



**ΠΑΝΕΠΙΣΤΗΜΙΟ ΔΥΤΙΚΗΣ ΑΤΤΙΚΗΣ**  
**ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ ΥΓΕΙΑΣ ΚΑΙ ΠΡΟΝΟΙΑΣ**  
**ΤΜΗΜΑ ΜΑΙΕΥΤΙΚΗΣ**  
**ΠΜΣ: ΠΡΟΗΓΜΕΝΗ ΚΑΙ ΤΕΚΜΗΡΙΩΜΕΝΗ**  
**ΜΑΙΕΥΤΙΚΗ ΦΡΟΝΤΙΔΑ**

## **Μεταπτυχιακή Διπλωματική Εργασία**

**« Κύριοι βιολογικοί, ψυχολογικοί και κοινωνικοί παράγοντες που επηρεάζουν το Μητρικό Θηλασμό: Μια συστηματική ανασκόπηση »**

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**« Main Biopsychosocial Factors Influencing  
Breastfeeding: A Systematic Review »**

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**« Main Biopsychosocial Factors Influencing**

**Breastfeeding: A Systematic Review »**

**Μέλη Εξεταστικής Επιτροπής συμπεριλαμβανομένου και του Εισηγητή:**

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## ΔΗΛΩΣΗ ΣΥΓΓΡΑΦΕΑ ΜΕΤΑΠΤΥΧΙΑΚΗΣ ΕΡΓΑΣΙΑΣ

Η κάτωθι υπογεγραμμένη Ασημάκη Ειρήνη του Ασήμη, με αριθμό μητρώου 19003 φοιτήτρια του Προγράμματος Μεταπτυχιακών Σπουδών "Προηγμένη και Τεκμηριωμένη Μαιευτική Φροντίδα" του Τμήματος Μαιευτικής της Σχολής Επιστημών Υγείας και Πρόνοιας του Πανεπιστημίου Δυτικής Αττικής, δηλώνω ότι: «Είμαι συγγραφέας αυτής της μεταπτυχιακής εργασίας και ότι κάθε βοήθεια την οποία είχα για την προετοιμασία της, είναι πλήρως αναγνωρισμένη και αναφέρεται στην εργασία. Επίσης, οι όποιες πηγές από τις οποίες έκανα χρήση δεδομένων, ιδεών ή λέξεων, είτε ακριβώς είτε παραφρασμένες, αναφέρονται στο σύνολό τους, με πλήρη αναφορά στους συγγραφείς, τον εκδοτικό οίκο ή το περιοδικό, συμπεριλαμβανομένων και των πηγών που ενδεχομένως χρησιμοποιήθηκαν από το διαδίκτυο. Επίσης, βεβαιώνω ότι αυτή η εργασία έχει συγγραφεί από μένα αποκλειστικά και αποτελεί προϊόν πνευματικής ιδιοκτησίας τόσο δικής μου, όσο και του Ιδρύματος. Παράβαση της ανωτέρω ακαδημαϊκής μου ευθύνης αποτελεί ουσιώδη λόγο για την ανάκληση του πτυχίου μου».

Η Δηλούσα  
Ασημάκη Ειρήνη



## ABSTRACT

**Background:** Breastfeeding is a valuable and intimate procedure that can be interrupted by various biopsychosocial factors. The aim of this study was to conduct a literature research about breastfeeding and identify the relationship between any biopsychological component and breastfeeding duration and intensity.

**Methods:** a systematic review of the literature was conducted on the databases of PubMed and ScienceDirect. The search criteria included primary researches of the last 20 years, written in English. This study includes synchronous and updated information about breastfeeding and its value.

**Results:** the search identified 19 studies, reporting the main biopsychosocial factors affecting breastfeeding intention and duration, including maternal age, occupation, smoking, obesity, the feeding type that the women received, social support, birth complications, cesarean delivery, anxiety and self-efficacy.

**Conclusion:** midwives should be informed about the factors that could negatively affect breastfeeding and encourage mothers to breastfeed their newborns by providing corrective information and aid.

**Keywords:** breastfeeding AND predictors, psychological factors, social factors, biological factors.

## ΠΕΡΙΛΗΨΗ

Ο μητρικός θηλασμός αποτελεί μια πολύτιμη αλλά και ευαίσθητη διαδικασία, η οποία μπορεί να διαταραχθεί από διάφορους ψυχοκοινωνικούς και βιολογικούς παράγοντες.

**Σκοπός:** να συσχετισθεί η πρόθεση για θηλασμό και η διάρκεια του θηλασμού με ποικίλους ψυχολογικούς, κοινωνικούς και βιολογικούς παράγοντες.

**Μέθοδος:** συστηματική βιβλιογραφική ανασκόπηση στις ηλεκτρονικές βάσεις δεδομένων Pubmed και ScienceDirect. Τα κριτήρια αναζήτησης περιλάμβαναν πρωτογενείς έρευνες της τελευταίας 20ετίας στα Αγγλικά. Στην μελέτη συμπεριλαμβάνονται σύγχρονα και αναθεωρημένα δεδομένα για τον μητρικό θηλασμό.

**Αποτελέσματα:** εντοπίστηκαν συνολικά 19 μελέτες. Φαίνεται ότι η ηλικία της μητέρας, η εργασία, το κάπνισμα, η παχυσαρκία, ο τύπος τροφής που έλαβε η μητέρα ως νεογνό, η υποστήριξη, οι επιπλοκές στον τοκετό, η καισαρική τομή, το άγχος και η αυτάρκεια μπορούν να επηρεάσουν τόσο την έναρξη όσο και τη διάρκεια του μητρικού θηλασμού.

**Συμπέρασμα:** οι μαίες θα πρέπει να έχουν γνώση των παραγόντων που μπορούν να ασκήσουν αρνητική επίδραση στον θηλασμό και να ενθαρρύνουν τις μητέρες να θηλάζουν, παρέχοντας τους σωστή πληροφόρηση και βοήθεια.

**Λέξεις – Κλειδιά:** μητρικός θηλασμός και προγνωστικοί παράγοντες, ψυχολογικοί παράγοντες, κοινωνικοί παράγοντες, βιολογικοί παράγοντες.

