

Factors associated with breastfeeding initiation and maintenance for Aboriginal and Torres Strait Islander women in Australia: A systematic review and narrative analysis.

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ABSTRACT

Background: Australian Aboriginal and Torres Strait Islander (hereafter referred to as Aboriginal) women breastfeed at lower rates than non-Aboriginal women. Little is known about factors associated with breastfeeding specific to Aboriginal women and infants.

Aim: Determine the protective and risk factors associated with breastfeeding for Aboriginal women in Australia. **Methods:** CINAHL, Medline, EMBASE, SCOPUS, PsycINFO, and the Cochrane library were searched for peer-reviewed literature published between 1995 and 2021. Quantitative studies written in English reporting protective and risk factors associated with breastfeeding for Aboriginal women or women having an Aboriginal infant were included. Ten percent of papers were co-screened, and two reviewers completed data extraction. Narrative data synthesis was used.

Findings: The initial search identified 12,091 records, with 31 full text studies retrieved, and 17 reports from 14 studies met inclusion criteria. Protective factors included living in a remote area, attending an Aboriginal-specific service, attending a regional service, higher levels of education attainment, increased maternal age, living in larger households, being partnered, and having a higher reported number of stressful events and social health issues. The identified risk factors were smoking in pregnancy, admission to SCN or NICU, and being multiparous.

Conclusion: This review identified factors associated with breastfeeding for Aboriginal women. Government focus, support, and consistent funding are required to plan and implement evidence-based interventions and services for Aboriginal women and infants in urban, rural, remote, and very remote locations. Rigorous research is required to understand the Aboriginal-specific factors associated with breastfeeding to improve rates and health outcomes for Aboriginal women and infants.

Statement of significance

Problem

There are disparities in rates of breastfeeding, with limited

evidence of the factors associated with breastfeeding for Aboriginal women.

What is already known

There are protective and risk factors associated with breastfeeding shared by Aboriginal and non-Aboriginal women, however, there

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are factors specific to Aboriginal women, with studies identifying factors for Aboriginal women often having limitations.

What this paper adds

This review identified the factors associated with breastfeeding specific to Aboriginal women and infants, including factors that are amenable to change. A culturally appropriate targeted approach, including implementation of Aboriginal-specific services, supported by all levels of government is required to improve breastfeeding outcomes for Aboriginal women and infants.

Introduction

Breast milk feeding has important short- and long-term health benefits for women and infants and is the complete way to feed babies [1]. Health benefits for infants include a reduced risk of overweight or obesity, type 2 diabetes [2], childhood leukemia [3], infections [4,5] and, for women, reduced risk of diabetes and some cancers [1,6]. Conversely, *not* breastfeeding has significant health risks for women and infants [1,7], however, rates across the globe are below the recommended international targets set by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) [8].

Globally, Indigenous populations, including Aboriginal and Torres Strait Islander peoples in Australia, experience poorer health outcomes than non-Indigenous populations in the same country, with higher rates of maternal and infant mortality and morbidity [9,10]. While the term 'Indigenous' is used throughout this review, we respect the diversity of the communities represented by the use of this generic term. Colonisation is a key factor that has contributed to poorer health outcomes [11] and intergenerational trauma [12] for Indigenous communities and has also played a crucial role in the loss of culture and cultural practices [13] and traditional breastfeeding knowledge and practices, which may be a contributing factor to the gap in breastfeeding rates seen today [14]. Prior to colonisation, limited western evidence suggests that for Aboriginal and Torres Strait Islander women and infants, breastfeeding was routine, and was maintained for two to four years [15].

A systematic review of international evidence in developed countries reported a number of factors that influenced breastfeeding initiation and maintenance [16]. This included mode of birth, parity, age, education, income, smoking status, breastfeeding education, keeping mother and baby together and breastfeeding support [16]. Other systematic reviews have found that intention and self-confidence [17,18], timing of breastfeeding [19], obesity [20], past breastfeeding experiences [17, 18], perception of milk supply [21], return to work, marketing of infant formula [7], postnatal depression (PND) [17] and partner support [22] are also associated with breastfeeding outcomes. However, due to the heterogeneity of studies [16], self-reporting [18,20], small sample sizes [17,20], and limited eligible studies, these findings may not be generalisable to the wider population. One systematic review of qualitative studies that focused on parents' views found that bonding and attachment, body image, female role models, self-esteem/confidence, lifestyle, knowledge, and formal information sources were all associated with breastfeeding [23]. None of these systematic reviews reported on the inclusion, exclusion, or consideration of Indigenous women as a separate group; therefore, these findings may not be relevant to Indigenous populations. Smaller studies have found factors such as hypertension and diabetes [24], cultural influences [21] and partner status [25] to be associated with breastfeeding initiation and maintenance.

Individual studies have identified specific factors that are associated with breastfeeding initiation and maintenance for Aboriginal and Torres Strait Islander women, however, these have not previously been synthesised to explore the consistencies and differences. Identified factors include parity, length of stay, gestational age at birth [25], remoteness [26], postnatal depression, number of people living in the household [27], attending an Aboriginal and Torres Strait Islander specific birthing

