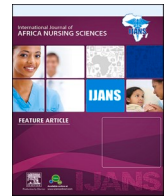


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# A critical look at exclusive breastfeeding in Africa: Through the lens of diffusion of innovation theory

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## ABSTRACT

**Background:** Exclusive breastfeeding is a practice widely promoted across many developing countries. Despite all the potential advantages and three decades of promotional efforts, exclusive breastfeeding remains short of expectations with a consistent low rate of practice in sub-Sahara Africa since its inception.

**Objectives:** Roger's diffusion of innovation theory was used to examine innovation attributes affecting the adoption of exclusive breastfeeding in Africa.

**Methods:** A critical review exploring evidence on exclusive breastfeeding in Sub-Sahara Africa was conducted. The databases MEDLINE, CINAHL, Scopus, JSTOR, Google Scholar, and PUBMED were searched and supplemented with additional search of grey literature. Eligible studies were selected and a directed content analysis approach to data extraction was conducted in alignment with the diffusion of innovation theory to facilitate narrative synthesis.

**Result:** Articles reviewed were diverse and focused on studies exploring barriers to exclusive breastfeeding in several African countries. Key findings indicate several attributes of exclusive breastfeeding are incompatible with African traditional beliefs and cultural practices.

**Conclusion:** The attributes identified in this review are worthy of consideration when Promoting exclusive breastfeeding among the African people as these are critical predictors of its adoption. Moreover, the adoption of exclusive breastfeeding requires more of socio-cultural processes rather than technical processes. Extended family members and the grandmothers have significant roles in childcare, and they have a powerful influence on innovation decision-making about exclusive breastfeeding. We recommend that the opinions of these adopters be considered when planning exclusive breastfeeding programs. Exclusive breastfeeding needs to be modified to accommodate African traditional values system.

## 1. Introduction and background

Traditionally, breastfeeding has been an acceptable method of infant feeding in African culture before the advent of exclusive breastfeeding (EBF). Many pregnant mothers look forward to breastfeeding with pride. Africans believe that breastfeeding facilitates a strong bond between a mother and her child. Some Africans have a strong belief in the power of the breastmilk; that a woman is capable of blessing or casting a spell on a child with its power. The World Health Organisation (WHO) recommended EBF in the early 1990s with the aim to promote optimal growth and development, and protect children against several diseases including diarrhoea, upper respiratory infections, and other common infections (Lamberti, Walker, Noiman, Victora, & Black, 2011; Victora et al., 2016; WHO, 1991). EBF is a feeding practice widely promoted across many developing countries and requires infants to be introduced to breastfeeding within one hour of birth, breastfed exclusively for the first six months of life with only breast milk, without the use of any other food or drinks except for oral rehydration solution (when necessary), and continue to be breastfed up to 2 years of age and beyond.

Several life-long maternal, child and societal health benefits have been associated with EBF (American Academy of Pediatrics [AAP], 2018). Evidence indicates that an infant that is not exclusively breastfed is at a substantial risk for both short and the long-time effects such as stunted growth and impaired cognitive ability (Ogbo, Okoro, Olusanya, Olusanya, & Ifegwu, 2019). National efforts to promote EBF began in some African countries in 1992 (Nigerian Federal Ministry of Health, 2005). Efforts made by the United Nations International Children's Emergency Fund (UNICEF) included training of all levels of healthcare workers, establishment of Baby Friendly Hospital Initiatives (BFHI), and the recruitment of community extension workers on lactation management for mothers (UNICEF/WHO, 2018). Specific strategies to promoted EBF included hospital birthing, postpartum maternity leave, breastfeeding counselling, and elimination of traditional feeding practices (Stadsklev Engebretsen et al., 2014). Related socio-economic factors were aggressively targeted through numerous programs by WHO, UNICEF, and individual nations (Bégin et al., 2019).

Despite all the potential advantages and three decades of promotional efforts, EBF remains short of expectations. While the global target

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is 50% rate by 2025 (WHO/UNICEF, 2016), EBF has been consistently low in sub-Saharan Africa since its inception (Agho et al., 2019; Agunbiade & Ogunleye, 2012; Bhattacharjee et al., 2019). The primary barriers to sustainability of EBF involve poor understanding and cultural perceptions of EBF (Bhattacharjee et al., 2019; Chakona, 2020; Cherop, Keverengety, & Mbagaya, 2009; Ugboaja, Nwosu, Igwegbe, & Obi-Nwosu, 2013). Persistent conflicts between traditional beliefs and EBF highlight a lack of acceptance and credibility for EBF in Africa (Asfaw, Argaw, & Kefene, 2019; Maonga, Mahande, Damian, & Msuya, 2016). For instance, herbal and medicinal preparations are commonly used among indigenous African people based on the beliefs that they ward off evil spirits and promote infants survival (Davies-Adetugbo, 1997; Maonga et al., 2016). To these people, feeding infants exclusively on breast milk is regarded not only as an unrealistic idea but as a “dangerous practice” that put infants at risk (Davies-Adetugbo, 1997, p.122).