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## INTRODUCTION

Breast milk is the ideal food since birth, and its benefits can be seen in the short and long term. It has an impact on children's comprehensive health, growth, and development, and creates a protection against future diseases. Breastfeeding is considered one of the most cost – effective interventions aimed at reducing infant morbidity and mortality. There is a number of research reports that address the various advantages that breastfeeding brings to mothers and children, as well as to families and society. Breastfeeding is a natural behavior, but it cannot be performed only by instinct, so mothers discontinue breastfeeding for various reasons.

This article underlines the importance of breastfeeding and includes a detailed analysis of the breastfeeding and its multiple advantages for the infant, the mother, the environment and the society. In addition, a systematic review is conducted in order to investigate the several biopsychosocial factors associated with the intention and continuation of breastfeeding.

# CHAPTER 1: BREASTFEEDING

## 1.1. Historical Background

Compelling accounts of inappropriate and unethical marketing of breastmilk substitutes and of many infants becoming malnourished or dying from contaminated or diluted breastmilk substitutes were followed by the adoption of the International Code of Marketing of Breastmilk Substitutes at the 34th World Health Assembly in 1981. The Code implicitly recognised that health workers, women, and families are susceptible to direct and indirect marketing strategies. It consists of 11 articles which, along with subsequent resolutions from the World Health Assembly, outline the responsibilities of governments, health-care systems, and workers, and of the companies that market or manufacture breastmilk substitutes. The Code represents the collective will of the member states of the UN and so carries substantial political and moral weight. However, it depends on national legislation, monitoring, and enforcement for its effectiveness. Violations of the Code remain prevalent and show that without enforceable legislation and investment to support monitoring, it will have limited effect.

Breastfeeding became less common in high-income countries during the 20th century. Similar patterns were also seen in better-educated, wealthier, and urban women in low-income and middle-income countries. Breastmilk substitutes were perceived as modern and prestigious, and breastfeeding was associated with being poor and unsophisticated. In August, 1990, policy makers and international agencies adopted the Innocenti Declaration, which affirmed that all infants should receive “exclusive breastfeeding from birth to 4–6 months of age and thereafter should continue to be breastfed”. In the same year, the UN Convention on the Rights of the Child enshrined health and health care, including the advantages of breastfeeding, as a legal right of the child and the promotion of breastfeeding as a legal obligation of countries that ratified the Convention. The Convention called for states to take appropriate measures for children of working parents, and to protect the public from improper and biased information that persuades mothers to give up breastfeeding. In 1991, the Baby

Friendly Hospital Initiative (BFHI) was launched to scale up ten interventions in birthing facilities to protect, promote, and support successful breastfeeding.

Despite these initiatives being established many years ago, global breastfeeding rates remain far below international targets, and commitment to breastfeeding, in terms of policy and investment, is in a state of fatigue (Rollins et al., 2016).

Despite its established benefits, breastfeeding is not a norm in many communities. Multifactorial determinants of breastfeeding need supportive measures at many levels, from legal and policy directives to social attitudes and values, women's work and employment conditions, and health-care services to enable women to breastfeed. When relevant interventions are delivered adequately, breastfeeding practices are responsive and can improve rapidly. The best outcomes are achieved when interventions are implemented concurrently through several channels. Breastfeeding provides short-term and long-term health advantages to children, women, and society. To realise these gains, political support and financial investment are needed to protect, promote, and support breastfeeding (Gonzales et al., 2021).

## 1.2. Epidemiology

Globally, the prevalence of breastfeeding at 12 months is highest in sub-Saharan Africa, south Asia, and parts of Latin America. In most high-income countries, the prevalence is lower than 20%. There are important differences—eg, between the UK (<1%) and the USA (27%), and between Norway (35%) and Sweden (16%).

Most mothers in all countries start breastfeeding; only three countries (France, Spain, and the USA) have rates below 80% for ever breastfeeding. However, early initiation is low, as is exclusive breastfeeding. Breastfeeding at 12 months is widespread in low-income and lower-middle-income countries, but uncommon elsewhere.

Low-income countries have a high prevalence of breastfeeding at all ages, but the rates of initiation and exclusive breastfeeding are unsatisfactory even in these countries.

Countries from eastern and southern Africa tend to have on average lower rates of continued breastfeeding but higher rates of exclusive breastfeeding than do those in west Africa. In Latin America and the Caribbean, and in central and eastern Europe

and the Commonwealth of Independent States, both indicators tend to be lower than in Africa. Countries from east Asia and the Pacific region have moderate to high prevalence of both indicators (Victora et al., 2016).

### 1.3. Breast-milk composition

Breast milk contains all the nutrients that an infant needs in the first 6 months of life, including fat, carbohydrates, proteins, vitamins, minerals and water. It is easily digested and efficiently used. Breast milk also contains bioactive factors that augment the infant's immature immune system, providing protection against infection, and other factors that help digestion and absorption of nutrients (WHO, 2009).

#### 1.3.1. Fats

Breast milk contains about 3.5 g of fat per 100 ml of milk, which provides about one half of the energy content of the milk. The fat is secreted in small droplets, and the amount increases as the feed progresses. As a result, the *hindmilk* secreted towards the end of a feed is rich in fat and looks creamy white, while the *foremilk* at the beginning of a feed contains less fat and looks somewhat bluish-grey in colour. Breast-milk fat contains long chain polyunsaturated fatty acids (docosahexaenoic acid or DHA, and arachidonic acid or ARA) that are not available in other milks. These fatty acids are important for the neurological development of a child. DHA and ARA are added to some varieties of infant formula, but this does not confer any advantage over breast milk, and may not be as effective as those in breast milk (WHO, 2009).

#### 1.3.2. Carbohydrates

The main carbohydrate is the special milk sugar lactose, a disaccharide. Breast milk contains about 7 g lactose per 100 ml, which is more than in most other milks, and is another important source of energy. Another kind of carbohydrate present in breast milk is oligosaccharides, or sugar chains, which provide important protection against infection (WHO, 2009).