service, admission to special care nursery (SCN) or neonatal intensive care unit (NICU) [28], perception of breast milk supply [27,28], and maternal health [28]. One study found that younger age and smoking did not have a statistically significant impact on breastfeeding for Aboriginal and Torres Strait Islander women [27], contrary to findings of other studies. Another factor that is important to consider in the context of breastfeeding for Aboriginal and Torres Strait Islander women is child removal by government protective services. Aboriginal and Torres Strait Islander children are removed at significantly higher rates than non-Indigenous children, with rates continuing to increase over time [26]. Child removal is linked to the effects of colonisation, and past policies and practices, particularly the Stolen Generation [26]. There is limited literature available in regard to breastfeeding for Aboriginal and Torres Strait Islander mothers who have a child in out of home care, and there is a lack of awareness of the importance of breastfeeding and the right for women to breastfeed and infants to receive breastmilk within child protection services [29]. While child placement principles include fostering an ongoing connection between women and infants, inclusive of breastfeeding, this is not currently being upheld. The Australian Government has identified this as an action area in the National Breastfeeding Strategy [30], and reducing overrepresentation of Aboriginal and Torres Strait Islander children in out of home care is one of the targets in the new Closing the Gap agreement [31]. Despite being an identified action area, child removal has continued to increase over time [32], emphasising the need for ongoing commitment and action to make tangible improvements.

Studies that have explored factors that are associated with breastfeeding among Aboriginal and Torres Strait Islander women have tended to have a small sample size, be focused on a single geographic location, and include a single Aboriginal and/or Torres Strait Islander population, yet it is important to understand the factors associated with infant feeding choice to inform strategy development. In the Aboriginal and Torres Strait Islander health context, individual, interpersonal, historical, socioeconomic, societal/structural and cultural factors all need to be considered [7].

We are not aware of any previous systematic reviews that have synthesised all the relevant research to understand the protective and risk factors associated with breastfeeding for Aboriginal and Torres Strait Islander women in Australia. Therefore, this systematic review aims to answer the following question: What are the reported protective and risk factors associated with breastfeeding for Aboriginal and Torres Strait Islander women in Australia?

Methods

The preferred reporting items for systematic review and meta-analysis (PRISMA) recommendations were followed for this review [33], with registration of the protocol with PROSPERO (CRD42021222306).

Search strategy

The databases CINAHL (EBSCO), Medline (Ovid), EMBASE, SCOPUS (Elsevier), PsycINFO (Ovid), and the Cochrane library were searched for relevant studies. An experienced university librarian assisted in identifying search terms and creating a concept map. [Supplementary Table 1](#) provides the full search strategies for each database. Reference lists of study reports included in the systematic review were also examined for further relevant studies.

Eligibility Criteria

Participants

Australian Aboriginal and/or Torres Strait Islander women or non-Indigenous women having an Aboriginal and/or Torres Strait Islander

baby were eligible for inclusion in this review. Exclusion criteria included studies that only included women with multiples or preterm infants born before 37 completed weeks gestation, or where studies included non-Indigenous women without reporting data separately by Aboriginal or Torres Strait Islander status.

Outcomes

The primary outcomes of interest were the protective and risk factors associated with breastfeeding initiation and maintenance. Outcome measures included all reported protective and risk factors associated with breastfeeding initiation or maintenance.

Types of studies

The databases were searched, and alerts created, with the final search performed on 21st June 2021. All quantitative studies, of any design, that described the factors associated with breastfeeding were considered for inclusion. Only peer reviewed Australian studies, published in English after 1995, were considered for inclusion to reduce the risk of potentially less relevant older data influencing the results and due to the language restrictions of the reviewers.

Study selection

Literature search results were managed in EndNote X9 [34] and Covidence [35]. Initially, duplicate records were removed automatically in Covidence, and then manually during screening. Title, abstract and full-text screening were undertaken independently by one Aboriginal reviewer (TS), however, a minimum of 10% of records were co-screened by a second reviewer (HM) at each stage of screening. The results of screening have been summarised using the PRISMA flow diagram [33].

Data collection process

Details of the included studies were extracted independently by two reviewers (TS and HM/JB or CC, a second Aboriginal reviewer), after initially piloting two studies with a pre-labelled excel spreadsheet. Disagreements were resolved through discussion and consensus with a third reviewer (HM/JB/CC/DF). Authors were contacted for further information where required. Details of data extracted is available in [Supplementary Table 2](#).

Risk of bias in individual studies

Risk of bias (RoB) within studies was assessed using the Joanna Briggs Institute (JBI) tools, with assessment completed independently by one reviewer (TS) and 10% assessed by a second reviewer (HM). Studies were included regardless of classification, however, RoB classification was considered when discussing the findings. Assessment of quality was considered from an Aboriginal perspective by one reviewer (TS) using 'The Aboriginal and Torres Strait Islander Quality Appraisal Tool' [36], created by the Centre of Research Excellence in Aboriginal Chronic Disease Knowledge Translation and Exchange (CREATE). RoB assessment and quality assessment was collated in table format.

Data analysis and synthesis

Due to the variability of study designs and heterogeneity, a narrative synthesis was undertaken, with findings presented in table format. In the text, results are presented by protective factors first, then risk factors, and each of these are further sub-divided into overall factors, factors associated with breastfeeding initiation (or breastfeeding at hospital discharge) and factors associated with breastfeeding maintenance (by time period).

Results

Study selection

Database searches identified 12,091 studies with 6899 titles and abstracts screened for relevance following the automatic removal of duplicates. On title and abstract screen, 6844 records did not meet inclusion criteria and were excluded. The excluded studies either were not relevant to the topic (did not explore breastfeeding or were animal studies), were manually identified duplicates, or they did not meet the inclusion criteria. Thirty-four full text studies were sought for retrieval, with 31 reports retrieved. A further 81 studies were identified through reference list harvesting, with 78 reports assessed for eligibility. Of the 78 reports, 34 duplicates and 43 studies not meeting the inclusion criteria were excluded. Seventeen reports of 14 studies met the inclusion criteria and were included in this review. [Fig. 1](#) provides a visual representation of the publications identified and reviewed.