It has been noted that inability to translate research into practice is a major problem preventing optimal benefits of advances in healthcare (Grimshaw, Eccles, Lavis, Hill, & Squires, 2012). While several studies have been focused on EBF, attention has not been paid to the aspects of EBF that affect its translation to practice among indigenous African population. More work is required to explore some aspects of EBF that conflict with African traditional beliefs and practices and how the conflict affects the adoption of EBF in Africa. It has been argued that a scientific innovation is more likely to be feasible and acceptable to the adopters when it is carefully tailored to the context where it is intended to be implemented (Rogers, 2003). A fundamental challenge of an innovation is in identifying contextual determinants (i.e., barriers and facilitators) and determining which implementation or intervention strategies will address the determinants (Waltz, Powell, Fernandez, Abadie, & Damschroder, 2019). To that end, we found it necessary to conduct this critical review of the literature and it was necessary to examine the perceived attributes of EBF that may have affected its successful adoption in Africa. The use of an appropriate framework to provide direction for planning and guiding knowledge translation activities could be helpful in designing culturally appropriate strategies for EBF in Africa. Rogers defined innovation as a new idea, practice, or object that is unfamiliar to an individual (or the unit of adoption). According to this definition, while breastfeeding may not have been a novel practice in African culture, EBF is considered a new idea that some Africans are not familiar with because it conflicts with some ingrained cultural beliefs and traditional practices.

The purpose of this critical review was to use the diffusion of innovation (DOI) theory (Rogers, 2003) to examine the perceived attributes of EBF that affect its successful adoption in Africa. We used DOI theory as a lens because of its extensive use in several disciplines to study adoption of new ideas and in understanding how innovations spread within a society. Rogers identified five important attributes that need to be considered during an innovation adoption process: a) relative advantage- the degree to which an innovation is perceived as better than the idea that it supersedes; b) compatibility- the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters; c) complexity- the degree to which an innovation is perceived as difficult to understand and utilize; d) trialability- the degree to which an innovation may be experimented with on a limited basis; and e) observability- the degree to which the results of an innovation are visible to others. Identifying the attributes of EBF as an innovation is particularly important in understanding the rate of its adoption among a population.

This paper addressed the research question: What are the attributes of EBF affecting its adoption in sub-Saharan Africa? The specific objectives were: 1) To review the available research evidence on EBF in sub-Saharan Africa and identify its perceived attributes among participants, and 2) To identify the rate of adoption of EBF reported in some selected research studies.

## 2. Method

As a key step in this critical review and with the assistance of the health sciences librarian, we conducted a literature search in several health databases, which included but were not limited to MEDLINE, CINAHL, Scopus, JSTOR, Google Scholar, and PUBMED. We additionally incorporated grey literature to enhance the depth search and how comprehensive the review was (Benzies, Premji, Hayden, & Serrett, 2006). The key words for the search were constructed as follows: (exclusive breastfeeding or breast-feeding or breastfeeding) AND (mothers or fathers or grandmothers or mothers-in-law) AND (barriers or obstacles or challenges or difficulties or issues) AND (experiences or perceptions or attitudes or views or feelings) AND (sub-Saharan Africa or sub Saharan Africa or sub-Sahara).

### 2.1. Inclusions and exclusion criteria

It was beyond the scope of the search to include all documents regarding breastfeeding. The researchers defined the inclusion and exclusion criteria to ensure the relevance of retrieved articles. We defined our inclusion criteria as all peer reviewed research related to EBF in sub-Saharan African population that were published between 1990 and 2020, and grey documents from WHO and UNICEF reports with target on exclusive breastfeeding. We defined exclusion criteria as non-English publications, published abstracts without full text access, as well as reviews, posters, dissertations, books or book chapters, commentaries, and editorials that bear no relevance to our study.

### 2.2. Article search and data selection process

Guided by PICO, we followed the steps of the PRISMA Flow diagram (Fig. 1) and applied the stated inclusion and exclusion criteria in the selection of citations as follows: peer reviewed research related to EBF in sub-Saharan African population and published between 1990 and 2020. We focused on this time range as EBF was introduced in 1990 and included the period of major policies on EBF some African countries (Nigerian Federal Ministry of Health, 2005; UNICEF/WHO, 1990; WHO, 2009). We independently screened articles from the initial search using a two-step approach in which we screened the title and abstracts for eligibility. Two reviewers independently reviewed titles and abstracts of articles for primary sources of research and relevance to EBF in Africa. Articles on which reviewers could not reach a consensus about their eligibility were excluded. Initial search yielded 1863 articles, out of which 1499 were excluded based on duplication, leaving 364 articles for further screening. After the title and abstract screening, 63 articles were considered relevant. However, 47 articles were excluded after closely reading all 63 articles in full and applying all inclusion and exclusion criteria as follows: Twelve non-English publications were excluded because of the time and cost involved in translation. Fifteen published abstracts and 10 conference posters were eliminated because of lack of access to full text. Five dissertations, 3 commentaries, and 2 editorial publications were excluded based on lack of relevance and limited access to full scope of materials, thereby leaving 16 articles. Two grey documents were later included from WHO and UNICEF reports based on relevance, giving a total of 18 articles for review.