#### 1.3.3. Protein

Breast milk protein differs in both quantity and quality from animal milks, and it

contains a balance of amino acids which makes it much more suitable for a baby. The concentration of protein in breast milk (0.9 g per 100 ml) is lower than in animal milks. The much higher protein in animal milks can overload the infant's immature kidneys with waste nitrogen products. Breast milk contains less of the protein casein, and this casein in breast milk has a different molecular structure. It forms much softer, more easily-digested curds than that in other milks. Among the whey, or soluble proteins, human milk contains more alpha-lactalbumin; cow milk contains beta-lactoglobulin, which is absent from human milk and to which infants can become intolerant (WHO, 2009).

#### **1.3.4. Vitamins and minerals**

Breast milk normally contains sufficient vitamins for an infant, unless the mother herself is deficient. The exception is vitamin D. The infant needs exposure to sunlight to generate endogenous vitamin D – or, if this is not possible, a supplement. The minerals iron and zinc are present in relatively low concentration, but their bioavailability and absorption is high. Provided that maternal iron status is adequate, term infants are born with a store of iron to supply their needs; only infants born with low birth weight may need supplements before 6 months. Delaying clamping of the cord until pulsations have stopped (approximately 3 minutes) has been shown to improve infants' iron status during the first 6 months of life (WHO 2009).

#### **1.3.5. Anti-infective factors**

Breast milk contains many factors that help to protect an infant against infection including:

- immunoglobulin, principally secretory immunoglobulin A (sIgA), which coats the intestinal mucosa and prevents bacteria from entering the cells;
- white blood cells which can kill micro-organisms;
- whey proteins (lysozyme and lactoferrin) which can kill bacteria, viruses and fungi;
- oligosaccharides which prevent bacteria from attaching to mucosal surfaces.

The protection provided by these factors is uniquely valuable for an infant. First, they

protect without causing the effects of inflammation, such as fever, which can be dangerous for a young infant. Second, sIgA contains antibodies formed in the mother's body against the bacteria in her gut, and against infections that she has encountered, so they protect against bacteria that are particularly likely to be in the baby's environment (WHO, 2009).

### **1.3.6. Other bioactive factors**

*Bile-salt stimulated lipase* facilitates the complete digestion of fat once the milk has reached the small intestine. Fat in artificial milks is less completely digested.

*Epidermal growth factor* stimulates maturation of the lining of the infant's intestine, so that it is better able to digest and absorb nutrients, and is less easily infected or sensitised to foreign proteins. It has been suggested that other growth factors present in human milk target the development and maturation of nerves and retina (WHO, 2009).

## **1.4. Animal milks and infant formula**

Animal milks are very different from breast milk in both the quantities of the various nutrients, and in their quality. For infants under 6 months of age, animal milks can be home-modified by the addition of water, sugar and micronutrients to make them usable as short-term replacements for breast milk in exceptionally difficult situations, but they can never be equivalent or have the same anti-infective properties as breast milk.

Infant formula is usually made from industrially-modified cow milk or soy products. During the manufacturing process the quantities of nutrients are adjusted to make them more comparable to breast milk. However, the qualitative differences in the fat and protein cannot be altered, and the absence of anti-infective and bio-active factors remain. Powdered infant formula is not a sterile product, and may be unsafe in other ways. Life threatening infections in newborns have been traced to contamination with pathogenic bacteria, such as *Enterobacter sakazakii*, found in powdered formula. Soy formula contains *phyto-oestrogens*, with activity similar to the human hormone oestrogen, which could potentially reduce fertility in boys and bring early puberty in girls (WHO, 2009).

## **1.5. Health effects of Breastfeeding**

The mechanisms by which breastfeeding affect health are extremely varied, and this variation implies that different metrics of breastfeeding behaviour must be utilised to truly understand the relationships of interest. Rarely is it adequate to group all breastfeeding behaviour into a single category regardless of duration, intensity, feedings per day, mode of delivering milk to the infant or timing of feedings. For example, many of the maternal benefits of breastfeeding are likely related to the hormonal effects of producing milk over a long period. For some outcomes in the child, the composition of the milk itself is likely important. Long-chain polyunsaturated fatty acids may be important for intellectual development, ghrelin and leptin in the milk may be important for appetite regulation, pathogen-specific antibodies may be important for protection against otitis media, and nonspecific immune factors may be important for asthma. On the other hand, the feeding of breast milk from a bottle or cup rather than feeding directly from the breast may be more important for outcomes such as malocclusion or obesity. Even when most of the infant's diet comes from breastfeeding, small amounts of breastmilk substitutes can substantially alter the intestinal flora, with health outcomes yet to be fully elucidated (Grummer-Strawn & Rollins, 2015).

The risk of all-cause mortality was higher in predominantly, partially and nonbreastfed infants compared to exclusively breastfed infants 0–5 months of age. Children 6–11 and 12–23 months of age who were not breastfed had 1.8- and 2.0-fold higher risk of mortality, respectively, when compared to those who were breastfed. Risk of infection-related mortality in 0–5 months was higher in predominantly, partially and nonbreastfed infants compared to exclusive breastfed infants. The risk was twofold higher in nonbreastfed children when compared to breastfed children aged 6–23 months (Sankar et al., 2015).

A meta-analysis shows that breastfeeding is related to improved performance in intelligence tests. Maternal IQ is an important confounder, but breastfeeding was associated with a gain in performance in IQ tests even among studies that controlled for maternal intelligence. A positive effect of breastfeeding on cognition was also observed (Horta et al., 2015).

A recent meta-analysis reported that breastfeeding was associated with a 14% lower

risk of postpartum depression, breastfeeding duration of more than 1 month was associated with a 37% lower risk for postpartum depression, breastfeeding for less than 1 month was associated with a 6% lower risk for postpartum depression, exclusive breastfeeding compared with never breastfeeding was associated with a 53% lower risk for postpartum depression and exclusive breastfeeding compared with partial breastfeeding was associated with an 8% lower risk for postpartum depression (Xia et al., 2022).

Ever breastfeeding was associated with 22% reduction of breast carcinoma risk compared with never breastfeeding. Compared with no breastfeeding, breastfeeding for less than six months and breastfeeding for 6–12 months were associated with 7% and 9% risk reduction of breast carcinoma, respectively (Chowdhury et al., 2015).