Study characteristics

[Supplementary Table 3](#) summarises the characteristics of the 14 studies exploring the protective and risk factors associated with breastfeeding among Aboriginal and Torres Strait Islander women. The studies were mostly geographically representative across Australia, with three studies based in Queensland (QLD) [37–39], three in Western Australia (WA) [40–42], two each in New South Wales (NSW) [43,44] and Victoria [25,45], and one each in the Northern Territory (NT) [46] and South Australia (SA) [28]. There was one study conducted across WA, the NT and QLD [47] and one national study [27]. Tasmania and the Australian Capital Territory (ACT) were the only jurisdictions not represented in this review.

The included studies represented a range of quantitative designs including cohort studies [27,37,40,44,46], cross sectional studies [25, 38,41,43,47], a population based routinely collected data study [28], a before and after design study [42], a non-randomised interventional trial [39], and a pilot study [45].

[Table 1](#) presents the 14 studies that explored the protective and/or risk factors associated with breastfeeding for Aboriginal and Torres Strait Islander women. Four studies reported protective factors only [39, 42,44,45], two studies reported risk factors only [37,38] and the remaining studies reported both protective and risk factors. A small number of studies reported similar factors, however, the majority of studies reported protective and risk factors that were not identified in any other study included in this review.

Risk of bias within studies

We used the JBI Checklist for Analytical Cross-Sectional Studies (eight appraisal items) to assess RoB in five studies and the Checklist for Cohort Studies (11 appraisal items) to assess RoB in the remaining nine studies [48]. The 'Aboriginal and Torres Strait Islander Quality Appraisal Tool' [36] was also used to assess quality from an Aboriginal perspective across all studies, with each assessment summarised in [Supplementary Table 4](#). No study was excluded based on the quality of the study, however, RoB was considered when discussing the findings.

All five studies assessed with the Checklist for Analytical Cross-Sectional Studies met the majority of appraisal items on the checklist. The appraisal items not met were questions focused on standard measurement criteria and confounding factors. Most studies assessed using the Checklist for Cohort Studies met the majority of the appraisal items on the checklist. Identification of confounding factors and strategies to deal with confounding factors were the appraisal items most likely to receive a no (N) or unclear (U) answer.

Assessment of quality using the Aboriginal and Torres Strait Islander Quality Assessment Tool identified that most included studies were unclear (U) in their reporting of the appraisal items on the checklist.

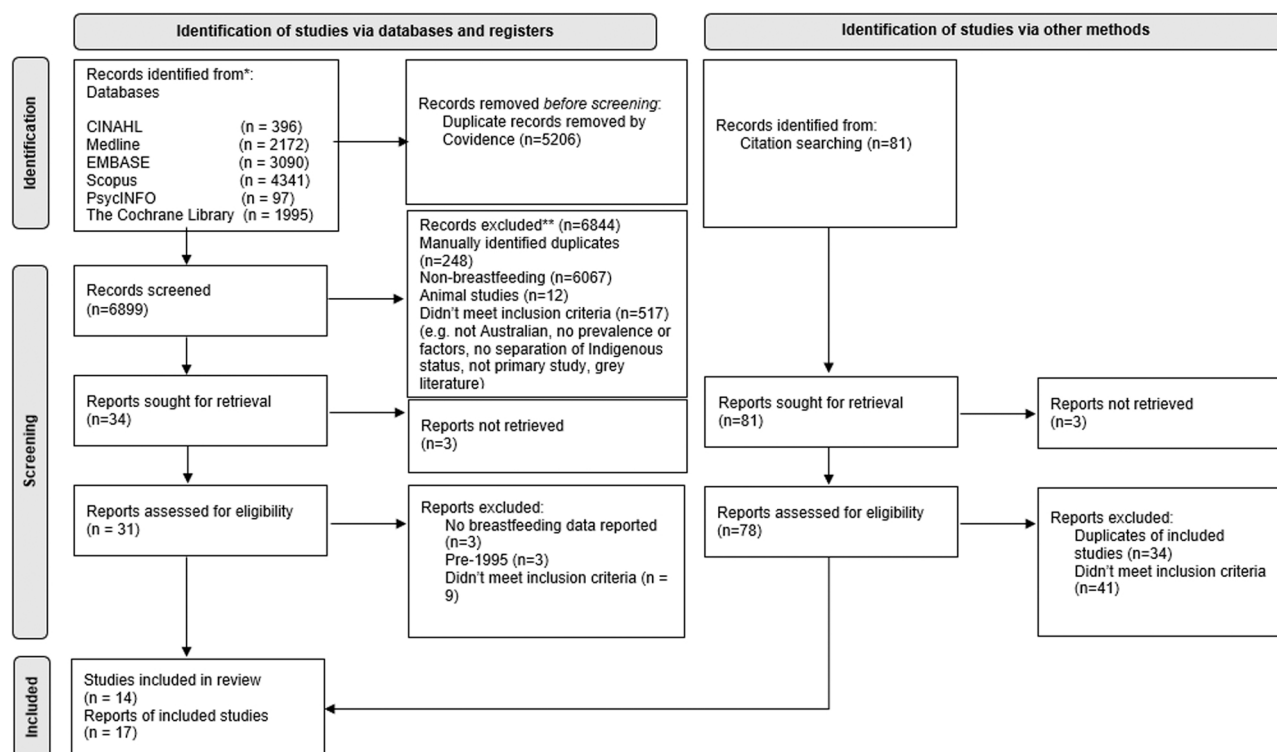


Fig. 1. PRISMA 2020 flow diagram.