### 2.3. Data extraction

The final selection of articles was exported and organised into folders in a reference manager account. Two reviewers (O.O. and J. K.) independently extracted from each study, using a data extraction tool created manually by the reviewers. Any lack of clarity or disagreement was resolved through dialogue. Data extraction included the author, the country, and the perceived attributes. We included these attributes in the extraction table because they are to be considered when studying innovation adoption process (Rogers, 2003). We reviewed 16 articles on

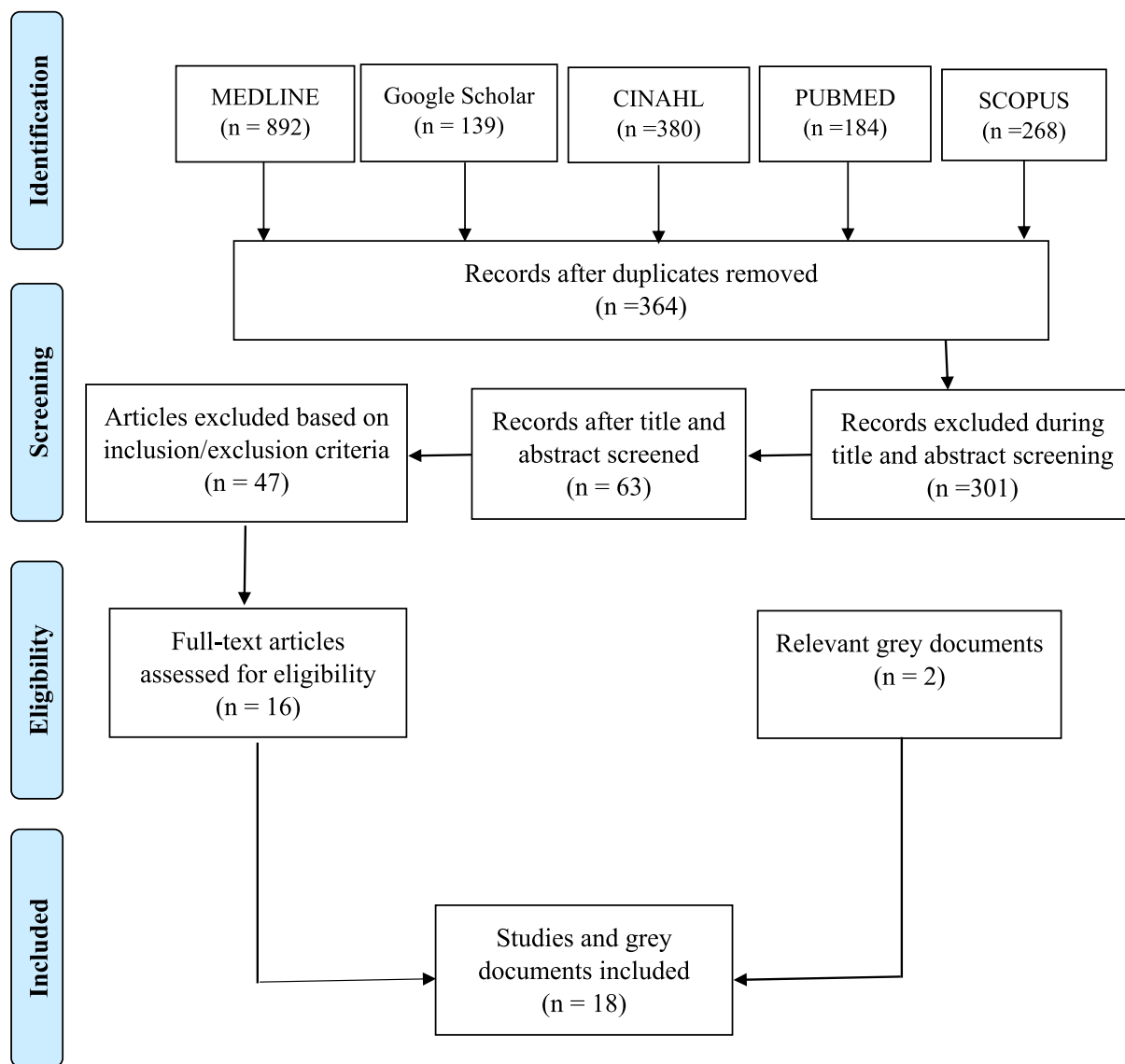


Fig. 1. Summary of literature search and number of articles (Moher, Liberati, Tetzlaff, Altman, The PRISMA Group, 2009).

EBF in relation to its perceived attributes and its adoption in Africa. Articles were diverse and focused on studies conducted in different African countries. We enumerated the studies, countries of origin, perceived attributes, and the rate of EBF adoption (See Table 1). We also presented the features and basic information about each study regarding the research design, aim, sample, and key conclusions (see table 2).

### 3. Results

A significant percentage (31%) of the literature stems from South Africa, followed by Ghana (12%), Nigeria (12%), and Kenya (12%). Other countries included Niger (6.5%), Zambia (6.5%), Tanzania (6.5%), Guinea Bissau (6.5%), and Cameroon (6.5%). Due to the rounding of numbers, the percentages do not sum up to 100%. We found only a few studies that explored EBF as an innovation or addressed the

perceived attributes of EBF within cultural context. Since we used DOI theory, this section presents a direct content analysis of the findings relating to the perceived attributes (relative advantages, compatibility, complexity and trialability) and the adoption rate of EBF as found in the studies.

