Original Research Article

ASSESSMENT OF THENUTRITIONAL KNOWLEDGE AND PRACTICEOF LACTATING MOTHERS ON EXCLUSIVE BREASTFEEDING IN THE ST CHARLESCOMMUNITY, NORTHERN REGION, GHANA

ABSTRACT

Background: The prevalence of exclusive breastfeeding for the first six months of life has remained low worldwide and in Ghana, despite strong evidence in support of its practice. The practice of exclusive breastfeeding is influenced by maternal knowledge and attitudes as well as socio-demographic and cultural factors.

Purpose: This study was aimed at assessing the knowledge and practice of exclusive breastfeeding among mothers in the Tamale metropolis of Ghana.

Methods: This cross-sectional study was conducted among 200 community lactating mothers with infants aged 0–24 months in the St Charles community in Tamale metropolis of Ghana. All data was collected using a questionnaire that contained both closed and open-ended questions. The simple random sampling was used to recruit respondents into the study.

Findings: Despite the generally high knowledge of exclusive breast feeding, the mothers did not exclusively breast feed their babies. These mothers did not practice exclusive breast feeding because they misunderstood certain signs of the child to mean wanting to eat food or drink water, regarding breastmilk to be inadequate to meet the nutritional needs of the child and misunderstood healthcare professionals' exclusive breast-feeding advice.

Recommendations: Beyond dissemination of health messages, healthcare professionals should pay more counselling attention to less educated mothers, and also children's caregivers.

Key Words:*Exclusive breastfeeding, Infants, Lactating mothers, Rural, Ghana*.

BACKGROUND

The promotion of exclusive breastfeeding (EBF) for the first 6 months of a newborn's life is one of the most effective strategies for lowering infant morbidity and mortality in resource limited situations (Mogre et al., 2016). There has been a growing interest in exclusive breastfeeding as the best feeding strategy for newborns all around the world in the previous decade (Afaya et al., 2017). Breastfeeding is essential for the life, nutrition, and development of a newborn (World Health Organisation [WHO], 2015). Breastfeeding, especially when started early and exclusively, aids in child survival (Serajul et al., 2017), accounts for healthy brain development, boosts cognitive and sensory function, and has been linked to improved intelligence and academic performance in children (Serajul et al., 2017). (Isaacs et al. 2010, AAP 2012, UNICEF 2015). Breast milk contains all of the nutrients an infant requires to grow healthy and strong. Infants who are exclusively breastfed have fewer infections and are less likely to acquire serious illnesses, while women who practice EBF benefit from extended lactation amenorrhea (Nukpezah, Nuvor, & Ninnoni, 2018). The global percentage of exclusive breastfeeding is 38 percent; however, the World Health Assembly in 2012 established a goal of increasing the rate to at least 50 percent by 2025. In Ghana, 52.3 percent of children under the age of six months are exclusively breastfed (Boateng, 2018).

Due to inadequate sanitary conditions, a high illness load, and a lack of safe drinking water in low-income and developing nations, it is particularly important to practice exclusive breastfeeding in the early stages of life (the first six months of a child's life). Exclusive breastfeeding is the safest, healthiest, and most cost-effective method of feeding a newborn (UNICEF, 2013). Several studies on breastfeeding have found that optimal nursing technique can save around 800,000 infant lives in the poor countries alone (UNICEF 2015, WHO 2016).

Despite these suggestions, it has been proven over time that exclusive breastfeeding is not uniformly practiced; most moms love the concept but fail to nurse exclusively only a few weeks after giving birth to their infant. Many factors, including cultural, societal, and economic factors, have been recognized as potential barriers to effective exclusive breastfeeding (Tampah-Naah & Kumi-Kyereme 2013, Fosu-Brefo & Arthur 2015). According to the Ghana Demographic and Health Survey (GDHS), around 98 percent of Ghanaian children are breastfed at some time in their lives. The average duration of EBF is four months, and by the age of six to nine months, 73% of breastfed children are given complementary meals (Ghana Statistical Service (GSS), Ghana Health Service (GHS), and ICF International., 2015). Despite the health benefits of EBF and worldwide efforts to promote it, the number of children who are exclusively breastfed in Ghana has declined by 17% between 2008 and 2014 (Ghana Statistical Service (GSS), Ghana Health Service (GHS), and ICF International, 2015).

