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Exclusive Breastfeeding Practice (EBF), Survival Function and Factors Associated with the Early Cessation of EBF in Developing Countries

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Authors' contributions

This work was carried out in collaboration among all authors. Authors MRK and NR conceptualized the idea, analyzed updated evidence, conducted the study, analyzed the data and prepared the manuscript and drafting. Authors MS and MMI helped in drafting process and comparison. All other authors helped in manuscript preparation, drafting and submission.

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ABSTRACT

Exclusive breastfeeding (EBF) till first six months has been constantly discussed in terms of variable practice across societies. The reasons for this fluctuation remain speculative at this point though. Thus, to investigate the issue further considering its importance, this study was conducted which aimed at providing a comprehensive analysis of the prevalence of exclusive breast-feeding, associated factors of early cessation and their effect on survival function of child in developing countries. The study is a literature review based current evidence found in different journals. The analysis shows the prevalence of EBF has not increased significantly and varies in different developing countries mostly hovering around 50% in best scenario and around 35% in most of the countries according to UNICEF global database of 2019. The factors most frequently associated with the breastfeeding exclusively were maternal employment, education, age, mode of delivery, post-natal care and adequacy of breast milk and the effect of these factors on the survival of baby's has been presented by considering Kaplan-Meier survival estimates found out by different

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studies. The study also discussed the numerous benefits EBF have on child and mother's health and how important it is to consider the existing viewpoints towards EBF so that the practice can be improved further in developing countries. The factors responsible for early cessation of EBF re-iterated by many studies, yet the lifesaving practice is not in satisfactory level due to largely maternal health and socioeconomic determinants. Hence, proper concerted actions required for the improvement of EBF practice in many developing countries.

Keywords: Exclusive breastfeeding; associated factors; survival analysis; developing countries.

1. INTRODUCTION

Breastfeeding is one of the vital areas of public health because it has a direct influence on the wider population's overall quality of health and mortality levels [1]. As well as being the key source of enough nutrition for breastfed infants, it offers well-known short-term benefits in lowering the risk of mortality and infectious diseases [2]. Prior studies have also confirmed the long-term protection breastfeeding offers against non-communicable diseases [3]. For these reasons, and on the basis of strong, long-established evidence, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have both recommended that new mothers initiate breastfeeding within 1 hour of giving birth, then exclusively breastfeed their infants for the first 6 months of life, and continue breastfeeding up to the age of 2 years and beyond [4,5]. Breastfeeding is a natural food that serves as a complete source of infant nutrition for the first six months of life. It contains all the necessary nutrients provided in a bio available and easily digestible form, protecting both mothers and children against illnesses and diseases with immunological properties [6]. Breast milk contains essential fatty acids needed for the infant's growing brain, eyes, and blood vessels and these are not available in other types of milk. Breastfeeding on demand at day and night at least 8 times in 24 hours will provide more milk as suckling stimulates milk production [7].

Early initiation of breastfeeding should be promoted and prelacteal feeds should be discouraged. Because of its high levels of vitamin A, antibodies, and other protective factors, the colostrum is often considered the baby's first immunization [7]. Simple, valid and reliable indicators are essential to track the progress and guide investment to improve nutrition and health during the first two years of life. Of the indicators, exclusive breastfeeding ranks first, being estimated to have the potential to prevent 13% of all deaths. Indeed, of the 6.9 million under-five children that were reported to be dead globally in 2011, an estimated 1 million lives could have been saved by simple and accessible practices such as EBF [8].

Previous studies have reported several predictors of the cessation of EBF. Differences are evident not just between countries but also within the same country. Several factors have been shown to be associated with EBF: variations between urban and rural areas, infant's age, mothers' employment status and education level, knowledge about good breastfeeding practices, occupation, monthly household income, mothers' smoking status, socio-economic position, prelacteal feeding, parity, positive attitudes towards EBF, intent to exclusively breastfeed before delivery, timely initiation of breastfeeding, mode of delivery, infant's birth weight, health system practices, discarding colostrum and community beliefs [9, 10]. However, considering the importance of EBF on baby's and mother's health in short and long term this paper attempted to analyze the effect of various factors on the survival function of the child by considering Kaplan-Meier survival estimates found out by different studies. In addition, attention has been given to discuss on how the practice of EBF can be improved further in developing countries.