Aboriginal and Torres Strait Islander governance and leadership, Indigenous research paradigms, following of community protocols and protection of intellectual and cultural property were the most common items to be assessed as unclear (U). The majority of studies received a no (N) answer to the questions assessing translation of findings into sustainable changes and direct benefits to participants, which may be attributable to the observational nature of most studies. Kildea et al. [39], Leonard et al. [47] and Salmon et al. [27] were rated yes (Y) to more than half of the questions, showing they clearly reported their considerations in regard to their conduct of research with Aboriginal and Torres Strait Islander people.

Protective factors

There were significant variations in the factors reported as protective of breastfeeding overall for Aboriginal and Torres Strait Islander women; however, there were some factors that were reported in more than one included study (Table 2). Remoteness or living outside of a metropolitan area was reported in five studies [27,28,41,42,46], attending an Aboriginal and Torres Strait Islander specific or focused service was reported in three studies [28,39,45], maternal age (>25 [27] and >35 [25] and 'older' maternal age [40]), level of education (higher levels [41], year 10 or higher [27] and degree or diploma [28]) were reported in three studies and being partnered [25,27] and living in larger households (≥ 4 people) [27,41] were each reported in two studies. For attending an Aboriginal and Torres Strait Islander specific service, there was one urban study [39], one rural study [45] and one study including urban, regional and remote areas [28], demonstrating that this may be a factor regardless of geographic location. Brown et al. [28] reported an increase in breastfeeding rates when attending either an Aboriginal and Torres Strait Islander service or a mainstream service in a regional area in SA in comparison to a metropolitan area. They also found that Aboriginal and Torres Strait Islander services maintained higher rates of breastfeeding in both regional and metropolitan areas in comparison to mainstream services, however, did not reach statistical significance for Aboriginal and Torres Strait Islander services in

metropolitan areas when adjusted for confounders [28].

Breastfeeding initiation or breastfeeding at discharge from hospital after birth

Factors that were protective of breastfeeding initiation and/or breastfeeding at discharge from hospital after birth were attending an Aboriginal and Torres Strait Islander specific service [39,45], older maternal age [25,40], perceived preference of partner and maternal grandmother for breastfeeding, whether the woman's grandmother had ever breastfed [40], higher infant gestational age at birth, caesarean birth [25], remoteness [27,42], being partnered, and having an education level of year 10 or higher [27].

For improved rates of *exclusive* breastfeeding, Kildea et al. [39] reported higher infant gestational age at birth and attending an Aboriginal and Torres Strait Islander specific service improved rates of exclusive breastfeeding on discharge, and a retrospective analysis of an Aboriginal and Torres Strait Islander specific Community Child Health Nurse service found that increased engagement with the service improved exclusive breastfeeding rates [44].

Up to six months

For the factors associated with breastfeeding up to six months, timing of the outcome measures was significantly varied. Reporting of protective factors occurred between 2 and 3 weeks [43], at six weeks [28,46], at 12 weeks [28], at ≥ 3 months [41], at six months [27,45,46], and in one case, as overall factors associated with breastfeeding duration [47]. These factors included intention to breastfeed [43], having a degree or diploma/higher levels of education [28,41], attending a regional service, a higher reported number of stressful events and social health issues [28], living outside of a metropolitan area/remote residence [27, 28,41,46], being a non-smoker, infant birthweight ≥ 2500 g, female infant, families with four or more children [41], age > 25, mothers without postnatal depression, living in medium sized (4–5) and larger (6–22) households [27], attending an Aboriginal and Torres Strait Islander specific service [45] and younger infant age [47].

Table 1
Studies reporting protective and risk factors for breastfeeding by author/s name.

Author	Protective Factors	Risk Factors
Austin and Arabena, 2020 [45]	Implementation of an Aboriginal and Torres Strait Islander specific service (EARL model)	N/A
Binns et al., 2006[40,68, 69]	Older maternal age, perceived preference of partner/maternal grandmother for BF and maternal grandmother BF history	Vaginal birth, attending antenatal classes and being multiparous
Brown et al., 2019[28]	Degree/diploma, living outside of the metropolitan area, attending a regional service, attending an Aboriginal and Torres Strait Islander specific service and higher reported number of stressful events and social health issues	Cannabis use and admission to SCN/NICU
Chamberlain et al., 2017 [37]	N/A	GDM and smoking in pregnancy
Craig et al., 2011 [43]	Intention to BF	Residing in suburb in the most disadvantaged SEIFA and smoking
Cromie et al., 2012[41,70]	Higher levels of education, non-smoker, BW \geq 2500 g, female infant, families with \geq 4 children and greater residential isolation	Lowest category of financial strain and smoking during pregnancy
Freeman et al., 2018[44]	Increased engagement with CCHN service	N/A
Hayman et al., 2000[38]	N/A	Age > 30 years
Kildea et al., 2021[39]	Attending the BiOC service	N/A
Leonard et al., 2017[47]	Younger infant age	N/A
Longmore et al., 2020[46]	Higher GA at birth and remote residence	T2DM, caesarean, admission to neonatal nursery and maternal obesity
McLachlan et al., 2017 [25]	Maternal age > 30, partnered and caesarean birth	Single, multiparous, length of hospital stay < 3days, smoking after 20 weeks gestation and infant born < 37 weeks
Salmon et al., 2019[27]	Remoteness, partnered, education \geq year 10, age > 25, mothers without PND and medium (4–5) and larger (6–22) household size	Urban area or areas of low isolation, unpartnered and education \leq year 9, maternal age < 25 and mothers with PND and smaller household size
Smith et al., 2000[42]	Remoteness	N/A

BF: breastfeed/ing, BiOC: Birthing in Our Community, BW: birthweight, CCHN: community child health nurse, EARL: Early Assessment Referral Links, GA: gestational age, GDM: gestation diabetes mellitus, N/A: not applicable, NICU: neonatal intensive care unit, PND: postnatal depression, SCN: special care nursery, SEIFA: Socio-Economic Indexes for Areas, T2DM: type 2 diabetes mellitus.