Mothers who ever breastfed their children had a 30% reduction in the risk of ovarian carcinoma, when compared with those who never breastfed. The risk of ovarian carcinoma was 17% lower among women who had breastfed for less than six months when compared with those who did not breastfeed. The risk of ovarian carcinoma among mothers who breastfed for 6–12 months was 28% lower when compared with women who had not breastfed. The highest risk reduction was observed among women who breastfed for more than 12 months, in whom the risk of ovarian carcinoma was 37% lower than among women who had not breastfed (Chowdhury et al., 2015).

## **1.6. Breastfeeding and COVID-19**

So far, there is not enough scientific evidence that the virus is present in the milk of mothers with suspected or confirmed coronavirus disease 2019 (COVID 19) and that there is transmission of the virus to the infant through breast milk (Chambers et al., 2020). If a mother with COVID-19 or with suspected infection is asymptomatic or with mild symptoms at the time of delivery, continuing with breastfeeding with strict control measures to avoid infection transmission to the newborn is recommended. However, if a mother has severe symptoms, the newborn will be separated from her regardless of whether he/she has symptoms or not and must be fed with freshly expressed breast milk, without the need to pasteurize it, since it is not considered to be a vehicle for the virus (Davanzo et al., 2020). Exclusive breastfeeding should be



ensured especially during the COVID-19 pandemic, given that there are greater benefits in the mother-child relationship, nutrition, immunity and protection against SARS-CoV-2. In those infants with COVID-19, exclusive breastfeeding might change the course of the disease. Exclusive breastfeeding should be ensured by using expressed milk or, if possible, using donated milk from a healthy mother or from a milk bank (Norma et al., 2021).

### **1.7. The environmental costs of not breastfeeding**

Although not yet quantifiable in monetary terms, environmental costs are also associated with not breastfeeding. Breastmilk is a “natural, renewable food” that is environmentally safe and produced and delivered to the consumer without pollution, unnecessary packaging, or waste. By contrast, breastmilk substitutes leave an ecological footprint and need energy to manufacture, materials for packaging, fuel for transport distribution, and water, fuel, and cleaning agents for daily preparation and use, and numerous pollutants are generated across this pathway. More than 4000 L of water are estimated to be needed along the production pathway to produce just 1 kg of breastmilk-substitute powder. In the USA, 550 million cans, 86 000 tons of metal, and 364 000 tons of paper, annually used to package the product, end up in landfills. Breastfeeding and human milk's contribution to environmental sustainability and food security year-round should be considered in climate-smart development goals at national and global levels (Rollins et al., 2016).

### **1.8. Breastmilk—a personalised medicine**

The nutritional advantages of breastfeeding and its protection against infection are well known. In the past two decades, the possibility that crucial imprinting events might be modulated during breastfeeding, with potential lifelong effects for the infant, has become apparent.

These events might be mediated directly or through effects on the infant microbiome. The ability of the microbiome to regulate host responses in infancy depends on individual bacterial species, which modulate T-cell polarisation and immune

regulation, metabolic responses, adipogenesis, and possibly even brain development and cognitive functioning.

Abnormal colonisation patterns have a deleterious long-term effect on immune and metabolic homeostasis. It is therefore remarkable that a mother's breastmilk transmits elements of her own microbiome and immune responses, and also provides specific prebiotics to support growth of beneficial bacteria.

Protection against breast cancer for a breastfeeding mother might also be mediated through peroxisome proliferator-activated receptor modulation.

Lactoferrin, a major breastmilk component, binds bacterial CpG motifs and blunts mucosal NF- $\kappa$ B responses to the flora. Microvesicles called exosomes are secreted into breastmilk, and might inhibit atopic sensitisation dependent on maternal immune experience.

Breastmilk fat globules contain many secreted micro-RNAs, the expression of which is modulated by maternal diet, which are predicted to target several genes in the infant.

Evidence also exists that multipotential stem cells are secreted into breastmilk and can persist within infants.

Human breastmilk is therefore not only a perfectly adapted nutritional supply for the infant, but probably the most specific personalised medicine that he or she is likely to receive, given at a time when gene expression is being fine-tuned for life. This is an opportunity for health imprinting that should not be missed (Victora et al., 2016).

In conclusion, breastfeeding is irreplaceable for newborn's health and its development. The identification of the factors that can disturb the initiation and continuation of breastfeeding could assist on its augmentation. Next chapter includes a systematic review of the major biological, psychological and social components that affect breastfeeding

## **CHAPTER 2: SYSTEMATIC REVIEW**

# Main Biopsychosocial Factors Influencing Breastfeeding: a Systematic Review

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## ABSTRACT

**Background:** Breastfeeding is important for an infant's development as well as the mother's recovery after birth. Breastfeeding is influenced by a variety of biopsychosocial variables. The purpose of this study was to conduct a comprehensive literature search and explore the relationship between any biopsychological component and breastfeeding duration and intensity.

**Methods:** The databases of PubMed and ScienceDirect were searched. The official website of World Health Organization (WHO) was also explored.

**Results:** The search identified 19 studies, reporting the main biopsychosocial factors affecting breastfeeding intention and duration, including maternal age, occupation, smoking, obesity, the feeding type that the women received, social support, birth complications, cesarean delivery, anxiety and self-efficacy.

**Conclusion:** This systematic review has confirmed that there are specific biopsychosocial factors influencing the breastfeeding process. It is proposed that current care and support should encourage mothers to breastfeed their newborns by providing corrective information and aid.