2. METHODS

For reviewing, searches are done for getting journal articles into pub med/medline, google scholar, database of open access journals and science direct for relevant data and information.

2.1 Prevalence of EBF in Developing Countries

Exclusive breastfeeding (EBF) practice during the first six months of infant's life is most effective for providing balanced nutrition and for the prevention of child mortality and morbidity. Although EBF is vital to promote infants' growth, development and health, however, globally only 50% of infants under 1 month of age and 30% of infants aged between 1 to 5 months are

exclusively breastfed [11]. According to WHO's report on early initiation and exclusive breastfeeding (2011), an overall prevalence of EBF was 36% globally, whereas the lowest rates of EBF were reported in West/Central Africa (20%) and the highest rates of EBF were found in East Asia/Pacific (43%) [12]. Current analyses on global incidence across 140 countries reported an increase in breastfeeding practice in the developing world from 33% in 1995 to 39% in 2010 among infants aged 0–5 months and also an improvement from 35% in 1995 to 47% in 2010 along with countries in Eastern and Southern Africa [13].

The rate of EBF practice in Bangladesh one of the south Asian country was 65% according to the BDHS report 2019 (Bangladesh Demographic and Health Survey 2017-18) [14]. The prevalence of EBF in developing countries according to several studies were higher that reported in some other countries such as Egypt (9.7%) [15], India (Tamil Nadu, 34%) [16], Saudi Arabia (Al-Hassa, 24.4%) [17] and the USA (16.8%) [18]. However, the prevalence of EBF was found higher in some other parts of the world such as Malaysia (Peninsular, 43.1%) [19], Arbaminch Southern Ethiopia (46.5%) [20], Bahir Dar city of Northwest Ethiopia (50.3%) [21], Debre Markos of Northwest Ethiopia (60.8%) [22], Western India (61.5%) [23] and the Goba district of South East Ethiopia (71.3%) [10].

3. FACTORS AFFECTING DURATION OF EXCLUSIVE BREASTFEEDING

3.1 Parental Education and Maternal Employment

There are various contributing factors that may relate to the duration of exclusive breastfeeding. Parental education and maternal employment were one of the major determinants. A study conducted in Sri Lanka showed the Kaplan-Meier survival estimates for the duration of exclusive breastfeeding and the Comparison of survival curves indicated that parental education and maternal employment were significantly associated with the duration of exclusive breastfeeding as bellows: [25].

The exclusive breastfeeding survival curves of both mothers (Fig. 2) and fathers (not shown) with higher level of education were constantly higher than those of parents with lower level of education. Comparison of survival curves using the log rank test indicated highly significant differences, for both mothers ($p < 0.001$, chi square = 16.217) and fathers ($p < 0.001$, chi square = 17.084). The exclusive breastfeeding survival curve of "employed" mothers was constantly higher than that of non-employed mothers (Fig. 3). Around 70% of "employed" mothers continued exclusive breastfeeding until completion of fifth month, whereas only 60% of "non employed" mothers continued exclusive breastfeeding up to four months. Several literatures also described maternal education and women's employment were two major determinants as being associated with exclusive breastfeeding.

3.2 Postnatal Care, Mode of Delivery and Adequacy of Breast Milk

There are another contributing factors that may relate to the duration of exclusive breastfeeding. Postnatal care, mode of delivery and adequacy of mother's breast milk were the other major determinants. A study conducted in South Ethiopia showed the cumulative survival probability of exclusive breastfeeding to six months as bellows: [26].

The cumulative survival probability of exclusive breastfeeding to six months was significantly higher for women who had postnatal care (PNC) as compared to women who had no PNC visit (log rank test, $p < 0.001$) (Fig. 4).