#### 3.1. Relative advantages

According to Rogers (2003), relative advantage is defined as the degree to which an innovation is considered better than the pre-existing idea. Relative advantages were not addressed in many of the articles. The advantages of EBF reported in many studies are not from the perspective of participants, but rather from what Greenhalgh (2005) describes as “objective advantage” or “the research evidence as evaluated by the experts” (p. 84). Objective advantages associate EBF with

**Table 1**  
Data extraction of studies on EBF in nine African countries.

Study	Country	Relative advantage	Compatibility	Complexity	Trialability	Observability	EBF Rate
Abba et al. (2010)	Niger	Not mentioned.	Incompatible with traditional beliefs, opinions, practices. Lack of conviction among HPs. Environment not conducive to EBF.	Contradictory messages about EBF creating confusion. The process of expressing breast milk is unpleasant.	No report on EBF experimentations.	Not observable	1%
Ayawine and Ayuurebobe (2015)	Ghana	Not applicable. Only based on research findings.	Incompatible with farming occupation, beliefs, and sexual practices.	It is natural for women in Abuakwa and Barekese communities to breastfeed infants.	No report on EBF experimentations.	Babies in Abwakwa and Barekese who were not subjected to mix feeds did not report any diarrhoea disease.	Not reported
Davies-Adetugbo (1997)	Nigeria	No perceived advantage for EBF among participants.	Incompatible with beliefs about birth, pre-lacteal rituals, and breastfeeding norms. A belief that infants need water and breastmilk does not meet infants' needs.	Pre-lacteal rituals and ceremonies involved, usually performed by older women.	No report on EBF experimentations.	Not applicable	Less than 2%
Desmond et al. (2008)	South Africa	Cost effectiveness. Increased breast health. Lower postnatal HIV transmission rate	Not reported	EBF feasible and practical, as demonstrated in many settings, including high HIV prevalence areas.	No report on EBF experimentations.	Low rates of mastitis. Lower risk of postnatal HIV transmission.	Not reported
Eregie (1998)	Nigeria	Advantages acknowledged	Not reported.	Not reported.	Not reported.	Not reported.	Not reported.
Fjeld et al. (2008)	Zambia	EBF is important for infants' survival, growth, development, and health.	Deep rooted beliefs and conventions on infant feeding and expectations from family members.	Lack of autonomy and decision-making power among mothers. Extended family pressure. Contradictory advice from health personnel.	Early initiation of breastfeeding, colostrum accepted, low use of pre-lacteal feeds, prolonged breastfeeding.	Infant crying was attributed to lack of satisfaction with breastmilk.	Not reported
Gewa and Chepkemboi (2016)	Kenya	Less illness and stomach problems, but affects mother's physical appearance, health, and the ability to engage in other activities.	A belief that breast milk is insufficient.	Not reported	55% of participant practiced EBF (self-reported)	Less illness, stomach problems, lower body weight.	61%
Goosen et al. (2014)	South Africa	Not reported	Incompatible with family values and belief system i. e. grandmother's role, separation from infants, and taboos about sex and breastfeeding.	Lack of support for mothers.	EBF practices with remarkable outcomes.	Significant association between infant weight and EBF	6%
Jakobsen et al. (2008)	Guinea-Bissau	No perceived advantage	Incompatible with the beliefs that breast milk is not enough for infant and not giving water is harmful.	Not reported	Not reported	Lower incidence of diarrhoea and mortality.	50%
Jamal et al. (2017)	South Africa	EBF facilitates mother-child bond.	The belief about giving infants water and pre-lacteal feeds. Keeping with the practice of early use of traditional medicine.	Conflicting advice from health care providers.	22% of participants successfully practiced EBF.	Not applicable.	31.6%
Kakute et al. (2005)	Cameroon	Not reported	Incompatible with sexual taboo and customary discarding of colostrum.	Farming activities make EBF difficult for mothers as they tend to leave infant with other caregivers.	Not reported.	Not reported.	Not reported.
Maonga et al. (2016).	Tanzania	Maternal and child benefits (based on objective advantages).	Post-birth rituals, the belief that breastmilk is insufficient for growth EBF is meant for HIV + mothers.	Not reported	Initial EBF rate of 76%, dropped to 24.1% at 6 months (self-reported).	Not reported.	24.1%.
Naanyu (2008)	Kenya	Research based	Perceived lactation insufficiency. Perceived	Social norm obligations. Simple,	Not reported	Perceived low risk of illnesses.	Not reported

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Table 1 (continued)

Study	Country	Relative advantage	Compatibility	Complexity	Trialability	Observability	EBF Rate	
Nkonki et al. (2014)	South Africa	Reduced prevalence of infant death from diarrhoea, pneumonia and neonatal sepsis (objective advantages).	Unconvincing to mothers (not to mix-feed).	risk. Supplementary herbal infusions. compared to formula.	Restricted entry into households for EBF promotion.	Not applicable. Focus was on promotion.	Not applicable.	Not reported
Otoo et al. (2009)	Ghana	Perceived low risk of illness.	Cultural practices/beliefs, family pressure.	Family pressure makes EBF difficult.	Previous research indicates some mothers' efforts to practice EBF.	Existing research	Not reported	Not reported
Rogers (2015)	South Africa	Awareness through prenatal education.	Not explored.	Contradictory messages from health professionals. Socio-economic status. Lack of support to mothers.			Not reported	12%

low risk of infant mortality rate and reduction in infectious diseases such as acute respiratory infections and diarrhoea diseases that constitute the leading causes of infant mortality in Africa (Davies-Adetugbo, 1997; Nkonki, Daviaud, Jackson, Chola, & Doherty, 2014). Fjeld et al. (2008) found that despite being aware of the several benefits of EBF, participants held some deep-rooted cultural beliefs that prohibit the practice of EBF. Although Gewa and Chepkemboi (2016) reported that babies that were exclusively breastfed experienced less illness and gastric problems, participants perceived a negative effect on physical appearance, such as altered breast shape. Mothers in South Africa (Jamal, Wilford, Masango, Haskins, Coutsooudis, Spies, & Horwood, 2017; Siziba, Jerling, Hanekom, & Wentzel-Viljoen, 2015) had a general understanding based on pre-natal education and they perceived EBF to be beneficial in terms of affordability, facilitation of mother-child bond, nutritional sufficiency, and promotion of infants' wellness. Relative advantages attributed to EBF included conveniences such as the safety and availability of breast milk (Rogers, 2015).

