beneficial to children's development, independent of the duration of breastfeeding
Simondon *et al.*, 2001	Growth	Weight and length measures, arm perimeter, triceps width	443 children; 1, 5, and 3 years; Senegal	At ages 2 and 3, children who were breastfed for a longer period tend to be taller ($p < 0.05$).
Singhal *et al.*, 2004	Arteriosclerosis	Cholesterol and protein analysis	216; pre-term teenagers; 13-16 years	There is some experimental evidence for the benefits of long-term breastfeeding on the prevention of arteriosclerosis.
Spyrides *et al.*, 2005.	Growth	Weight and length measures at 0, 2, 5, 6, and 9 months	479; Rio de Janeiro	The longer the breastfeeding duration, the greater the child's weight in the first months of life.
Villalpando & López-Alarcón, 2000	Growth	Weight and length evaluation; type of feeding and morbidity in the range of 15 days through the first 6 months	170; Healthy	At 6 months, breastfed children are heavier and tend to be taller than those fed with adapted milk ($p = 0.1$). Breastfeeding positively affects growth, avoiding infections.

Some studies also refer to the importance of breastfeeding for the mother-child relationship [10, 14, 19-21], being that breastfeeding acts as an analgesic in stressful situations [35]. More recently, some authors have established a positive relation between breastfeeding, especially when exclusive, and intellectual development [11, 19, 20, 23-25, 36]; the brain's development [31, 36]; the babies' growth [37-40]; physical health [41, 42]; and cognitive and motor development [43-45].

Two different studies, one by Leung [46] and the other by Oddy, Scott [42], showed that breastfed children, and those who were breastfed for longer, seek medical assistance less frequently. Furthermore, Oddy, Scott [42] concluded that maternal evaluations of the child's health were more positive in children who were breastfed.

The inconsistencies in the studies

Although the literature review, reported previously, indicated a positive association between breastfeeding and several aspects of health and child development, there are studies that do not support this connection. Filteau [47], questions if the practice of breastfeeding is maintained due to emotional reasons or to experimental evidence, given inconsistency in some results. This author refers that there are no significant differences regarding growth or intestinal problems between children who were breastfed partial or exclusively. He also refers that the immunisation factors of maternal milk exist to protect the mother and not the child; and further refers that maternal milk contains bacteria and viruses harmful to

the baby's health. Wang, Bates [48] through an economics analysis, report that the concerns about maternal milk in our society are diverse, varying from the presence of environmental chemicals in maternal milk, as well as the economic value of breastfeeding for society.

Moreover, other studies have detailed a series of critics about the advantages of maternal milk for health, and about the studies' methodologies [9, 25]. The author refers that, in spite of existing a protector effect against obesity in a later stage of life, this effect is too small, moreover, no clear association between breastfeeding and cardiac illnesses or death has been asserted, and the effect of breastfeeding on the allergic illnesses remains inconclusive. Thus, the author considers that the effects of maternal milk do not have a significant weight in individual terms, but they are important at the population level [25]. Regarding the methodology, the authors refer that the most studies are observational investigations, making it difficult to establish causal effects, and confounding variables may be due to the added difficulty of differentiating the maternal factors from those that are associated to breastfeeding (e.g., obesity and mental development) [9, 25].

Other authors have concentrated on the influence of breastfeeding on the allergic illnesses; which is a controversial subject, given that some studies have shown that breastfeeding has a protective effect in the atopic illnesses, while others suggest it has an increased risk. Exclusive breastfeeding during the first four months did not disclose an increased risk of developing atopic dermatitis with or without family history of the illness. However, a considerable amount of studies determined that breastfeeding may constitute a risk factor for atopic dermatitis, suggesting that it might also not be beneficial, or even harmful, to keep on breastfeeding babies that suffer from dermatitis and food allergies [49-51]. Friedman and Zeiger [52] sustain that the reason for this controversy includes the use of different methodologies, flaws in the studies, and also possible genetic differences between the subjects. However, a 20-year follow-up study, developed with 200 Finish infants, showed that, in infants with a family history of allergy, exclusive breastfeeding prolonged for 9 or more months, was associated to an increase in atopic dermatitis and food hypersensitivity symptoms during childhood [53].