**Keywords:** breastfeeding AND predictors, psychological factors, social factors, biological factors.

## INTRODUCTION

The life of a woman includes many stages, with her developmental stages involving pregnancy, childbirth and compatibility with the new baby. Each new mother is experiencing undesirable and strange states, including weakness, anxiety, helplessness, lack of happiness, sleepiness and disor-

der on the desire of food, lack of assurance and feelings of inability as a new parent (1). The situation worsens throughout the postpartum period, since the mother loses her energy due to tiredness, pharmacological impacts, duration of pregnancy and issues grown during the childbirth and lactation processes. The growth and development of newborns is mainly affected by the appropriate nutrition particularly in the early

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stages of their life (2). Breast milk is the optimal source for an ideal development of a newborn. Breastfeeding is beneficial to the infant's health and the community as a whole (3). Infants should be fed completely by breast milk for the first six months of their life, according to the World Health Organization (WHO) and the National Health and Medical Research Council (NHMRC) (4). Infants who are breastfed exclusively for the first six months of their lives possessed important advantages compared to those who consumed breast milk for only three or four months (3). The short-term benefits of exclusive breastfeeding have been reported by WHO and refer to the decrease of neonatal mortality and morbidity from infectious diseases. On the other hand, the long-term advantages are associated with the effect of duration and intention of breastfeeding on infant IQ. For mothers, the long-term benefits of breastfeeding are linked with a lower incidence of premenopausal breast cancer as well as ovarian cancer (5). The investigation of factors associated with breastfeeding duration and intention could improve mothers' ability to exclusively breastfeed for longer periods of time (6). On average, less than 60% of newborns were fed exclusively with breast milk for two months after their birth, less than 40% for four months and about 17% for six months postpartum until the first three years of their lives (7). The ability of a woman to elect to feed her infant exclusively with breast milk is linked to a variety of psychosocial factors (8).

In light of these considerations, the current study was performed to determine the role of major biopsychosocial factors on breastfeeding among mothers. Socio-demographic factors, including age, occupation, psychological factors such as stress, self-efficacy, and personality features, as well as biological factors such as smoking, birth complications and cesarean section were all evaluated. The assumption of this study is that specific biopsychosocial traits differentiate women who decide to breastfeed from those who prefer to bottle-feed their infants. The present article aims to synthesize current knowledge about biopsychosocial factors that influence mothers' decision to breastfeed their newborns, as gleaned from a systematic review of the literature, in order to highlight potential recommendations that health care providers can make to help mothers breastfeed for longer periods of time. □

## METHODOLOGY

### Search strategy

A systematic literature review was performed from March 2022 to July 2022 to investigate predictive biopsychosocial factors that affect the intention and duration of breastfeeding. The search strategy involved reviewing articles published between 2000 and 2022. This analysis was conducted according to systematic reviews and meta-analyses guidelines (9). The searched databases included PubMed and ScienceDirect. The official website of the World Health Organization (WHO) was also explored. The key words and terms used are shown in Table 1.

TABLE 1. Keywords and terms

Breastfeeding AND newborn	Cesarean delivery AND breastfeeding
Breastfeeding AND predictors	Delivery AND breastfeeding AND determinants
Psychological factors AND breastfeeding	Duration AND breastfeeding AND determinants
Psychosocial factors AND breastfeeding	Exclusive AND breastfeeding AND predictors
Breastfeeding AND maternal age	Breastfeeding AND smoking

### Selection criteria

Papers were limited to articles published in the last 22 years. Another inclusion criterion was that the articles were written in English. Papers were limited to those which examined the predictive biopsychosocial factors that were influencing breastfeeding intention and duration, regardless of the length of breastfeeding, and including any of the following categories of participants: uniparous or multiparous women (women with one or more previous deliveries), who did or did not breastfeed their child previously. The search strategy did not focus on exclusive breastfeeding. The authors first screened the titles and abstracts of identified citations for potential eligibility, and then examined the full texts to determine eligibility for inclusion in the review. The present review included nineteen different studies.

### Exclusion criteria

Studies were excluded from the review if they did not examine the influence of biopsychosocial factors on breastfeeding intention and duration. Papers focusing on other determinants affecting breastfeeding as well as those that focused on disadvantaged groups (e.g., teenage pregnancy, premature birth, gestational diabetes) were not included in our review. In addition, the authors excluded studies with unsuitable sample selection criteria – subjects who have been recently using

any medication affecting sleep, prescription drugs, or other drugs that in the opinion of the research team may interfere with the results of the present research. Studies that did not mention the control group were excluded. Also, papers that did not come to clear and defined results as well as those with no substantial outcome have not been included.

### Quality assessment

The Critical Appraisal Skills Programme (CASP) Systematic Review Checklist 201725 was used to assess the quality of each publication. This method aids in verifying the reliability of research and, as a result, confirms that the chosen literature was appropriate for inclusion in the present review. Critical Appraisal Checklists were used as a guide and aide memoire in order to carefully and systematically examine researches to judge their trustworthiness, value and relevance in a particular context (10).

### Selection process

The search strategy yielded 670 results; after the exclusion of duplicates (n=40), 630 papers were screened by the authors. Records with irrelevant title or abstract were rejected. Then, 130 full-text articles were assessed for eligibility, of which only 19 were considered relevant and valid for the

present review. Among the full-text articles that were excluded (n=111), the majority (n=51) did not focus on biopsychosocial factors and their influence to breastfeeding. When critically appraising each publication using CASP, 20 articles were excluded due to their low quality. Also, articles that had unsuitable sample selection criteria or no clear outcome, those which were not written in English or lacked a control group were also excluded. The remaining 19 studies were considered eligible and were included in the review. Figure 1 outlines the PRISMA flow diagram of studies included in the present review (9). □

## RESULTS

### Study characteristics

All included studies aimed to present biopsychosocial factors that were associated with breastfeeding intention and duration. The majority of the selected published reports were conducted in Europe (n=8). Specifically, five of the elected studies were done in the UK, one in Finland, one in Italy and one in Greece. In addition, four studies were performed in Australia, three in the USA, two in Canada, one in Hong Kong and one in West Africa (Ghana). Only four of all included studies were published between 2000–2009, with the majority (n=15) being published during the last decade. Breastfeeding was assessed by cohort (n=7) and cross sectional (n=4) studies, regression models (n=4), exploratory factor analyses (n=1) and national survey (n=1). Maternal age as well as employment was examined as a correlate of breastfeeding in four studies. In four studies, obesity (n=2) and smoking (n=2) were found to have a negative influence on the breastfeeding process. Psychological factors, more specifically maternal personality (n=1), self-efficacy (n=1) and social support (n=1), were examined in three studies. Personal and familial experiences were explored in one study. Four papers examined cesarean delivery and birth complications and their association with breastfeeding.