### 3.2. Compatibility

Compatibility is defined as the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of the potential adopters (Rogers, 2003). This attribute is therefore positively related to any innovation adoption decision. Abba, De Koninck, and Hamelin (2010) found that cultural beliefs and a lack of conviction on the part of community leaders and the health professionals prohibits EBF. There is also a taboo prohibiting sexual contact during breastfeeding, hence many mothers were compelled to stop breastfeeding early (Ayawine & Ae-Ngibise, 2015; Goosen, McLachlan, & Schübl, 2014; Kakute et al., 2005).

Perceived lactation insufficiency, the belief that a sick woman will produce 'bad milk', and a negative attitude towards EBF were factors that predispose the rural population to non-exclusive feeding practices (Fjeld et al., 2008). EBF was found to be incompatible with local occupations that separate mothers from their infants. Female farmers from rural Ghana usually leave babies in the care of others and travel miles away to attend to farming activities (Ayawine and Ae-Ngibise, 2015). Some cultural procedures such as the use of 'uji wa bada' (herbs), oil, or sugar for babies at birth are common and the beliefs that mothers who practice EBF do so because they have HIV make EBF unpopular (Maonga et al., 2016). A belief that breast milk is insufficient is the most common reason for introducing non-breastmilk foods (Eregie, 1998; Jakobsen, Sodemann, Biai, Nielsen, & Aaby, 2008; Kakute et al., 2005; Maonga et al., 2016; Nkonki et al., 2014).

People of a KwaZulu-Natal community in South Africa believe in giving pre-lacteal traditional medicine and ritual fluids and it is considered a norm to supplement breastfeeding from birth (Jamal et al., 2017). Exclusive breastfeeding is considered dangerous to the infant,

and that the baby has an obligatory requirement for supplementary water to quench its thirst. It is also believed that water promotes the infant's normal development, and that herbal teas serve as food and medicine (Kakute et al., 2005). Davies-Adetugbo (1997) identified some beliefs among the Nigerians that colostrum is dirty because it looks "like pus" or that toxins and contaminants can be passed down to babies through breastmilk, and therefore is potentially harmful to the infant (p. 119). Moreover, the idea that breastmilk could be expressed, stored, and be fed to an infant while the mother is away at work is not popular among some Africans. They have the suspicion that breastmilk can get contaminated, poisoned, or bewitched by an enemy of the family (Davies-Adetugbo, 1997).

### 3.3. Complexity

Rogers (2003) described complexity as the degree to which an innovation is considered difficult to understand and use. The implication that follows is that a higher degree of complexity renders an equally higher degree of difficulty in understanding and using any given innovation. Complexity thus becomes negatively related to an innovation adoption decision. Four of the studies presented no report in connection to complexity of EBF (Eregie, 1998; Gewa & Chepkemboi, 2016; Jakobsen et al., 2008; Maonga et al., 2016). Some studies reported that mothers saw EBF as a natural phenomenon that is feasible and practical (Ayawine and Ae-Ngibise, 2015; Desmond et al., 2008). However, some studies identified a lack of conformity with social norms, contradictory messages from health personnel, and family pressure (Jamal et al., 2017; Naanyu, 2008). The studies showed the significant influence the extended family groups have on mothers. The influences are to the extent that family members prevent their wife/daughter/daughters-in-law from practicing EBF (Fjeld et al., 2008). It was reported that there was family pressure on young mothers to make decisions based on contradictory advice. The advice from health personnel at the clinic, whom she trusts, giving her one kind of advice, and the family members at home giving her another (Ayawine and Ae-Ngibise, 2015).

It was also noted that mothers were frequently given inappropriate advice that did not support EBF, and for many this was a key complexity to EBF and led directly to mothers failing to engage in EBF. For example, the advice for mothers to give water to treat constipation (Jamal et al., 2017). The belief about giving infants water is a tradition mostly reported amongst parents or family members and health workers also encouraged this practice. Health workers in the urban hospital routinely provided pre-lacteal feeds, disrupting mothers' plans to breastfeed (Jamal et al., 2017).