Fig. 5 described a child's cumulative survival probability of exclusive breastfeeding significantly different between women who had a spontaneous vaginal birth, and women who gave birth by cesarean section (*log rank test, $p < 0.05$)*. Women who gave birth spontaneously were more likely to sustain exclusive breastfeeding up to six months as compared to women who gave birth through cesarean section and women's perceived inadequacy of breast milk significantly influences duration of exclusive breastfeeding. Fig. 6 also showed the survival curve of women who perceived that their breast milk was inadequate were constantly below the survival curve of the other group *(log rank test, $p < 0.05$*). Some other literatures explored the possible association between the postnatal care, mode of delivery and exclusive breastfeeding, and most of them found a statistically significant link between caesarean births and lower exclusive breastfeeding rates at 6 months of age. For instance, a recent study in Saudi Arabia reported an inverse association between caesarean section delivery and exclusive breastfeeding [27].

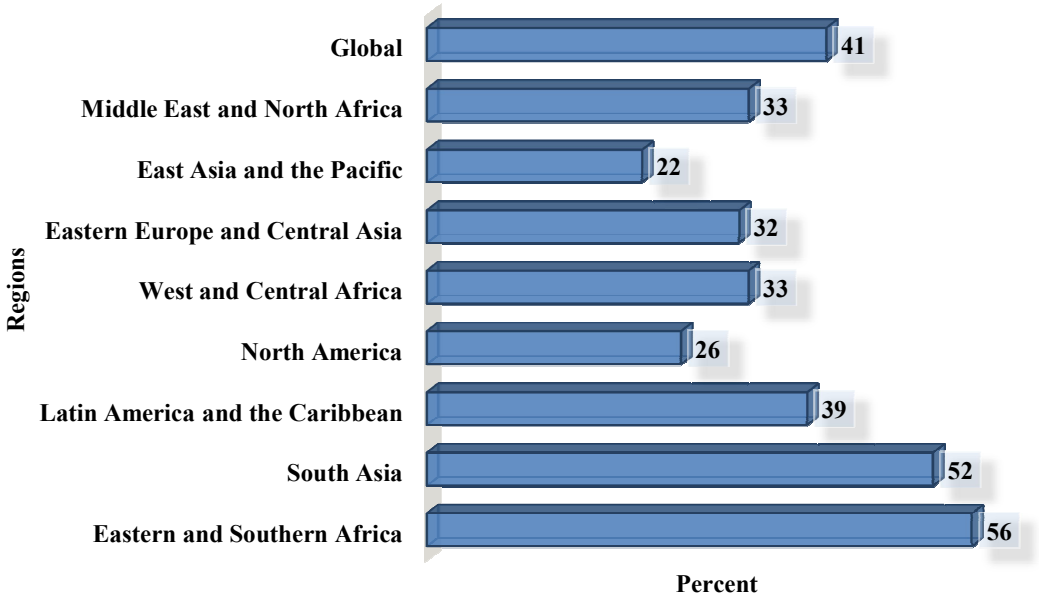

Fig. 1. EBF practice in various regions in the world

(Data Source, UNICEF global databases, 2018, based on MICS, DHS and other nationally representative sources, 2013-2018) [24]