Data from all selected studies were first collated and synthesized manually, then placed into tables to allow for the comparison of study aims, investigated biopsychosocial factors, sample, methodology, and findings. Table 2 delineates the characteristics of the 19 studies selected for this review. The impact of biopsychosocial factors on

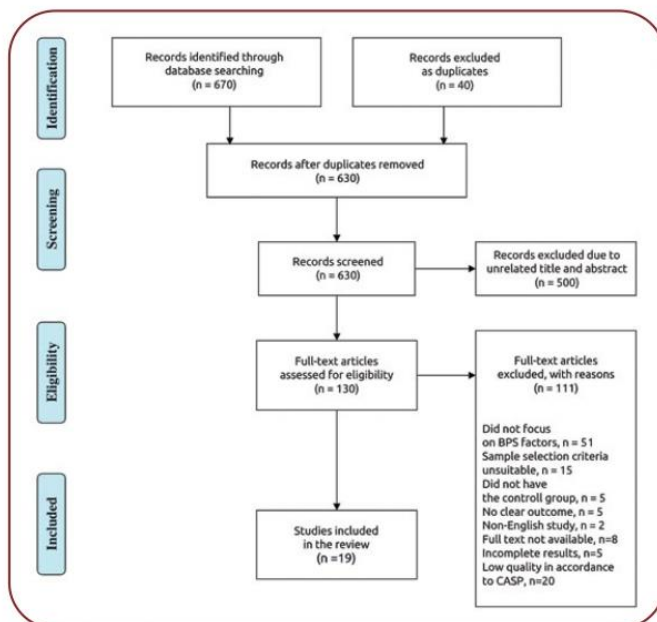


FIGURE 1. Flow diagram of studies included in the present review

TABLE 2. Characteristics of 19 studies describing the major biopsychosocial factors that affect breastfeeding

First author	Sample/Method	Factor(s)	Positive association with BF	Negative association with BF	Positive association with intention
Biro <i>et al</i> (2014)	N=110/Multivariable logistic regression	Maternal age	✓		✓
Britten <i>et al</i> (2001)	N=1.792/Cohort study	Maternal age	✓		✓
Lutsiv <i>et al</i> (2013)	N=92.364/Cohort study	Maternal age			✓
Di Mattei <i>et al</i> (2016)	N=160/Cohort study	Maternal age			✓
		Formula fed		✓	
Tarrant <i>et al</i> (2010)	N=1417/Cohort study	Occupation		✓	
Attanasio <i>et al</i> (2013)	N=1573/National survey	Occupation		✓	
Skafida (2012)	N= 5.217/Cohort study	Occupation		✓	
Nkrumah (2016)	N=225/Cross sectional study	Occupation		✓	
Verret-Chalifour <i>et al</i> (2015)	N=6.592/Cohort study	Obesity		✓	
Makela <i>et al</i> (2014)	N=848/Cohort study	Obesity		✓	
Clifford <i>et al</i> (2006)	N=856/Proportional hazards regression analysis	Smoking		✓	
Liu <i>et al</i> (2006)	N=3047/Logistic regression models	Smoking		✓	
Hauck <i>et al</i> (2011)	N=2,472/Cross sectional survey	CS delivery		✓	
Ayton <i>et al</i> (2015)	N=22.202/Cross-sectional survey	CS delivery		✓	
Brown <i>et al</i> (2013)	N=284/Exploratory factor analysis	Birth complications		✓	
Oakley <i>et al</i> (2014)	N=3840/Logistic regression analysis	Birth complications		✓	
		CS delivery		✓	
		BF support	✓		
Brown A (2014)	N=602/Exploratory cross-sectional survey	Extraversion	✓		
		Emotional stability	✓		
		Conscientiousness	✓		
DeJager <i>et al</i> (2014)	N=174/Correlational analyses	Self-efficacy	✓		✓
Iliadou <i>et al</i> (2020)	N=173/Exploratory factor analysis	Self-efficacy	✓		

BF=breastfeeding; CS=cesarean section

breastfeeding duration and intention is shown in Table 3.

### Main results based on the research question

#### 1. Socio-demographic factors

**Maternal age** – Significant differences between women's age and the breastfeeding process have been found in the literature. Di Mattei *et al* (2016) used the Iow Infant Feeding Attitude Scale (IIFAS) to assess mothers' intention and attitudes toward infant feeding. It consists of 17 attitude questions on a five-point Likert scale ranging from 5 "strongly agree" to 1 "strongly disagree". Questions were divided so that half were favorable to breastfeeding and the other half to formula feeding. Items that favored formula feeding were reverse scored and a total score was obtained. IIFAS scores could range from 17 to 85, with higher scores indicating a more positive attitude toward breastfeeding. IIFAS scores of 65 or above indicate that women are likely to breastfeed. From the multivariate

analysis, the significant role of age (ranging from 19 to 45 years) emerged as promoter of breastfeeding attitudes. In particular, older women resulted in a substantially higher IIFAS score (positive sign of age coefficient in the regression model) (11). Biro *et al* (2014) came to the conclusion that while younger women were just as likely to initiate breastfeeding as older women and had almost twice the odds of not breastfeeding at six months (12). Lutsiv *et al* (2013) revealed that older mothers had a higher intention to exclusively breastfeed their infants compared to younger ones (13). Britten *et al* also determined positive impacts of maternal age on the duration of the breastfeeding process, where younger mothers had negative effects on the breastfeeding intention and duration (14).