### 3.4. Trialability

Rogers (2003) presented trialability as the degree to which new ideas

**Table 2**  
Features of the reviewed studies.

Study	Design	Aim of the study	Sample	Major Conclusion
Abba et al. (2010)	Qualitative exploratory design.	To document health professionals' attitudes and practices regarding EBF promotion in hospital settings in the urban community of Niamey, Niger.	A sample of 31 frontline health professionals. Sample technic not specified by authors.	The need for training and regular supervision of health professionals regarding EBF.
Ayawine and Ayuurebobe (2015)	A cross-sectional comparative design.	To identify the determinants of EBF in two sub-districts in Ghana.	A sample of 300 mothers.	A need for Community Based Growth Promotion strategy and a recommendation to address mothers' occupational needs.
Davies-Adetugbo (1997)	Mixed-methods study.	To assess local knowledge and attitudes of breastfeeding and the sociocultural factors relating to EBF.	Homogeneous groups of grandmothers, pregnant women, lactating mothers, husbands, and community health workers.	EBF is important for child survival in the local communities where the sanitation is poor and the water supply is unsafe. However, the most serious conflict between local knowledge and the recommendations is the approach. Any intervention promoting EBF needs to consider the cultural factors
Desmond et al. (2008)	Mixed-methods study.	To present a costing and cost effectiveness analysis of a successful intervention to promote EBF in high HIV prevalence area in South Africa.	Multiple.	The simplified scenario, with a combination of clinic and home visits, is the most efficient in terms of cost per increased month of EBF and has the lowest incremental cost effectiveness ratio.
Eregie (1998)	Mixed methods study	To examine factors associated with EBF among African population.	Infants and mothers with early postnatal care at a child welfare clinic.	Birth weight showed significant association with exclusive breastfeeding rate. This may be related to the general belief that smaller infants require supplementary feeding much earlier to speed up their postnatal 'catch-up' growth.
Fjeld et al. (2008)	Qualitative study.	To collect baseline information on current infant and young child feeding practices, attitudes, and knowledge in Mazabuka, Zambia.	Fathers, grandmothers, health staff and traditional birth attendants.	The message that EBF is beneficial had reached the health workers and was taught to mothers. However, conventions and expectations from family members in Zambian community were important barriers in preventing EBF practice. The deep-rooted beliefs that prohibit EBF need to be addressed in projects.
Gewa and Chepkemboi (2016)	Cross-sectional survey.	To determine the relationships among mothers' knowledge, outcome expectancies, normative beliefs, and cessation of exclusive breastfeeding in rural Kenya.	A sample of 400 mothers of children, 0–24 months old.	In addition to knowledge levels, mothers' beliefs play an important role in their decisions to practice EBF. Addressing these beliefs has the potential to contribute to more effective promotion efforts in rural Kenya.
Goosen et al. (2014)	Observational, descriptive study, with qualitative assessment methods.	To describe the factors impeding EBF practices in a low-income area of the Western Cape Province of South Africa.	Ten focus group with a total of 91 caregivers and health care workers	Multifaceted and interlinked barriers to EBF include the influence of convention, community perceptions, beliefs, suboptimal infant feeding education, and the lack of local postnatal breastfeeding support.
Jakobsen et al. (2008)	Randomized Control Trial.	To evaluate the impact of promotion of exclusive breastfeeding on infant health in Guinea-Bissau.	A birth cohort of 1721 infants.	Although mothers were sensitive to follow new breastfeeding recommendations, it had no beneficial impact on infant health in this society with traditional, intensive breastfeeding. There seems to be little reason to discourage local practices if there are no strong data justifying such a change.
Jamal et al. (2017)	Qualitative longitudinal study	To explore enablers or barriers to success among mothers who planned to exclusively breastfeed their infants for the first six months of life, in KwaZulu-Natal, South Africa	Purposive sample of 22 women.	Mothers reported conflicting EBF education from health workers, hence better strategies to improve EBF rates recommended.
Kakute et al. (2005)	Survey	To identify cultural/social barriers to exclusive breastfeeding.	Mothers in a rural geographical region of North West Province of Cameroon.	Pressures to support traditional practice, beliefs about EBF, the need to feed infants with family grown foods, and sexual taboo.
Maonga et al. (2016).	Cross-sectional mixed-methods study	To examining factors affecting EBF practice among women in Muheza district, Tanga region of North Eastern Tanzania.	A sample of 316 women with infants aged 6–12 months.	Low rate of EBF reported, strategies to target beliefs and EBF training for mothers recommended.
Naanyu (2008)	Mixed methods study	To investigate the duration of EBF among young mothers during the first five months after birth.	Thirty women from three Mother and Child Health/Family Planning clinics in Eldoret, Kenya.	Duration of EBF increases with age, where younger mothers (below 20 years) have shorter durations of exclusive breastfeeding compared to older mothers. This may be due to increase in employment of young mothers outside the home and/or a lack of parenting skills.
Nkonki et al. (2014)	Randomized-controlled trial.	To promote EBF in three sites in South Africa.	A cluster sample of women from four sub-Saharan African countries.	The importance of documenting and quantifying factors that affect the feasibility and sustainability of community-based interventions, which are receiving increased focus in low income settings.
Otoo et al. (2009)	Mixed methods study	To elicit the perceived incentives and barriers to exclusive breastfeeding in Ghana.	Thirty-five breastfeeding women from the Manya and Yilo Krobo districts of Eastern Ghana.	Major obstacles to EBF were maternal employment, breast/nipple problems, perceived milk insufficiency, and pressure from family.