Nevertheless, the results from a study developed by Kramer, Matush [54] did not support a protective effect of prolonged and exclusive breast feeding on asthma or allergy.

Despite the fact that specific evidence relating human milk to the appearance of dental cavities does not exist, circumstances related with prolong breastfeeding, namely nocturnal breastfeeding, are associated to the early appearance of dental cavities in infancy. Thus, factors such as frequency, duration and intensity of breastfeeding are extremely important in determining the risk of adverse effects for the child's development and mouth health [55].

According to Pohl and Tylenda [56], the presence of chlorine based organic pesticides in the maternal milk, has been registered in many studies around the world, being that the interactions between chemicals in the maternal milk can influence its final toxicity. Moreover developing countries present a greater exposition index to these organochlorine pesticides, nevertheless knowledge on the reduced expositions is still scarce, although some studies indicate possible subtle effect.

Despite the consensus on maternal milk being the ideal and more complete food for babies, some studies have pointed out that children who are breastfed need supplements of vitamins D [23] and K [23], which contradicts the idea that maternal milk satisfies all the baby's needs. The composition of maternal milk presents individual variations, which influence the actual success of breastfeeding in reducing the risk of disease [57]. Moreover, there are some situations or medical conditions where maternal milk is not recommended and may actually be contraindicated, having to be controlled when performed [10, 19].

Lothrop [11], who strongly supports breastfeeding when possible, refers that adapted milk formulas are perfectly adjusted to the baby's needs, recognizing that children fed with adapted milk formulas develop without any growth disorders, deficiencies or diseases.

Beyond the medical issues, several studies support that there are many other forms to establish the same type of proximity and affective bond that the baby has to the breast, through the baby bottle [11, 26].

Authors refer that the effects of maternal milk depend on the gestational age and clinical situation of the child. According to Reynolds [58], the effect of breastfeeding in the development of full term children seems to be minimum or insignificant, on the other hand, for healthy children; the differences are not substantial from the clinical point of view. Thus, the benefits of maternal milk can be more significant for premature or ill babies [11, 59], or in the case of full term children with low weight for their gestational age [60, 61].

In this way, and according to Pilkington [62], the politics of breastfeeding promotion must be cautiously adapted to the existing epidemiologist context, at a local level and in a small scale.

Specific information about the studies that do not support a positive association between maternal milk and the health, development and well-being of the child can be found on table 2. These studies do not consider breastfeeding to have an actual impact on the pain relief [63]; growth [37-40, 42, 64]; cognitive development [43-

45]; prevention of atopic diseases [22, 29]; haemophilia [65, 66]; respiratory infections [29]; cardiovascular diseases [64]; obesity [30]; and diabetes [67].

Furthermore, Leung [46] concluded that the breastfed children have more frequent doctor appointments, and are more frequently hospitalized due to jaundice than bottle-fed babies.

Table 2. Experimental evidence that refutes the benefits of the breast milk for children's health well-being and development