**Occupation** – Attanasio *et al* (2013) revealed the role of employment in the duration of the breastfeeding process. The early end of the breastfeeding process is associated with full-time em-

TABLE 3. Impact of biopsychosocial factors on breastfeeding duration and intention

<b>Maternal age</b>	<b>Biro <i>et al</i>, 2014:</b> Duration: (AdjOR 1.76, 95% CI 1.34–2.33), Intention: (AdjOR 1.13, 95% CI 0.63–2.05)	<b>Cesarean delivery</b>	<b>Hauck <i>et al</i>, 2011:</b> Duration: (HR 1.86, 95% CI 1.69–20.6) <b>Ayton <i>et al</i>, 2015:</b> Duration: (HR 1.29, 95% CI 1.24–1.35) <b>Oakley <i>et al</i>, 2014:</b> Duration: (OR 1.50, 95% CI 1.09–2.07)
	<b>Britten <i>et al</i>, 2001:</b> Duration: (OR 8.44, 95% CI 1.68–2.88), Intention: (OR 9.92, 95% CI 4.87–18.78) <b>Lutsiv <i>et al</i>, 2013:</b> Intention: (AdjOR 3.64, 95% CI 3.13–4.23) <b>Di Mattei <i>et al</i>, 2016:</b> Intention: ( $p = 0.02$ )	<b>Maternal personality</b>	<b>Brown A (2014):</b> Duration: extraversion (Spearman's rho = $-0.112$ , $P = 0.037$ ), emotional stability (Spearman's rho = $-0.120$ , $P = 0.028$ ), conscientiousness (Spearman's rho = $-0.109$ , $P = 0.041$ )
<b>Occupation</b>	<b>Tarrant <i>et al</i>, 2010:</b> Duration: (AdjOR 2.06, 95% CI 1.33–3.18) <b>Attanasio <i>et al</i>, 2013:</b> Duration: (AdjOR 0.48, 95% CI 0.25–0.92; $P=0.28$ ) <b>Skafida, 2012:</b> Duration: [full-time (HR 1.6) or part-time (HR1.3)] <b>Nkrumah, 2016:</b> Duration: ( $p=0.020$ )	<b>Birth complications</b>	<b>Brown <i>et al</i>, 2013:</b> Duration: fetal distress [ $F(1,255) = 11.373$ , $P = 0.001$ , $d = 0.9$ ], failure to progress [ $F(1, 255) = 4.616$ , $P = 0.03$ , $d = 0.6$ ], and postpartum hemorrhage [ $F(1,255) = 4.51$ , $P = 0.03$ , $d = 0.6$ ] <b>Oakley <i>et al</i>, 2014:</b> Duration: [long labour duration (OR 0.89, 95% CI 0.66,1.22), long length of postnatal stay (OR 1.39, 95% CI 0.59,3.24)]
<b>Obesity</b>	<b>Verret–Chalifour <i>et al</i>, 2015:</b> Duration: (Rradj 1.26, 95% CI 1.08–1.46) <b>Makela <i>et al</i>, 2014:</b> Duration: ( $P=0.02$ )	<b>Self-efficacy</b>	<b>DeJager <i>et al</i>, 2014:</b> Duration: ( $p<.001$ ), Intention: ( $p<.01$ ) <b>Iliadou <i>et al</i>, 2020:</b> Self-efficacy: ( $p<0.001$ ) for women who had exclusive breastfeeding at six months (109/173, 63%) [mean (SD): 50.1 (11.9)]
<b>Smoking</b>	<b>Clifford <i>et al</i>, 2006:</b> Duration: (OR 1.50, 95% CI 1.09–2.07) <b>Liu <i>et al</i>, 2006:</b> Duration: (95% CI 1.52–2.97)	<b>Formula fed</b>	<b>Di Mattei <i>et al</i>, 2016:</b> Duration: ( $p < 0.001$ )
		<b>Breastfeeding support</b>	<b>Oakley <i>et al</i> (2014):</b> from non-professionals (OR 1.58, 95% CI 1.03–2.41) from professionals (OR 2.22, 95% CI 1.59–3.11)

ployment. On the other hand, self-employed mothers were prone to breastfeeding their children for a longer period of time (15). Skafida (2012) revealed that part-time working women were more inclined to continue the exclusive breastfeeding of their infants for six or more months than full-time employed mothers (16). Tarrant *et al* evaluated the correlation between returning to work and ending breastfeeding process before the completion of the first three months of the infant's life (17). Nkrumah (2016) revealed that mothers who returned to work at an early stage during the postpartum period were more probable to use infant formula, ending the exclusive breastfeeding (18).

## 2. Psychological factors

**Self-efficacy** – De Jager *et al* (2014) developed a model that correlated psychological factors with the duration of exclusive breastfeeding. According to their findings, self-efficacy was an independent factor that could predict the duration of exclusive breastfeeding. Other important factors included the maternal approach during the pregnancy period, psychological adaptation and potential difficulties during the breastfeeding process, which were also proved to have a significant impact on the duration and intention of exclusive breastfeeding (8). Additionally, Iliadou *et al* (2020)

explored the association of self-efficacy with breastfeeding; specifically, higher levels of self-efficacy three days postpartum were strongly related to exclusive breastfeeding at six months (19).

**Feeding type received by women in their infancy** – Another factor that seems to have a significant impact on the breastfeeding process is the feeding type received by women when they were infants. Di Mattei *et al* revealed that women who had been breastfed were more likely to breastfeed their children compared to formula-fed mothers (11).

**Breastfeeding support** – Another factor that seems to significantly influence the breastfeeding process is represented by breastfeeding advice or support. According to Oakley *et al*, women who did not receive feeding advice or support from a parent/peer group or voluntary organization were more likely to stop breastfeeding by 10 days after birth. In addition, compared to women who reported that midwives 'always' gave active support and encouragement regarding feeding, those who claimed this support was not given at all were more likely to have stopped breastfeeding 10 days after birth (20).

**Maternal personality** – Brown A. focused on the relationship between maternal personality and the decision to breastfeed a newborn. Personality is conceptualized as five main features



based on the Five-factor model (FFM): Agreeableness, Extraversion, Conscientiousness, Openness to experience and Emotional stability. Among these features, emotional stability, extraversion, and conscientiousness proved to be inversely associated with ceasing breastfeeding (21).

### 3. Biological factors

*Smoking* – Liu *et al* reported that smoking during the breastfeeding period was correlated to elevated rates of early ending of the breastfeeding process, associated with a negative impact of nicotine on the produced volume of breast milk and sleeping patterns of infants (22). Clifford *et al* (2006) reported that only 23% of mothers who smoke breastfed exclusively their child for six months postpartum (23).