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Table 2 (continued)

Study	Design	Aim of the study	Sample	Major Conclusion
Rogers (2015)	Quantitative cross-sectional study.	To explore the infant-feeding practices of mothers and caregivers of infants aged $\leq$ 6 months in four provinces in South Africa.	Sample of 580 mothers and/or caregivers of babies aged $\leq$ 6 months.	Innovative approaches required to increase the rate of EBF in South Africa.

or innovations are experimented for a limited time. Desmond et al. (2008) found that EBF is feasible and practical, as reported in many settings involved in their research, including high HIV prevalence areas. The challenges of attrition and a high turnover of community health workers were found to be the significant factors affecting the continuity and sustainability of many EBF programs. Also, Fjeld et al. (2008) reported a high rate of EBF following delivery of infants. According to the study, almost every child was breastfed immediately after birth, colostrum was rarely discarded, the use of pre-lacteal feed was low, and prolonged breastfeeding was widely practiced. It was also reported that fathers and grandmothers were supportive and encouraged EBF. Maonga et al. (2016) reported a high rate of EBF (76%) in the first month but dropped to 24.1% at 6 months.

### 3.5. Observability

Rogers (2003) described observability as the degree to which the results of an innovation become clearly visible to the potential users of that innovation. Also, Greenhalgh (2005) asserts that innovations that are highly observable are much more readily adopted. Mothers assume that crying is due to lack of satisfaction with breastmilk, and when the baby is supplemented with feeds, the natural physiological feedback (inhibition of breastmilk production as a result of supplemental feed and reduced breastfeeding) often confirms the idea of insufficient milk (Fjeld et al., 2008). Mothers who practice EBF, recorded lower incidences of diarrhoea (Ayawine and Ae-Ngibise, 2015), reduced incidence of mastitis, and a lower risk of postnatal HIV transmission (Desmond et al., 2008).

### 3.6. Rate of adoption

Rate of adoption is the relative speed with which an innovation is adopted by members of a social system. Apart from Kenya where 61% of mothers were reported to be practicing EBF (Gewa & Chepkemboi, 2016), many of the reviewed articles indicate a low rate of adoption of EBF has been slow in many African countries. Some studies did not report the rate of adoption of EBF (Eregie, 1998; Fjeld et al., 2008; Kakute et al., 2005; Naanyu, 2008; Otoo, Lartey, & Pérez-Escamilla, 2009).

In Niger, only 1% of 36 facilities received accreditation for BFHI between 1996 and 2005 and only 13 retained BFHI status by 2007 (Abba et al., 2010). In Ghana, mothers continued the common practice of mix feeding and discarding of colostrum (Ayawine, & Ae-Ngibise 2015). Less than 2% of mothers in Nigeria practice EBF (Davies-Adetugbo, 1997). In South Africa, 31.6% currently practice EBF (Jamal et al., 2017) compared to 2011, when only 6% of infants were exclusively breastfed (Goosen et al., 2014) and in 2012 when 12% practiced EBF (Rogers, 2015). In Tanzania, 24.1% of infants are exclusively breastfed (Maonga et al., 2016). Jakobsen et al. (2008) found that 50% of infants in Guinea Bissau were exclusively breastfed.

## 4. Discussion

The findings of this review are consistent with other studies which identify significant relationship between the characteristics of innovation such as relative advantage, compatibility, complexity and trialability and the adoption (Hatimtai & Hassan, 2020; Lawson-Body, Illia, Willoughby, & Lee, 2014).

Our major findings also confirm Rogers' arguments that the perceived attributes of an innovation determine the decision-making of potential adopters and the diffusion process. We found that very few of the studies explored the attributes of EBF from the perspectives of the potential adopters. Rather, many studies were focused on promotional efforts and the barriers encountered with EBF. The available data on the relative advantages were based on previous research. This finding validates Rogers' argument on the need to explore how potential adopters perceive the attributes of an innovation and "not the attributes as classified objectively by experts or change agents" (Rogers, 2003, p. 227). According to him, the perceived attributes have significant influence on the rate of adoption of an innovation.

Also, the problem of incompatibility was a recurring theme in the studies. A major reason why mothers were not able to practice EBF was because it was not consistent with African cultural values and traditions. Regardless of the level of knowledge of the potential adopters, they have allegiance to several cultural practices that conflict with EBF. For example, indigenous African traditions encourage the use of medicinal herbs and early introduction of local foods to infants, and mothers are obliged to follow these traditions (Madiba & Langa, 2014). Our findings are consistent with Bhattacharjee (2019), that generational infant feeding practices are passed on among African people and mothers are largely influenced by these practices. What has not been considered in research and promotional programs is accommodation of cultural practices in EBF. According to Rogers (2003), "an innovation's incompatibility with cultural values can block its adoption" (p. 241). EBF could have been modified to accommodate safe practices of indigenous feeding rather than totally discouraging them. Another aspect of compatibility identified by Rogers (2003) is the degree to which an innovation is perceived as meeting the needs of the client system. The more an innovation can integrate with the needs of potential adopters, the greater its prospect for adoption. Our review indicated that the potential adopters did not perceive EBF as capable of meeting their needs (Davies-Adetugbo, 1997; Gewa & Chepkemboi, 2016; Jakobsen et al., 2008; Maonga et al., 2016).