Risk factors

As with protective factors, there were also associated risk factors that were identified in more than one study (Table 3). Four studies reported smoking in pregnancy [25,37,41,43], and two each reported admission to special care nursery (SCN) or the neonatal intensive care unit (NICU) [28,46] and being multiparous [25,40] as risk factors for not breastfeeding. Binns et al. [40] examined smoking in their study, but found it was not significantly associated with breastfeeding, also finding vaginal birth and attending antenatal classes to be negatively associated with breastfeeding, in contrast to other available evidence [16].

Breastfeeding initiation or breastfeeding at discharge from hospital after birth

For breastfeeding initiation, risk factors reported were age > 30 years [38], being single [25], multiparous [25,40], having a length of hospital stay < 3days, smoking after 20 weeks gestation, low birthweight and infants being born < 37 weeks [25]. For breastfeeding on discharge, vaginal birth, attending antenatal classes [40], having gestational diabetes mellitus (GDM) and smoking in pregnancy [37] were the associated risk factors.

Identified risk factors for not exclusively breastfeeding at discharge included having type 2 diabetes mellitus (T2DM), caesarean birth, admission to neonatal nursery (special care or neonatal intensive care unit) and maternal obesity [46].

Up to six months

Again, the associated risk factors for breastfeeding duration were identified at multiple and varied time points. Craig et al. [43] reported residing in the most disadvantaged suburbs was a risk factor for ceasing breastfeeding at 2–3 weeks. Two studies reported factors at six weeks, including cannabis use [28], T2DM and maternal obesity [46], and one study reported cannabis use and admission to SCN or NICU as factors at 12 weeks [28]. For breastfeeding < 3 months, Cromie et al. [41] reported experiencing financial strain was a risk factor, and Craig et al. [43] reported smoking as an associated factor for ceasing breastfeeding by six months.

Discussion

This study is the first systematic review, to our knowledge, that synthesises and reports the protective and risk factors associated with breastfeeding for Aboriginal and Torres Strait Islander women in Australia. We encountered factors that were associated with breastfeeding among both Aboriginal and Torres Strait Islander and non-Indigenous women, along with factors that were specific to Aboriginal and Torres Strait Islander women. We found protective and risk factors associated with breastfeeding for Aboriginal and Torres Strait Islander women that were identified as significant across multiple studies. These protective factors included living in a remote area, attending an Aboriginal and Torres Strait Islander specific service, higher levels of education attainment, increased maternal age, living in larger households, and being partnered. The identified risk factors were smoking in pregnancy, admission to SCN or NICU, and being multiparous. The findings from this review suggest that geographic location (remote versus urban/metro), attending an Aboriginal and Torres Strait Islander specific service, the number of people living in a household (larger versus smaller), attending a regional service and having a higher reported number of stressful events and social health issues are protective factors associated with breastfeeding that are specific to Aboriginal and Torres Strait Islander women in Australia. Factors identified across more than one study and factors conflicting with other available evidence will be discussed in detail below.

Sociodemographic factors

Partner status was a factor found to be associated with breastfeeding for Aboriginal and Torres Strait Islander women in two included studies, which is consistent with the literature for other Indigenous populations in New Zealand/Aotearoa [49], Canada [50], and the United States [51]. Being partnered was found to be protective of breastfeeding and being unpartnered a risk factor. One study also reported that the perceived preference of the partner for breastfeeding was protective [40]. Other evidence supports improved breastfeeding rates when a woman's partner is supportive [22] or prefers breastfeeding. In contrast to this, a systematic review of international evidence found that most included studies (four of five) did not find a relationship between social support or perceived social support and rates of breastfeeding [17],

Table 2
Protective factors reported in included studies by author/s name.

	Remoteness/living outside metropolitan areas	Attending a birth in a Torres Strait Islands specific service	Older maternal age	Higher level of education	Partnered	Living in larger households	Perceived preference of partner/maternal grand and mother	Maternal grand mother BF history	BW > 2500 g	Female infant	Higher reported number of stressful events and social health issues	Increased service engagement	Younger infant age	Higher GA at birth	Caesarean birth	Mothers without PND	Attending regional service	Intention to BF	Non – smoker	Families with ≥ 4 children
Austin and Arabena, 2020[45]	✓																			
Binns et al., 2006[40,68,69]			✓				✓	✓												
Brown et al., 2019[28]	✓	✓		✓							✓						✓			
Craig et al., 2011[43]																		✓		
Cromie et al., 2012[41,70]	✓			✓					✓	✓									✓	✓
Freeman et al., 2018[44]											✓									
Kildea et al., 2021[39]		✓																		
Leonard et al., 2017[47]													✓							
Longmore et al., 2020[46]	✓													✓						
McLachlan et al., 2017[25]			✓		✓										✓					
Salmon et al., 2019[27]	✓		✓	✓	✓	✓										✓				
Smith et al., 2000[42]	✓																			

BF: breastfeed/ing, BW: birthweight, GA: gestational age, PND: postnatal depression

Table 3
Risk factors reported in included studies by author/s name.