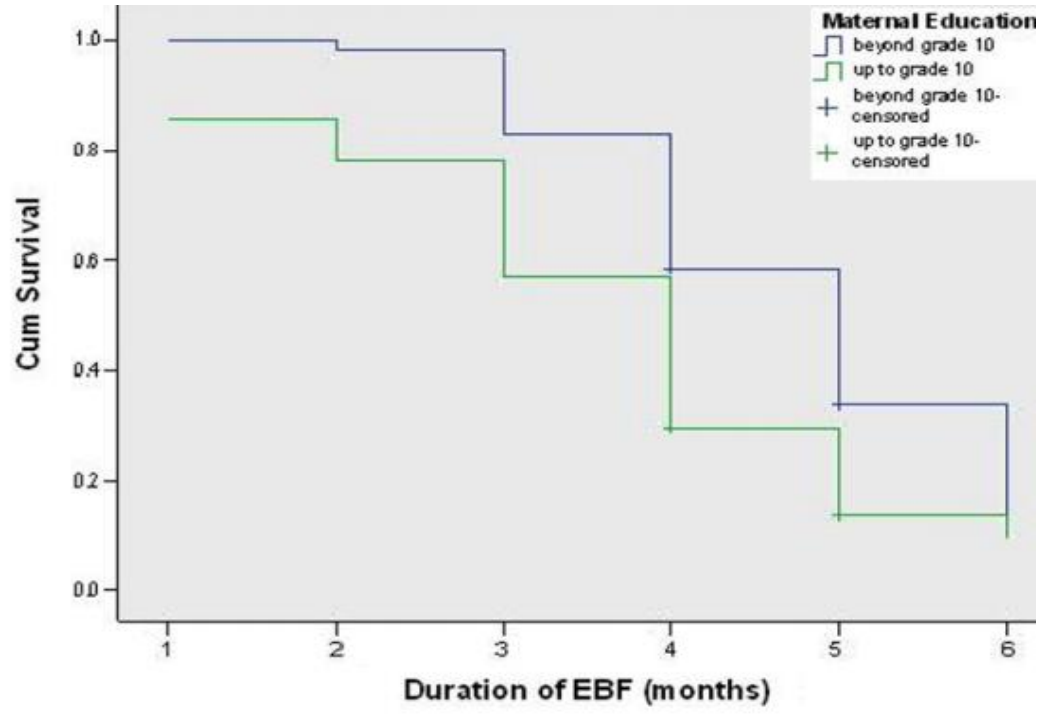

Fig. 2. Comparison of maternal educational level regarding survival data on exclusive breastfeeding

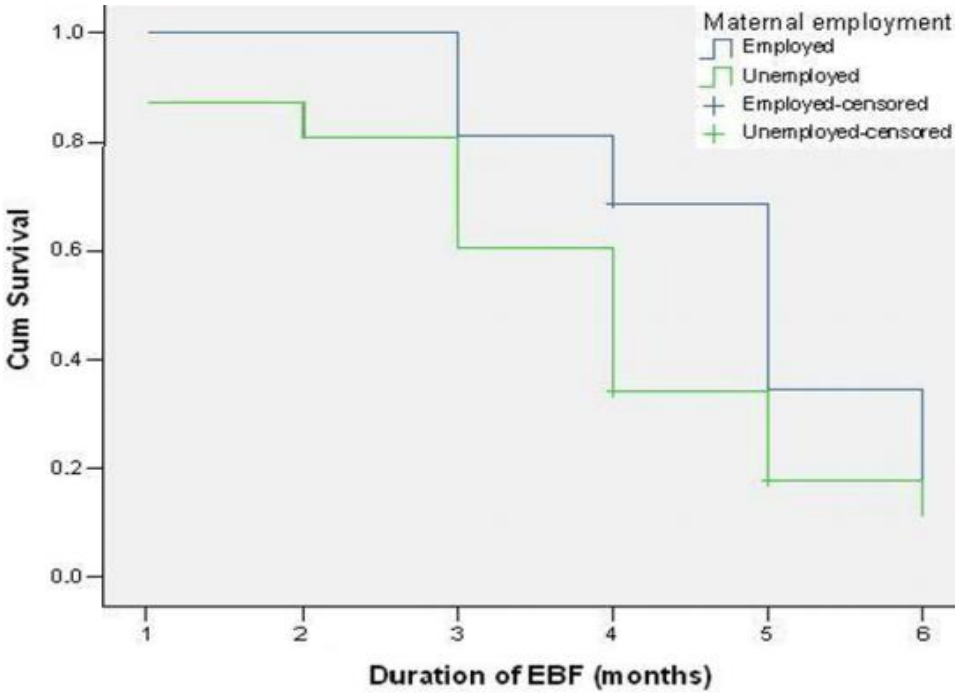

Fig. 3. Comparison of maternal employment status regarding survival data of exclusive breastfeeding