Another important incompatibility factor is the sense of community in African cultures. The rate of adoption of innovation tends to be slow in societies where collective goals take precedence (Rogers, 2003). Consistent with findings in Dede and Bras (2020), our review indicates no involvement of grandmothers and husbands, who are the key decision makers about childcare in Africa. While attempting to increase the mothers' knowledge through prenatal education strategies, the change agents need to keep in mind that Africans are a collective goal-oriented people. Targeting the mothers alone is not a sufficient promotional strategy because many mothers are not independent decision-makers. The decisions about childcare is largely influenced by several other members of the extended family such as the grandmothers and the heads of the household. It is important to include this category of adopters whose opinions tend to influence decision-making about EBF adoption. Rogers (2003) also pointed out that the more the number of people involved in making innovation decision the slower the rate of adoption, and diffusion moves faster when fewer people are involved. This also explains why there is a slow diffusion rate of EBF in many African countries.

Breastfeeding is not complex, but there is a lack of flexibility related to EBF. The context in which the mothers are required to practice EBF make it difficult. For instance, Ayawine and Ae-Ngibise (2015) found that breastfeeding is acceptable to the people of Abuakwa and Barekese

in Ghana and those mothers are willing to breastfeed wherever they find themselves. However, because EBF is foreign to African culture, more than prenatal education or 'top-down' policies are required to promote acceptance, particularly among grandmothers and the elders. This group of 'adopters' have significant roles in decision-making.

We identified several factors from the studies that make EBF complex to implement, not in terms of knowledge, but because of deeply held cultural beliefs and traditional practices. Unfortunately, the majority of the health professionals (regarded as the change agents) also believe in these cultural practices. They, therefore, often provide conflicting messages, which are confusing to the mothers (Abba et al., 2010; Jamal et al., 2017). Fjeld et al. (2008) and Jamal et al. (2017) identified extended family pressure and having to make decisions based on contradictory advice i.e. grandmother versus health personnel, lack of autonomy and decision-making power of the mothers as some of the challenges of implementing EBF in Africa.

Also, there is a lack of flexibility feature with EBF that makes its practice unacceptable to many African indigenes. Rogers (2003) explained the concept of re-invention, which is the degree to which an innovation is changed or modified by the adopters in the process of adoption or implementation. An innovation diffuses more rapidly when it can be re-invented, and its adoption is more likely to be sustained. EBF does not allow much freedom for a re-invention or a departure from the core version of 'exclusiveness' promoted by the change agents. Adopting an innovation is not necessarily a passive role of just implementing a stipulated template of the innovative idea, part of what promote the success of an innovation, according to Rogers (2003) is the ability to re-invent it in a wide variety of different ways. Many adopters prefer to be able to customize the new idea to fit their unique situation (Rogers, 2003).

Another factor affecting the adoption of EBF is a lack of observability. Rogers (2003) described preventive innovation as a type of innovation that has a particularly slow rate of adoption because its outcome is not observable. Preventive innovation is a new idea that is aimed at reducing the occurrence of certain undesirable future event (Rogers, 2003). EBF falls in the category of preventive innovations. It is difficult for potential adopters to make a connection between EBF and its acclaimed benefits. Adoption of EBF now may prevent a future occurrence of health problems but some infants may be equally healthy without being exclusively breastfed. The fact that the infant has not fallen sick or died cannot not be directly connected to EBF. The idea that a child is alive and healthy as a result of EBF is not convincing to the indigenes, therefore it is difficult for them to appreciate the benefits.

## 5. Limitations of this study

While great efforts have been made to include all articles that met the inclusion criteria, conditions such as database variation and indexing of journals may have caused an omission of some relevant articles from this review. We have made some inferences in this paper about the influence of culture and traditional beliefs on adoption of EBF in Africa. However, some of our findings may have been influenced by the small number of the reviewed studies, their characteristics, or the inclusion criteria, not necessarily a reflection of the society. There is also the possibility that people in urban or rural areas or those with higher educational status may not necessarily have to choose between healthcare professionals' advice and that of their family. Therefore, this finding may not represent the experience of Africans regarding EBF. Furthermore, there is increasing evidence suggesting that Africans are diverse and are embracing individualistic worldview. This diversity of Africans, their realities and their changing worldviews are not represented in the reviewed studies. Therefore, our findings need to be interpreted with these limitations in mind.

## 6. Conclusion and recommendations

Drawing on DOI theory, this paper contributes to knowledge by providing an insight to the attributes of EBF that impact its adoption in Africa. Adopting a new idea, even when it offers several benefits could be difficult. Many decades of health promotional efforts aimed at persuading mothers to breastfeed their infants was largely unsuccessful in Africa. The attributes of innovation identified in this review are critical predictors for the acceptance and the continued practice of EBF among the Africans. Moreover, we identify a few factors in our findings that indicate that the adoption of EBF among African people require more of socio-cultural processes rather than technical processes.

An important point to keep in mind is the communal nature of African society. The grandmothers and extended family members have significant roles in childcare. They have a powerful influence on innovation decision-making about EBF and the entire diffusion process that cannot be underestimated. We recommend a modification of EBF in ways that accommodate African traditional values system. The views of the grandmothers and family members should be considered when planning EBF programs because these people are the potential adopters of EBF practice. Research needs to be designed to explore how indigenous people perceive EBF. Doing so will help to determine strategies that are acceptable to them in promoting EBF in their communities. The attributes of EBF have a sequential- rather than concurrent- impact, particularly on the adoption decision. Those who perceive no relative advantage of EBF may not consider other attributes and hence, resulting in a lack of motivation to practice EBF. Research is required to explore how people perceive the relative advantage of EBF in their communities.

## Declaration of Competing Interest

We declare that there are no known conflicts of interest associated with this publication and there has been no financial support that could have influenced its outcome.

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