Author(s)	Vaginal birth	Attending N class	Multiparous	Cannabis use	Admission to SCN/NICU	GDM	Smoking	Residing in low SES area	Lowest category of financial strain	Age > 30	Older infant age	T2DM	Maternal obesity	Unpartnered	Length of hospital stay > 3 days	Infant born < 37 weeks	Urban area/area of isolation	Education > year 9	Maternal age > 25	Caesarean birth	Mother with PND	Smaller household size
Binns et al., 2006 [40,68,69]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brown et al., 2019 [28]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chamberlain et al., 2017 [37]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Craig et al., 2011 [43]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cromie et al., 2012 [41,70]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hayman et al., 2000 [38]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Longmore et al., 2020 [46]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
McLachlan et al., 2017 [25]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Salmon et al., 2019 [27]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

AN: antenatal, GDM: gestational diabetes mellitus, PND: postnatal depression, SEIFA: Socio-Economic Indexes for Areas, T2DM: type 2 diabetes mellitus

however, this review was not specific to Aboriginal and Torres Strait Islander women.

A shared protective factor for breastfeeding among both Aboriginal and Torres Strait Islander and non-Indigenous women in Australia is higher levels of education attainment. Level of education attainment is another factor influencing breastfeeding that is shared by some Indigenous populations outside of Australia [51,52]. For Aboriginal and Torres Strait Islander women, education attainment is lower in comparison to non-Indigenous women and has been an ongoing focus of the Closing the Gap policy agenda since 2008. While not successful in many goal areas, this policy aims to close the health and life expectancy gap between Aboriginal and Torres Strait Islander and non-Indigenous Australians and, specifically, increase the number of people who have completed a tertiary qualification [31]. Rates of year 12 attainment or equivalent are higher in major cities (85%) compared with very remote areas (38%), yet breastfeeding rates remain higher in very remote areas. Further exploration of this factor for women living in remote areas would be beneficial to understand if this is a factor that is relevant in the remote context. Continued focus on improving levels of educational attainment is imperative as a modifiable component that can assist in improving breastfeeding rates for Aboriginal and Torres Strait Islander women.

Remoteness

Remoteness was a factor identified in this review as being strongly protective of breastfeeding. While this is a consistent finding for Aboriginal and Torres Strait Islander women in Australia, there are some inconsistencies about the association for Indigenous populations in other high-income colonised countries. A study in the United States found that Native American women were more likely to initiate breastfeeding if living in rural locations [53]. However, for Indigenous women in Canada, Romano et al. [52] found no difference in rates of breastfeeding between rural or urban areas. In this review, Aboriginal and Torres Strait Islander women living in remote locations had higher rates of breastfeeding initiation, maintained breastfeeding for longer, and were more likely to exclusively breastfeed their babies than Aboriginal and Torres Strait Islander women in urban areas. The findings in this review are important in the Australian context, however, the generalisability to other Indigenous populations may be limited. With the majority of Aboriginal and Torres Strait Islander people living in Australia residing in urban or regional areas [54], it is important to understand the factors associated with living in a remote area that are protective of breastfeeding.

There have been attempts at identifying these factors, suggesting that those living in urban areas could be influenced by western practices [55], or that maintenance of a traditional lifestyle, along with limited access to foods (including formula), safe water, and bottle cleaning facilities, influence remote breastfeeding practices [41]. While there is limited current evidence to understand this, we speculate that maintaining connection to culture, living on traditional country, family ties and kinship, cultural traditions and knowledge sharing, cultural norms, less influence from western culture, limited access to other types of infant feeding options, and support for breastfeeding as a natural way to feed babies, may play a pivotal role for women living in remote communities experiencing higher rates of breastfeeding. Recently, Longmore et al. [46] called for further exploration of cultural and family connections to understand breastfeeding for women living in remote areas. In the face of colonisation, the effects of the Stolen Generation and the interruption to sharing of culture, breastfeeding practices in these remote communities is a testament to the strength and resilience of Aboriginal and Torres Strait Islander people and their ability to maintain an ongoing connection to their culture.

Stressful life events

In this review, we found that experiencing stressful events or social

health issues was associated with increased rates of breastfeeding. In the study by Brown et al. [28], women were more likely to breastfeed when experiencing a higher number of stressful events and social health issues. In contrast to this, Cromie et al. [41] reported experiencing financial strain was associated with lower rates of breastfeeding, and Craig et al. [43] reported living in the most disadvantaged suburb was also associated with lower rates of breastfeeding. Other available evidence suggests that rates of breastfeeding are lower for women experiencing stressful life events, with a study by Li et al. [56] finding that women who experienced stressful life events were less likely to maintain breastfeeding. Aboriginal and Torres Strait Islander women are more likely to experience increased social health issues in comparison to non-Indigenous women, evidenced by more than half of the women in the study by Brown et al. experiencing three or more issues. More than half (53%) of the participants in the study by Brown et al. [28] attended a culturally specific service, and based on the findings, increased breastfeeding may be correlated with receiving culturally safe and competent care.