Authors	Health and Development Dimensions	Measures	Sample: N, age, etc.	Results/Conclusions
Aarts *et al.*, 2003	Growth	Weight measurement on a biweekly basis and length measurement on a monthly basis	147 children exclusively breastfed and 325 partially breastfed; weigh at childbirth ≥ 3 kg; Switzerland	The children breastfed exclusively since birth present the same growth in terms of weight and length as the children that were not breastfed exclusively. During the first six months of life, children fed exclusively or partially with breast milk grow in the same proportion.
Angelsen *et al.*, 2001	Motor development	Bayley`s Scale of Infant Development; WPPSI-R; Peabody Development Scale	345 children; Scandinavia	A clear association was not found between the duration of breastfeeding and motor development at 13 months or 5 years of age.
Bilgen *et al.*, 2001	Pain relief (foot test)	Crying, recovery time; heart beat; behavior pain scale	130 babies; healthy; term; 4 groups; sucrose, breast milk, sterilized water, and breastfeeding	Breastfeeding does not have any additional benefits in terms of behavior effects on pain relief. The sucrose is 25% superior to breastfeeding regarding pain relief, which is reflected in crying time and behavioral variables.
Chen & Kaplan, 2003	Asthma, atopic diseases	Clinical history interviews; queries; pulmonary, bronchus, and allergy function tests	137 children; 3 years; follow-up from 3 to 26 years; New Zealand	Breastfeeding does not have a protective function against atopic diseases and long-term asthma.
Eckhardt *et al.*, 2001	Growth	Anthropometrics measures	185 children; exclusively or mainly breastfeeding; México	From 6 to 20 months, exclusively breastfed children present lower growth indicators (weight and length) compared to other children.
Eregie, 2001	Growth	Monthly measurement of cephalic perimeter length, coefficient between length and arm diameter	219 children; term; exclusive breastfeeding	The exclusively breastfed children present a normal infantile growth rate for their age concerning the studied parameters.
Gómez-Sanchiz *et al.*, , 2004	Cognitive development	Bayley Infant Development Scale	238 babies; born between 1995 and 1998	Significant differences in psychomotor development were not found based on feeding procedures and their duration.
Gómez-Sanchiz *et al.*, 2003	Cognitive development	Bayley Infant Development Scale	249 babies evaluated at 18 months	Significant differences in psychomotor development were not found based on feeding type.
Haschke & Van´t Hof, 2000	Growth	Euro-Growth Study data regarding length, weight, and body mass	319 children breastfed exclusively, 185 fed with breast milk and solids, 1,509 fed in several ways	The growth pattern of the breastfed children reveals an increase of weight from 2 to 3 months but a lower weight and length increase from 6 to 12 months. Between 12 and 36 months, the differences among the groups are minimum and irrelevant from a clinical point of view. Breastfeeding duration is negatively correlated with the increase of length and weight from 12 to 24 months but not until 36 months.

Continuación tabla 2

Authors	Health and Development Dimensions	Measures	Sample: N, age, etc.	Results/Conclusions
Jasen *et al.*, 2005	Hemophilia	Inhibitor development (rate)	90; with hemophilia type A; born between 1975 and 2005	Breastfeeding does not present a protective effect in the development of the hemophilia inhibitor.
Knobe *et al.*, 2002	Hemophilia	Queries	116; men; born between 1980 and 1999	Breastfeeding does not present a protective effect related to hemophilia. There are no statistically significant differences between children who were breastfed ($p = 0.22$) and children who were not breastfed ($p = 0.86$).
Kramer *et al.*, 2003	Breathing infections, atopic eczema, growth standards	Data about feeding, illness (infections, atopic eczema), and growth (weight, length, and cephalic perimeter) at 1, 2, 3, 6, 9, and 12 months	2,862 children with exclusive breastfeeding during 3 months and 621 exclusively breastfed for 6 months or more; Belarus	There are no significant differences among the two groups regarding respiratory infections, atopic eczema, and growth (weight, length, and cephalic perimeter) standards.
Leung, 2005	Health services resources for jaundice, gastrointestinal, breathing / feverish diseases	Visits to the doctor, hospitalizations	8,327 children followed for 18 months; born through 1997; China	Breastfed children require more external hospital consultations for jaundice, particularly in the first 3 months of life. Breastfeeding is also associated with a larger number of hospitalizations for jaundice.
Martin *et al.*, 2005	Growth and cardiovascular disease	Medical observation and blood test analysis (IGF-I, IGFBP-3)	488; born in 1991/1992; Sub-sample of a study	The results of the study are inconclusive; it is not possible to confirm the hypothesis that breastfeeding is associated with long-term health.
Martin *et al.*, 2002	Growth	Anthropometric measures (weight and BMI); historical study	2,995 children	There is no significant association between breastfeeding and the body mass indicator (BMI) during childhood or adulthood.
Oddy *et al.*, 2006	Health problems, growth	Feeding, socio-demographics aspects, and data related with health	Australian mothers' investigation for 52 weeks	At 52 weeks, children fed with adapted milk present a higher weight ($p = 0.041$) and length ($p = 0.011$) than exclusively breastfed children.
Oddy *et al.*, 2004	Asthma, atopic eczema, weight (obesity)	Medical diagnosis; skin-prick test; body mass indicator	2,195 children followed through 6 years of age	An association does not exist between breastfeeding and excess weight.
Ong *et al.*, 2002	Growth	Evaluation of the weight, length / height, and cephalic perimeter from 0 to 5 years old	1,335 children	A divergence exists in terms growth during childhood, and breastfed children present weight and length increases slower than those fed by baby bottle. Significant differences do not exist at any age for cephalic perimeter.
Sadauskaite-kuehne *et al.*, 2004	Diabetes type 1	Medical diagnosis, questionnaires	517 children in the southeast of Sweden; 286 in Lithuania; 0-15 years	Exclusive and long duration breastfeeding is shown to be a protective factor against type 1 diabetes.