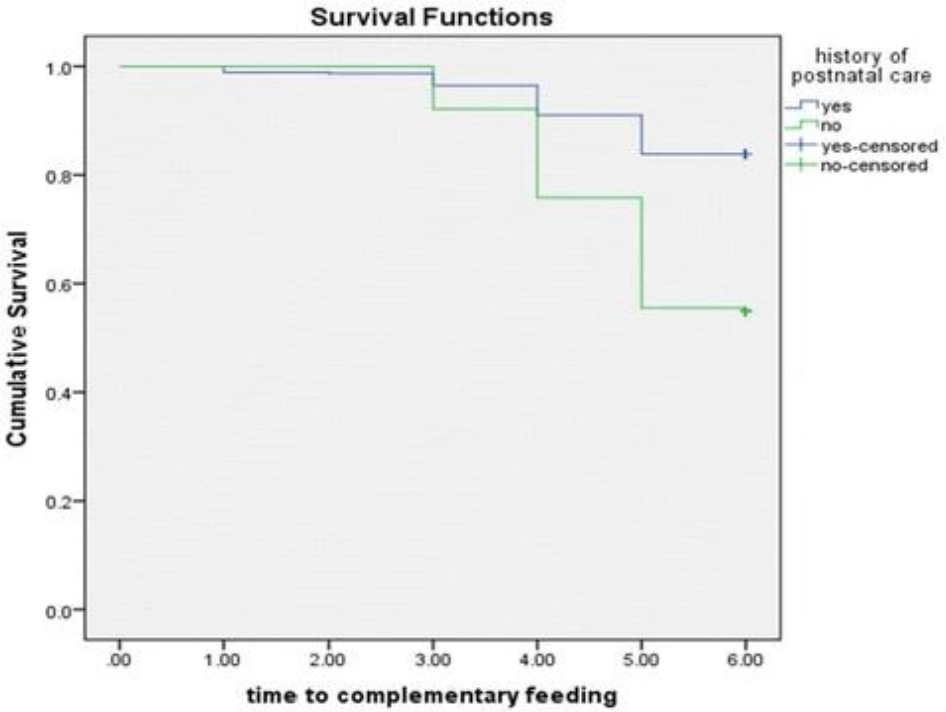

Fig. 4. Cumulative Survival probability of exclusive breastfeeding practice for women who had and had not postnatal care, South Ethiopia, 2016

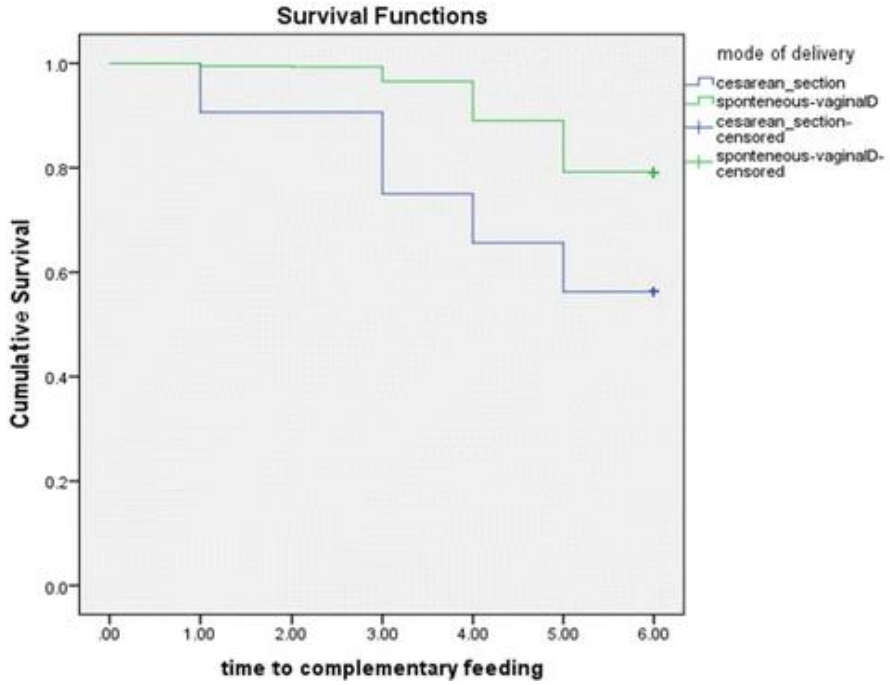

Fig. 5. Cumulative Survival probability of exclusive breastfeeding practice for women who gave birth spontaneously and through cesarean section, South Ethiopia, 2016