Smoking

Smoking was identified as a risk factor for not breastfeeding in this review across multiple studies. This reinforces what is already known about risk factors associated with breastfeeding, particularly for Aboriginal and Torres Strait Islander women. Smoking is a factor associated with lower breastfeeding that has been identified across other Indigenous populations in high-income countries [49–51]. While rates of smoking in pregnancy for Aboriginal and Torres Strait Islander women remain higher than those for non-Indigenous women (44% vs 12% in the first 20 weeks), it is important to acknowledge that the rates of smoking in pregnancy for Aboriginal and Torres Strait Islander women have decreased over time, from 52% in 2006 to 45% in 2017 [54]. It is also necessary to consider the historical and cultural context of smoking for Aboriginal and Torres Strait Islander people, and while tobacco smoking was not a traditional part of Aboriginal and Torres Strait Islander culture prior to colonisation, in the modern context it is seen as a cultural factor that strengthens bonds and provides an opportunity to share and come together to yarn (talk) [57,58]. Smoking is a risk factor that is modifiable and reducing or stopping smoking in pregnancy, and before pregnancy where possible, should be a focus for Aboriginal and Torres Strait Islander women to improve rates of breastfeeding along with perinatal outcomes and overall health and wellbeing.

Vaginal birth

We identified one study in this review [40] that reported vaginal birth as a factor associated with **not** breastfeeding for Aboriginal and Torres Strait Islander women. There are conflicting findings however regarding mode of birth and the impact on breastfeeding outcomes. A meta-analysis of 47 studies exploring mode of birth, found that vaginal birth was consistently associated with increases in breastfeeding initiation and maintenance [16]. Additionally, a study by Hobbs et al. [59] reported lower rates of breastfeeding for women who had a caesarean birth. On the other hand, a population-based study conducted in Victoria reported that women who had a caesarean birth had higher odds of initiating breastfeeding, although infants born via caesarean were less likely to take their last feed on discharge from hospital exclusively from the breast [25]. It therefore appears the findings by Binns et al. [40] that women who had a vaginal birth had lower rates of breastfeeding, do not align with most evidence, and should be considered with caution as a factor associated for Aboriginal and Torres Strait Islander women.

Antenatal education

Antenatal education is another factor associated with breastfeeding

that has conflicting findings. In this review, Binns et al. [40] reported that Aboriginal and Torres Strait Islander women who attended antenatal classes for their current or previous pregnancy/ies were less likely to breastfeed, so women in the study by Binns and colleagues may not have attended antenatal classes in the current pregnancy. In addition, the number of women who had attended antenatal classes was low in comparison to those who did not attend classes (30 versus 395) [40]. The findings reported by Binns et al. [40] contrasts with other evidence, including a Cochrane Review, which reported no association or improved breastfeeding outcomes with antenatal education [60], and another Cochrane Review which found no evidence that antenatal breastfeeding education changed rates of breastfeeding initiation or maintenance [61]. Given the conflicting evidence, further research with a larger sample size is warranted to determine if antenatal education is a factor associated with breastfeeding for Aboriginal and Torres Strait Islander women, particularly as it was reported in a single study in this review and given the low number of women included in the study that attended antenatal classes.

Attending an Aboriginal and Torres Strait Islander service

Another key factor protective of breastfeeding in this review was attending an Aboriginal and Torres Strait Islander specific service. Currently, there is limited evidence to support improvement in breastfeeding rates for women attending an Aboriginal and Torres Strait Islander specific service. Aboriginal community-controlled health organisations (ACCHOs) are Aboriginal and Torres Strait Islander specific primary health care services that provide comprehensive, culturally safe, and holistic health care for their local communities [62], including maternity care services [63]. ACCHOs are often preferred by many Aboriginal and Torres Strait Islander people, in comparison to mainstream health services [64]. Pearson et al. [63] recently reported that ACCHOs provide support and activities that address the social determinants of health and health inequity for Aboriginal and Torres Strait Islander people and found improved satisfaction with care for Aboriginal and Torres Strait Islander women through the Mums and Bubs program [63]. Traditionally, these services provide antenatal and postnatal care, without the option to provide birthing care for Aboriginal and Torres Strait Islander women [63]. In 2020, the Royal Australian College of General Practitioners released a statement outlining their support for increased investment in ACCHOs, acknowledging the role they play in improving Aboriginal and Torres Strait Islander health outcomes [65].

Two studies in this review found improved breastfeeding rates in an urban [39] and urban and regional [28] context for women attending an Aboriginal and Torres Strait Islander specific service, however, Brown et al. [28] reported that in the urban context, after adjusting for maternal age and education, they did not reach statistical significance. Therefore, it is important to interpret this finding with caution and to consider this finding in the context of geographic location, particularly as we are not able to adjust for confounders in this review.

Child removal

Child removal has historically been very traumatic for Aboriginal and Torres Strait Islander people due to government policies and the Stolen Generation. Recent data shows that Aboriginal and Torres Strait Islander children are 10 times more likely to be in out of home care than non-Indigenous children, with 39% of children in out of home care identifying as Aboriginal and/or Torres Strait Islander [26]. Rates of child removal in the Aboriginal and Torres Strait Islander community have continued to increase over time, and, given the limited literature available, it is important for research to consider this as a potential risk factor that is associated with breastfeeding in this population of women and infants.

The association of child removal and breastfeeding was not reported

by any studies included in this review, however. A Canadian study reported that breastfeeding initiation was most likely to occur when mothers remained the primary caregiver of infants, and for babies that were removed, none had ever fed at the breast, although some were able to receive expressed breast milk [66]. It is reasonable to expect that this would be a similar experience for mothers whose infants are removed from their care in Australia, reinforcing the need to consider this as a factor influencing breastfeeding, particularly given the high rates of Aboriginal and Torres Strait Islander children in out of home care.

Strengths and Limitations

This review makes an important contribution to the knowledge and evidence of the protective and risk factors associated with breastfeeding for Aboriginal and Torres Strait Islander women and babies in Australia. As the search strategy and methodologies of included studies were broad and inclusive, it enabled us to report on the factors associated with breastfeeding for Aboriginal and Torres Strait Islander women. We identified factors that are specific to Aboriginal and Torres Strait Islander women, which can be used in the future to support ongoing research and planning. A further strength of this review is the inclusion of Aboriginal researchers, who were involved throughout the review process.