Breast and ovarian cancer risk is reduced in mothers who adhere to EBF guidelines (WHO, 2009). According to the World Health Organization (2016), the beneficial impact of EBF is not confined to the lactation period and can last for years after nursing is stopped. In areas of poverty, low nutrition, and poor cleanliness, where disease rates are higher, the benefits of EBF are greater. This is because giving alternative meals to newborns before they are six months old is typically linked to contamination during the preparation and administration procedure. These mistakes can lead to diarrheal infections such as cholera and dysentery, which can result in childhood mortality (WHO, 2009).

According to the World Health Organization (2009), with EBF coverage of 90%, nearly 13% of deaths of children under the age of five years in low and middle-income countries may be avoided.This conclusion is in accordance with previous researchers who believe that starting breastfeeding within the first hour of birth can save roughly 20% of neonatal fatalities in low-

and middle-income countries (Neovita, 2016).Furthermore, proper breastfeeding has the potential to avert 12% of all fatalities in children under the age of five (Black et al., 2012).

When compared to those who are not breastfed, children who are exclusively breastfed are less sensitive to childhood ailments and are 14 times more likely to suffer from illness (Black et al., 2012).In low- and middle-income nations with low EBF prevalence, childhood mortality is high.In Ghana, for example, infant mortality is 53 per 1,000 live births, whereas mortality among children under the age of five is 31 per 1000 live births, and these death rates are largely attributed to mothers' insufficient EBF practices (Tawiah-Agyemang et al., 2008).Other studies in Ghana found that if all infants started nursing during the first hour after birth, neonatal fatalities may be avoided (GSS, 2011).Infant and young child feeding (IYCF) program, convention on the rights of the child, and baby friendly hospital initiative are some of the initiatives and policies implemented in Ghana to support EBF practice (Jones et al., 2003).Despite the implementation of these rules, Ghana's EBF rate remains below the WHO's target of 90%.

According to a report from Ghana's multiple indicator cluster surveys, EBF in Ghana fell from 63.7 percent in 2008 to 46 percent in 2011. (GSS, 2011).EBF was 63.3 percent in Tamale, to be precise.In practice, the global rate of EBF is modest (39%) with 36 percent happening in low-income nations (WHO, 2009).Several barriers to proper nutrition and baby feeding behaviors have been discovered.The views surrounding infant feeding practices, as well as a lack of information and assistance on proper feeding practices, particularly EBF for the first six months of life, are significant among them (Tawiah-Agyemang et al., 2008).

However, based on the literature reviewed at the beginning of this study, there appears to be limited evidence on the related factors associated with EBF knowledge and practice in the Tamale metropolis, and no study has covered the vast majority of EBF among lactating mothers in the Tamale metropolis's St Charles community.As a result, the goal of this study was to analyze lactating mothers' knowledge and practice of EBF in the St Charlese community in Ghana's northern region.

METHODS

Study Design: The study design was a descriptive cross-sectional design and employed quantitative methods to gather information.

Study Population: All mothers residing in the St Charles community will constitute the target population for this study. The total population of women in the community is estimated at 1125.

Setting: The study will be conducted at the St Charles community located in the Tamale Metropolis. Tamale is the Northern Regional Capital and one of the six metropolitans in Ghana and the only metropolitan in the Northern Part of the country. Tamale is a cosmopolitan city and is among the fastest growing cities in West Africa and thus made the city the ideal place for the study.The Tamale Metropolis has a total population of 371, 351 (Ghana Statistical Service, 2014) and is inhabited by people from both urban and rural backgrounds. The community is an urban community inhabited by natives (Dagombas) and people from other tribes.

Inclusion Criteria: Women of child bearing age who were currently breastfeeding at the time of the study or who had stopped breastfeeding not later than 1 year.

Exclusion Criteria: Mothers who have never breastfed or are temporary visitors to the town, mothers of infants having any serious illness including congenital deformities, mothers who are having psychological illness, mothers who had certain disease conditions with contraindications to breastfeeding e.g.,AIDS, Breast cancer.

Sampling: The simple random sampling was used to recruit respondents based on the inclusion and exclusion criteria.

Sample Size Determination: The total population of women in the St Charlese community is estimated at 1125. The sample size for the survey was computed according to the formula for sample size determination by Yamane (1967).

$$n = \frac{N}{1 + Ne^2}$$

Where ***n***is required sample size.

Nis the total population size which is 1125.

eis acceptable sampling error (0.05) at 95% Confidence Interval

By substitution:

$n = \frac{1125}{1+1125(0.05)^2} n = 295$

Hence, the sample size for the study = **295** respondents.

Using an estimated population of 1125 women, a sample size of 295 respondents will be needed for this study. In order to reduce inaccurate results and make up for non-responsiveness, the sample size will be rounded off to 324 respondents. Therefore, a total of 324women were invited into the study.