*Obesity* – Obesity has been linked to a higher risk of limited breastfeeding length and intention. Verret – Chalifour *et al* revealed that obese women were less likely to initiate breastfeeding compared to normal weight ones in the immediate post-partum period (24). Mäkelä *et al* (2013) suggested that women who were overweight or obese before pregnancy breastfed fully and totally for a shorter time (25).

*Cesarean delivery* – Hauck *et al* came to the conclusion that mothers who gave birth with cesarean section breastfed exclusively their newborns for a limited period of time (26). Specifically, Oakley *et al* found that planned cesarean was significantly associated with increased cessation between 10 days and six weeks (20). According to Ayton *et al*, more than 50% of mothers who gave birth with cesarean section exclusively breastfed their newborns for only two months postpartum (27).

*Birth complications* – Brown *et al* linked fetal distress, failure to progress and postpartum hemorrhage to shorter breastfeeding duration. Women who had complications related to their birth achieved to breastfeed for a limited time than those who did not face any birth difficulties (28). Additionally, Oakley *et al* reported that breastfeeding cessation at 10 days was significantly associated with long labour duration and long length of postnatal stay (20). □

## DISCUSSION

The present review outlines the results of studies that have examined biopsychosocial

factors and their association with breastfeeding intention and duration. The reported findings suggest that the initiation and duration of breastfeeding is determined by a combination of biopsychosocial factors either supporting or inhibiting a woman's ability to breastfeed her newborn.

### What biopsychosocial factors have been found to influence a mothers' decision to breastfeed her newborn(s)?

In the present review, a combination of biological, psychological and social factors has been shown to influence breastfeeding. Particularly, the physiological functions of a human, including breastfeeding, are influenced by disorders like depression and stress. The production of milk and its letdown can be affected by maternal anxiety (29). The entire evaluation of a breastfeeding mother's health quality, particularly the issue of postpartum mental health, is a crucial sign (30).

De Jager *et al* (2013) evaluated the role of psychological factors in the ability of mothers to exclusively breastfeed four and six months after the birth of their infants. The main psychological factors included postnatal depression, self-efficacy, stress, breastfeeding intention, mental outlook towards the breastfeeding process and social approval. These factors were related to the ability of mothers to feed their infants exclusively with breast milk for more than four months postpartum (31).

Simultaneously, breastfed mothers are more likely to breastfeed their children (11). This is in line with previous research that found that breastfeeding mothers were more likely to have been breastfed themselves (32). Regardless of socio-demographic differences, mothers' prior personal experiences had an impact on their breastfeeding practices. The knowledge of having been breastfed could bring a degree of familiarity with breastfeeding that mothers who were formula-fed do not have (32).

Our results suggest that breastfeeding support delivered by non-health professionals (peer support, voluntary organization) and specialist support such as breastfeeding clinics may have an important role in preventing breastfeeding cessations in the first few weeks (20). These results are consistent with the IFS which have linked breastfeeding support to increases in breastfeeding continuation particularly in the early weeks (33).

Reviews proved that older mothers were more likely to breastfeed their children for an extended period of time (11-14). A possible explanation could be that older mothers are self-confident in having higher experience and knowledge in terms of breastfeeding and therefore have a higher intention to breastfeed their newborns than the younger ones (34).

Skaftida (2012) revealed that part-time working women were more inclined to continue the exclusive breastfeeding of their infants for six or more months than full-time employed mothers. This might be attributed to the fact that the combination of dealing with work-related tasks and the breastfeeding process was more easily achieved by self-employed mothers since they could also work from home. Healthcare providers could inform mothers who intend to return to their workplace about how they could continue the breastfeeding process (16).

Concerning the negative relation between obesity and breastfeeding intention, the results of the present review are in accordance with those of another systematic review, indicating that mothers with a BMI  $\geq 30$  kg/m<sup>-2</sup> were less likely to exclusively breastfeed or to breastfeed for a longer period of time compared to those with a BMI  $\leq 30$  kg/m<sup>-2</sup> (35). Poor body image and lacking belief in breast milk's nutritional adequacy and sufficiency may partly explain the discrepancy between planned and actual breastfeeding duration in women with a BMI  $\geq 30$  (35).

For maternal smoking, the present review supports the negative association of smoking and breastfeeding (22, 23). Results of a recent meta-analysis were also relatively consistent in showing increased breastfeeding initiation and continuation for non-smokers compared with smokers (36).

Complications during labour may have a negative impact on breastfeeding. Explanations include adverse reactions to medication, delayed breastfeeding initiation and disruption of the normal endocrinology of childbirth. However, reasons for breastfeeding cessation linked to birth experience have not been fully examined. Mothers who experienced complications were more likely to discontinue breastfeeding due to pain and difficulty than those who did not experience complications (28).

Additionally, the negative association between cesarean section and early breastfeeding cessa-

tion is confirmed by another systematic review (37). It is significant that if breastfeeding is initiated, the mode of delivery has no apparent effect on the number of mothers still breastfeeding six months after birth (37).

#### Implications for future research

The present research indicates that there is a plurality of current evidence concerning the association between breastfeeding and biopsychosocial factors. Despite methodological differences between the included studies (e.g., differences in study designs and breastfeeding definitions), an association between breastfeeding and various biopsychosocial factors is suggested.

All selected studies have an imprecise definition of breastfeeding. To specifically address exclusive breastfeeding for at least six months, according to the standards, is a specific recommendation.

Moreover, current evidence is insufficient to clearly establish the implications of cesarean delivery and specific birth complications on the breastfeeding process. A further area to explore is the psychological impact of birth experience on breastfeeding duration. Birth complications and cesarean delivery increases risks of low breastfeeding rates (20). Although it appears that birth complications are associated with physical rather than psychological influences on breastfeeding cessation (28), the two may be interlinked. □

#### CONCLUSION

Based on the results of the current study, midwives should screen pregnant women for anxiety, depression, socio-demographic variables, including maternal age, occupation status, type of feeding received as a child. Midwives should build a trusting relationship with women and provide psychological support. Women and midwives should be aware of the negative association between cesarean section and breastfeeding and choose this delivery method only when necessary. Monitoring the new mothers before and after their birth could improve breastfeeding behaviors. □

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