Some limitations include exclusion of evidence from the grey literature, where Government reporting of the factors associated with breastfeeding may have potentially been missed. Qualitative studies were also excluded in this review, which could have provided in-depth understanding of the factors associated with breastfeeding as described by Aboriginal and Torres Strait Islander women rather than relying on factors identified through statistical analyses. Our review was limited to studies in English; however, it is unlikely that peer-reviewed studies about Aboriginal and Torres Strait Islander women and infants in Australia would be written in another language. No studies represented Tasmania or the ACT, therefore, findings may not be applicable to those Aboriginal and Torres Strait Islander populations. Another limitation was our inability to adjust for confounders or conduct a meta-analysis due to the heterogeneity of the included studies. Lastly, the generalisability of these findings may be limited both within Australia and in the global context, due to the diversity of Indigenous populations. Regardless, this review provides an important understanding of the factors associated with breastfeeding that are exclusively experienced by Aboriginal and Torres Strait Islander women in Australia.

Recommendations

Our systematic review identified the protective and risk factors associated with breastfeeding for Aboriginal and Torres Strait Islander women in Australia, including factors that are amenable to change. We recommend increased efforts from government agencies to support and fund Aboriginal and Torres Strait Islander specific services to provide culturally safe care for Aboriginal and Torres Strait Islander women and infants. Attending an Aboriginal specific service is associated with improved breastfeeding outcomes in this review and increasing access to these services for women and infants enhances the ability of care providers to target amenable factors associated with breastfeeding, including smoking prevention and/or minimisation. This review suggests that improving levels of education attainment can also facilitate improved breastfeeding outcomes, requiring government action to continue to work towards improving socioeconomic disadvantage for Aboriginal and Torres Strait Islander people, particularly women and infants.

We also recommend further research investigating Aboriginal and Torres Strait Islander specific factors positively associated with breastfeeding, incorporating the findings of this review. We recommend rigorous research that evaluates interventions that are effective at increasing breastfeeding rates, across urban, rural, regional, and remote

areas, and breastfeeding research that is representative across all states and territories of Australia. Many factors in this review were reported in a single study and not identified by other studies included in the review or supported by other available evidence and future research should analyse these factors to identify if they remain significant. Remoteness as an associated factor for breastfeeding requires further research, given that it has been found to be strongly protective of breastfeeding, however, we are yet to understand the reasons for this. Lastly, there is a need for qualitative research and a qualitative systematic review to determine the protective and risk factors for breastfeeding that are reported by Aboriginal and Torres Strait Islander women. Understanding these factors in-depth will facilitate an improved understanding, alongside quantitative data, which could then be used to inform strategies to improve breastfeeding rates.

Conclusion

Breastfeeding is important to improve outcomes for Aboriginal and Torres Strait Islander women and infants. We found living in remote locations, attending an Aboriginal and Torres Strait Islander specific service, attending a regional service, being partnered, higher levels of education, living in larger households and having a higher reported number of stressful events and social health issues were protective of breastfeeding for Aboriginal and Torres Strait Islander women. However, women who were multiparous, smoked, or had infants admitted to SCN or NICU were less likely to breastfeed. There is an urgent need to improve breastfeeding outcomes for Aboriginal and Torres Strait Islander women and infants to meet current breastfeeding recommendations. This requires national and state government focus, support, and consistent funding to plan, guide and implement evidence-based interventions and services for Aboriginal and Torres Strait Islander women and infants, such as Aboriginal and Torres Strait Islander specific maternity services. A particular focus is needed to implement these services across urban, rural, remote, and very remote locations and facilitating integrated maternity care between ACCHO's, Aboriginal and Torres Strait Islander specific services, and mainstream maternity services. Further rigorous research is required to understand the factors associated with breastfeeding for Aboriginal and Torres Strait Islander women and to evaluate effective breastfeeding interventions to enhance current strategies and inform new strategies to increase breastfeeding rates and improve the health of Aboriginal and Torres Strait Islander women and infants.

Differences between registration and review

A decision was made by all reviewers after the title and abstract screening to modify the eligibility criteria for this review. Eligible study populations identified in the protocol of this review included women who identified as Indigenous from the countries of Australia, Aotearoa/New Zealand, Canada, and the United States. The modified eligible study population is described in the methods section of this review, along with the search terms used initially. New search terms were not generated, as the initial search was inclusive of all terms required for the modified criteria. This decision occurred after consideration of the heterogeneity of data systems, collection and reporting of breastfeeding data in each country, particularly for Indigenous populations, and the complexity of between country comparisons [67].

Author contributions

Tanisha Springall: study conceptualisation, methodology, analysis, investigation, writing – original draft and review and editing. **Helen McLachlan:** study conceptualisation, methodology, investigation, writing – review and editing, supervision. **Della Forster:** study conceptualisation, methodology, writing – review and editing, supervision. **Jennifer Browne:** investigation, writing – review and editing.

Catherine Chamberlain: investigation, writing – review and editing.

Ethical statement

Ethics approval was not required for this study.

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Conflict of interest

None declared.

Author agreement

This article is the authors' original work and has not received prior publication and is not under consideration for publication elsewhere. All authors have seen and approved the manuscript being submitted and the authors abide by the copyright terms and conditions of Elsevier and the Australian College of Midwives.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.wombi.2022.06.012](https://doi.org/10.1016/j.wombi.2022.06.012).

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