Data collection instrument: A questionnaire consisting of both closed and open-ended questions was used to collect all data on socio-demographic factors (maternal age, infant's age, parity, as well as maternal educational level, and marital, occupational and religious status), knowledge on exclusive breastfeeding (EBF), attitude towards EBF, and practice of EBF. The open-ended questions were included to gain understanding of why mothers gave a specific answer. Items for the knowledge, attitude and practice of EBF scales of the questionnaire were adapted from the Food and Agriculture Organization of the United

Nations (FAO) guidelines for assessing nutrition-related knowledge, attitudes and practices (KAP) manual. This manual contains guidelines that serve as a reference guide and practical tools for undertaking high quality evaluation of nutrition and health related knowledge and practices at the community level. This manual has 13 module questionnaires capturing data on important knowledge, attitudes and practices related to 13 most common nutrition issues such as feeding infants (0–6 months), feeding young children (6–23 months), diet of school-aged children and among others. Based on the aims and objectives of this study, the questionnaire pertaining to feeding infants younger than 6 months was adapted for this study. The FAO questionnaire has been field tested in several countries to ensure validity, readability, ease of administration and is less burdensome on respondents.

The knowledge scale of the questionnaire consisted of 13 questions on assessment of mothers' understanding and intellectual capacity to recall the benefits of EBF, duration of EBF, and how to improve breastmilk supply. Each correct response was accorded a point and no point for each wrong response. A knowledge score was generated for each mother based on the number of correctly answered questions.The practice scale consisted of six items that assessed mothers' practice of EBF relating to the following: recall of EBF in the last 24hrs, mode of breastfeeding, who gave and what kind of food was given to the baby in the mothers' absence, introduction of liquids (i.e. plain water, infant formula, tinned milk, powdered or fresh animal milk, juice/juice drinks, clear broth, yogurt, porridge, herbal teas, solid/marshy foods). The mothers' answers to these questions were used to determine the practice of EBF. The form and nature of these items were provided by the United Nations Children's Fund (UNICEF) Multiple Indicator Cluster Surveys and the Demographic and Health Surveys.

Data collection procedure: After permissionwas obtained, the principal investigators visited the community for the purposes of data collection. During the process of data collection, the aims and objectives and procedures of the study were explained and informed consent was obtained from respondents. All patients who volunteer to be involved in the study were screened for their eligibility. Consent forms weresigned after both formal and verbal explanations were provided, subsequently, questionnaires were handed over to respondents. The questionnaires were self-administered to respondents who could read and write in English. Those who could not read nor write in English wereassisted to answer the questions. The principal investigators translatedthe questions into their respective local dialects. They informed that participation was voluntary and they were free to withdraw from the data collection process at any time without any consequence to them. Completing the questionnaire on average took about 10-15 minutes.

Data Management: In accordance with the FAO guidelines (2016), practice of EBF preceded the knowledge and attitude test. For purposesof content validity and appropriateness for the local context, items of the questionnaire were reviewed by a team of nutrition experts. This resulted in the addition of local foods commonly given to infants in the study setting. The questionnaire was pretested on a sample of 10 mothers with infants aged 0–24 months for purposes of comprehension, readability and easiness of administration.

Data Processing and Analysis: Data analysis was carried out with the aid of Statistical Package for the Social Sciences (SPSS)version 25 for Windows and one-way analysis of variance,reported using tables and prose. The process for the data analysis includes data coding, sorting, editing and checking for biases by doing a thorough counting of the study questionitems and frequency of occurrences.Both qualitative and quantitativedata was collected and analysed accordingly. Responses for all the open-ended questions wereread and re-read by all the authors. Common themes were identified through discussions and reflections. All quantitative data wereanalysed using descriptive statistics of mean for continuous variables and frequencies and percentages for categorical variables. Cross

tabulation and chi-square tests were used to determine univariate associations.To determine factors associated with the practice of EBF, a multivariate logistic regression was executed. Only variables that were significantly associatedto the practice of exclusive breastfeeding in the univariate analysis were included into the logistic regressionmodel. Results were presented as odds ratios and their respective confidence intervals at 95%. In all analysis a P-valueof <0.05 was considered statistically significant.

Ethical Consideration: Permission was sought from the community leaders. Written and verbal consent were sought from respondents. Respondents were informed that participation was voluntary and they could withdraw from the study anytime without consequences to them. The confidentiality of each respondent was assured.Respondents were also assured that where signatures appeared on the consent forms would be separated from the questionnaire and will be kept under lock and key and after two years of the study, the data will be discarded and no records of the data both electronically or hard copy will be available.