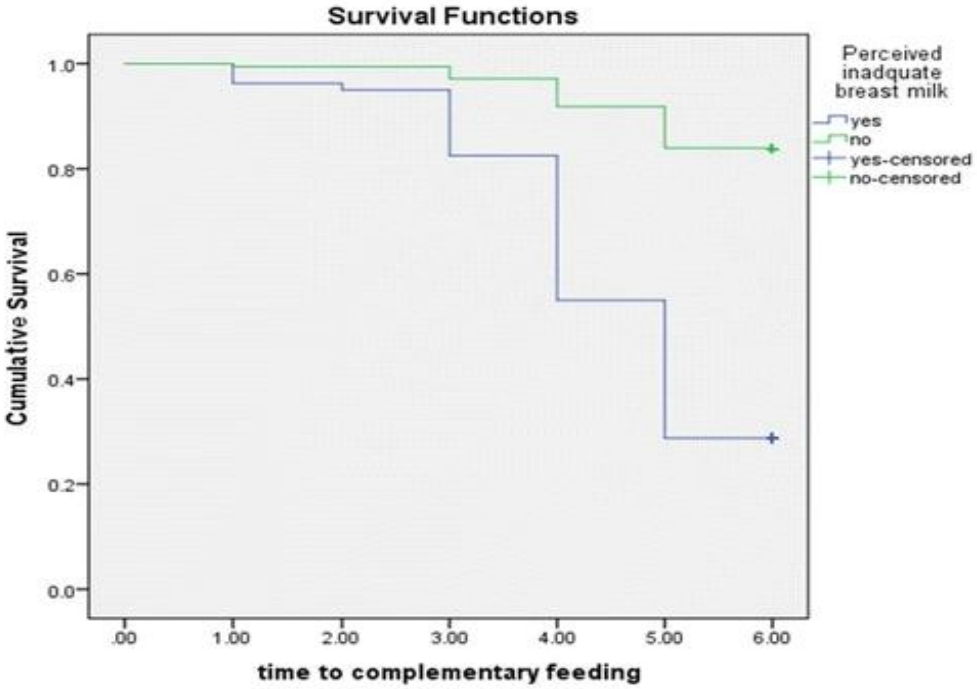

Fig. 6. Cumulative Survival probability of exclusive breastfeeding practice in relation to women's perception on adequacy of their breast milk, South Ethiopia, 2016

3.3 Other Factors

Associations were found by different studies between exclusive breastfeeding and the following factors: number of children, place of residence, night feeding, breastfeeding initiation and maternal knowledge of exclusive breastfeeding [27-29]. Furthermore, other more studies associated the following factors with exclusive breastfeeding practice: total family income, maternal birthplace, paternal education level, maternal nationality, planned feeding method, birth weight, advertisements for breast milk substitutes or teats, prelacteal feeding and advice from relatives [30-32]. A few of the studies also explored the possible associations between other factors and exclusive breastfeeding, such as instances of maternal illness, mothers cohabiting with partners, contraceptive usage, gestational age, and pacifier use, but no significant associations were found with any of these factors.

4. HOW DOES IT HELP TO INFANTS?

4.1 Diarrhea

Compared with infants who were not breastfed, those who were exclusively breastfed had a large and statistically significant reduction in risk for hospitalization for diarrhea. The PAFs (population-attributable fraction) suggest that 53% of diarrhea hospitalizations could have been prevented each month by exclusive breastfeeding and 31% by partial breastfeeding [33]. Exclusive breast feeding in early infancy reduces the risk of severe illness from diarrhea [34]. 1.73 (95% CI: 0.52, 5.75) times more diarrhea-specific clinic visits during the subsequent 43–91-d interval than did infants who were exclusively breastfed during the first 42 d of life [35].

4.2 Respiratory Infection

The prevalence of acute respiratory infection was also significantly associated with lack of exclusive breastfeeding [36]. Compared with infants who were not breastfed, those who were exclusively breastfed had a large and statistically significant reduction in risk for hospitalization for diarrhea (adjusted OR: 0.37; 95% CI: 0.18–0.78) and LRTI (adjusted OR: 0.66; 95% CI: 0.47–0.92) [33].