Continuación tabla 2

Authors	Health and Development Dimensions	Measures	Sample: N, age, etc.	Results/Conclusions
Sears *et al.*, 2002	Asthma, atopic diseases	Interviews on the clinical history, questionnaires, lung and bronchi functions tests, and skin allergies; follow-up from 3 to 26 years	1,037; 3 years; New Zealand	Breastfeeding does not have a protective function against atopic diseases and asthma, and it could even increase the risk of their occurrence. Compared to children who were not breastfed, there is a larger number of breastfed children between the ages of 13 and 26 with asthma ($p = 0.0008$), as well as with allergies to cats ($p = 0.0001$), dust/acaroids ($p = 0.0010$), and pollen ($p < 0.0001$).
Simondon *et al.*, 2001	Growth	Measurement of the weight, length, perimeter of the arm, thickness of the triceps	443 children; 1, 5, and 3 years; Senegal	The weight does not differ significantly with respect to breastfeeding. The weight at 3 years old is negatively associated with the weaning age ($p < 0.01$).
Spyrides *et al.*, 2005	Growth	Weight and length measurement at 0, 2, 5, 6, and 9 months	479; Rio de Janeiro	Breastfeeding duration does not affect the child's length in the first months of life.
Van´t Hof & Martin, 2000	Growth	Anthropometrics measures, Data from Euro-Growth Study	2,145; healthy children, end term pregnancy; > 2500g; 37 to 44 weeks; 3 feeding groups: WHO criteria, precocious introduction of solids, and control	Compared with the control group, the group that fulfils the WHO's criteria presents a larger weight in the first 2-3 months of life but a lower weight and length in the second year of life. At 30 and 36 months of life, the children's length within the group that follows the WHO's orientations is significantly inferior to that of the children of the control group.

Conclusions

This literature review examined the way breastfeeding is related with the child's health, well-being and development. The areas under analysis here included several dimensions: growth and weight, obesity, diabetes, buccal malformations, breathing infections, heart problems or diseases, atopic diseases, gastro-intestinal infections, motor and cognitive development, mother-baby relationship, pain prevention, physical health, and visits to doctors. These dimensions were approached both by studies about benefits of maternal breastfeeding, and by studies that contradict those findings.

Regarding the benefits of breast milk, the dimensions behaviour disorders, arteriosclerosis, syndrome of the sudden death, urinary infections, otitis and lymphomas were referenced in several studies. Also, Oddy, Scott [42] concluded that the maternal evaluation of the child's health is more positive when the children are breastfed.

However, regarding these pathologies, the reviewed studies did not identify a positive association between breastfeeding and haemophilia [65, 66]. It is also highlighted that breastfed children are more frequently hospitalized due to jaundice [46], and present more frequently oral cavities during childhood [55].

Beyond the critics to the advantages of the breast milk, several studies have shown that it contains harmful substances to the baby's health, such as bacteria, viruses and environmental chemical substances (e.g. chlorine based organic pesticides) [47, 48, 56]. Furthermore, these studies point out that the methodologies used by researchers are generally observational, making it difficult to establish concrete causal effects [25].

As we can observed, in spite of breastfeeding being a widely studied area, there still exists a great variety of pertinent aspects that need to be analysed, especially because most of the studies accomplished so far approach very specific variables, and in a repeated way.

However, the child's nutritional needs are today more thoroughly known, and the importance of an adequate nutrition is universally recognized. Therefore, given the clinical, social and cultural implications of the politics for the promotion and maintenance of maternal breast feeding, it is necessary to explain the discrepancies between these studies, deepening the knowledge through the development of scientific research using thorough methodologies and instruments used (specifically regarding the development of longitudinal studies), in order to confirm if maternal breastfeeding is significantly correlated with the children's health and well-being or if they actually are health beliefs [68, 69].

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