4.3 Obesity

Childhood obesity has become a major public health problem in many developed and developing countries [37]. Regarding obesity, breast feeding is a protective factor. This effect is stronger if the children were exclusively breast-fed [38]. Besides multiple hierarchical analysis of the exclusive breastfeeding model shows that exclusive breastfeeding was a protective factor against overweight and obesity [39]. A study documented a significantly lower rate of exclusive breastfeeding during the first 4 months in overweight children than in normal-weight children [37]. In Greek a study conducted on preschool children 1–5 years old, and find that the children that were exclusively breastfed were 0.49 and 0.54 times less likely for being overweight at 6 and 12 months of age, respectively, than children that were exclusively formula fed [40]. In Canada a cross-sectional analysis showed that exclusive breastfeeding to 3 months was protective of preschool obesity [41].

4.4 Blood Pressure

Children who had ever been exclusively breast fed had lower systolic blood pressures than those who had never been exclusively breast fed [42]. After adjusting for body mass index, sex and maternal blood pressure, the mean systolic blood pressure was 94.2 mmHg (95% CI 93.5–94.9 mmHg) in children exclusively formula-fed, 90.9 mmHg (90.2–91.6 mmHg) in those partially breast-fed and 90.3 mmHg (89.5– 91.1 mmHg) in those exclusively breast-fed for at least 15 weeks [43].

4.5 Diabetes

Type 2 diabetes was 59% less common in exclusively breastfed people compared with those who were exclusively bottle-fed [44]. A study suggests that there has an association between short-term (2 months) exclusive breastfeeding and positivity for 1A-2A or the combination of all four diabetes-associated autoantibodies suggests that long-term (4 months) exclusive breastfeeding protects genetically susceptible children from progressive beta-cell autoimmunity during the first years of life [45].

4.6 Cognitive Development of Child

The general consensus of many reports is that intelligence quotient (IQ) is increased in infants who are breastfed for longer than 6 months by 3 to 5 points [46]. The relationship appears to be dose-dependent. However, it also needs to be acknowledged that there are many confounding

social factors in the determination of cognitive development. A prospective birth cohort study with a 3-decade follow-up from Brazil (n = 5914 neonates with 3493 followed up) found an important relationship between breastfeeding for 12 months or more and cognitive development [47]:

- Higher IQ scores, a difference of 3.76 points (95% CI = 2.2-5.33)
- Four more years of education, 0.91 years (95% CI = 0.42-1.40)
- Higher monthly income of 341 Brazilian reals (95% CI = 93.8-588.3)

A cohort study from Singapore confirms the benefits of breastfeeding on improved cognitive development in Asian infants. Breastfeeding has not been shown to be associated with the prevention of autism [48].

5. HOW DOES IT HELP TO MOTHERS?

Both short- and long-term health benefits accrue to mothers who breastfeed. Such mothers have decreased postpartum blood loss and more rapid involution of the uterus. Continued breastfeeding leads to increased child spacing secondary to lactational amenorrhea. Prospective cohort studies have noted an increase in postpartum depression in mothers who do not breastfeed or who wean early [49]. A large prospective study on child abuse and neglect perpetuated by mothers found, after correcting for potential confounders, that the rate of abuse/ neglect was significantly increased for mothers who did not breastfeed as opposed to those who did (OR: 2.6; 95% CI: 1.7–3.9) [50]. Studies of the overall effect of breastfeeding on the return of the mothers to their pre-pregnancy weight are inconclusive, given the large numbers of confounding factors on weight loss (diet, activity, baseline Body Mass Index (BMI), ethnicity) [3]. In a covariate-adjusted study of more than 14000 women postpartum, mothers who exclusively breastfed for longer than 6 months weighed 1.38 kg less than those who did not breastfeed [51]. In mothers without a history of gestational diabetes, breastfeeding duration was associated with a decreased risk of type 2 diabetes mellitus; for each year of breastfeeding, there was a decreased risk of 4% to 12% [52]. The longitudinal Nurses' Health Study noted an inverse relationship between the cumulative lifetime duration of breastfeeding and the development of rheumatoid arthritis. If cumulative duration of breastfeeding exceeded 12 months, the relative risk of rheumatoid arthritis was 0.8 (95% CI: 0.8–1.0) and if the cumulative duration of breastfeeding was longer than 24 months, the relative risk of rheumatoid arthritis was 0.5 (95% CI: 0.3–0.8) [53]. An association between cumulative lactation experience and the incidence of adult cardiovascular disease was reported by the Women's Health Initiative in a longitudinal study of more than 139000 postmenopausal women [54]. Women with a cumulative lactation history of 12 to 23 months had a significant reduction in hypertension (OR: 0.89; 95% CI: 0.84–0.93), hyperlipidemia (OR: 0.81; 95% CI: 0.76– 0.87), cardiovascular disease (OR: 0.90; 95% CI: 0.85–0.96), and diabetes (OR: 0.74; 95% CI: 0.65–0.84). Cumulative duration of breastfeeding of longer than 12 months is associated with a 28% decrease in breast cancer (OR: 0.72; 95% CI: 0.65–0.8) and ovarian cancer (OR: 0.72; 95% CI: 0.54–0.97) [8].

5.1 What more can be done to Improve EBF Practice

Globally the variations persisting in EBF rate in different regions might be due to cultural, economic and socio-demographic differences across areas. Besides, all the countries probably are not look forward to enhancing the EBF rate with the same intensity which may also contribute to the discrepancy. The other possible reasons for the variation in EBF practice found in different studies may be the different methods used for measuring EBF [55]. This study revealed a number of factors such as mothers' education and occupation, fathers' education, mass media access, mode of delivery, antenatal care (ANC) and postnatal care (PNC) for mothers and breastfeeding counseling were independently and significantly associated with EBF practice. some study infers that, illiterate mothers were more likely to provide EBF to their infants and the practice rate of EBF was significantly reduced with the increase in mothers' educational status [19]. This could be explained as the fact that educated mothers have better job opportunities and they are likely to join services. Therefore, educated and employed mothers may not have or may not be able to manage enough time during working hours to breastfeed their infants [22]. Additional factors such as weaning as a part of preparation to get back to work, maternal fatigue and the pressure of fulfilling the demands of work may also contribute to this issue [56]. Interventions that need to be considered to improve EBF practice

include increasing media coverage regarding the awareness programs of breastfeeding, establishing breastfeeding-friendly working environment for working mothers and work-site day care centers for infants, establishing maternal health clinics and health extension programs throughout the country so that more number of pregnant women and mothers can receive appropriate health services, strengthening infant feeding counseling both at the community and institutional levels, discouraging home delivery, extending maternity leave up to the first six months after delivery and introducing paternity leave at least for first one or two months of infants' delivery. Initiatives should be taken for the proper execution of the recommended interventions which would be able to significantly increase the EBF practice among mothers [55].

6. CONCLUSION

Breastfeeding practice is shaped by various sociocultural and physiological factors which can impact, either alone or in combination, on a mother's choice and ability to successfully initiate and maintain exclusive breastfeeding of her infant. The present review has found that the factors most frequently associated with breastfeeding exclusively for the first 6 months of an infant's life were maternal employment, maternal education, maternal age, and mode of delivery. The present research therefore recommends that health care providers understand these determinants of breastfeeding so that they can provide detailed practical guidance to help mothers to overcome barriers where possible and, in doing so, assist in improving maternal and infant health outcomes. Future research should examine the possible causations between key influencing factors and breastfeeding patterns and practices in the south Asian region by deploying more appropriate research designs, such as cohort studies, which are able to analyze follow-up data, and can therefore produce more accurate and insightful results.

HIGHLIGHTS

- Exclusive breastfeeding practice in developing countries hovering around 50% in best scenario and 35% in rest of the cases according to UNICEF global database of 2019.
- Exclusively breastfed had a large and statistically significant reduction in risk for hospitalization for diarrhea, respiratory diseases and childhood obesity.
- EBF decreases postpartum blood loss and more rapid involution of the uterus of the mother's; the rate of abuse/ neglect increases for mothers who did not breastfeed as opposed to those who did.
- Survival curves of different studies reveals the factors most frequently associated with the breastfeeding exclusively were maternal employment, education, age, mode of delivery, post-natal care and adequacy of breast milk.
- Awareness programs, counselling, improving sociocultural context, positive working environment, improving healthcare facilities might be beneficial.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Ethical approval was obtained from the Ethical Committee, Noakhali Science & Technology University, Bangladesh as per the rule of conduct.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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