STUDY FINDINGS

The results show that, a high percentage of the mothers involved in this study (72%) were aged between 21 to 30 years and only 1.5% were 30 years old or beyond. The mean age of the women was 27.27 ± 5.87. The majority of respondents (61%) had no formal education, 15.5% had tertiary education, 9% had senior high school education, and only 7% and 7.55% had junior high school and primary education respectively. Most of the women were self-employed and a significant proportion had no employment (34%). A large proportion of the women in this study (84.4%) were married; the other proportion is composed of widows, the divorced and single mothers. Most of the respondents (80%) were Muslims. An overwhelming majority (98%) of respondents ever heard about EBF. The main sources of information about EBF were from the hospital and friends.

1.2 Knowledge of mothers on exclusive breastfeeding

About 29% of them could not define EBF; the majority defined it as giving the infant breast milk and water, while the rest had no notion. Breast milk alone, according to 24% of moms, is insufficient to meet the nutritional demands of the infant. They justified their position by claiming that if a child is solely fed breast milk for six months, the youngster may not be satisfied and may die. Others believed that the youngster was thirsty and that he or she should be given water to drink. The majority of moms (91.5%) were unaware that breast milk could be expressed, securely stored, and given to the infant while the mother was not around.

8.9% of moms thought herbs/drugs may be used to help them overcome nursing issues, while 6.8% said breastfeeding should be stopped.

Table 1.1Characteristics of mothers who do and do not practice EBF

	Exclusive breastfeeds		
Variable	Yes	No	P-value
Age of mothers in years			
<30	45 (40.5 %)	27 (34.2 %)	0.230
≥30	66 (59.5 %)	52 (65.8 %)	
Child's age in months			

<3	64 (57.7 %)	6 (7.6 %)	<0.001
>3	47 (42.3 %)	73 (92.4 %)	
Employment status			
Employed	85 (76.6 %)	66 (83.5 %)	0.161
Unemployed	26 (23.4 %)	13 (16.5 %)	
Educational level			
Low educational level	34 (30.6 %)	40 (50.6 %)	0.004
High educational level	77 (69.4 %)	39 (49.4 %)	
Parity			
1	42 (37.8 %)	28 (35.4 %)	0.428
>1	69 (62.2 %)	51 (64.6 %)	
Marital status			
Not married	8 (7.2 %)	5 (6.3 %)	0.528
Married	103 (92.8 %)	74 (93.7 %)	
Religion			
Christian	60 (54.1 %)	44 (55.7 %)	0.221
Muslim	51 (45.9 %)	33 (41.8 %)	
Knowledge of EBF			
High	72 (64.9 %)	15 (19.0 %)	<0.001
Low	39 (35.1 %)	64 (81.0 %)	

Table 1.2 Multivariate determinants of exclusive breastfeeding (n = 200)

Variable	**B**	**AOR (95%CI)**	**P-value**

Child younger than 3 months	2.49	12.02 (4.44, 32.54)	<0.001
High maternal level of education	1.24	3.47 (1.55, 7.75)	0.002
High level of maternal knowledge of EBF	1.77	5.87 (2.59, 13.26)	<0.001

DISCUSSION

Knowledge of Exclusive breastfeeding

In this study, we looked at community nursing moms with infants aged 0–24 months to see how much they knew about EBF, how they felt about it, and how they used it. In this sample, factors related to the practice of EBF were also examined. Similar to previous studies (Tampah-Naah & Kumi-Kyereme 2013, Mogre et al 2016), a greater number of mothers believed breastmilk was the best form of food and nutrition for their infants, and they agreed to the concept of six months of exclusive breastfeeding, with the majority stating that they learned about it from their health care providers. The mothers' knowledge of EBF was generally good, but there were a few noteworthy gaps.

However, the use of EBF has been proven to be less than ideal. The maternal level of education, the child's age, and having a strong awareness of EBF were all found to be connected with the practice of EBF. Misconceptions about the length of EBF and its inadequacy of Breastmilk which was found to be an effective way for mothers to meet their child's nutritional demands. The majority of moms were also unaware of the maternal benefits of exclusive breastfeeding. Similar knowledge gaps and misconceptions have been documented in the past (Apanga, 2014; Issaka et al., 2014 & Boateng, Yakong & Yombei, 2021). Emphasizing the maternal benefits of EBF could encourage moms to breastfeed their babies exclusively. Most moms were more likely to consult family and significant others to

overcome breastfeeding issues than to seek healthcare providers, according to this study's findings. While consulting relatives and significant others is not always incorrect, the accuracy and quality of advice and support provided cannot be guaranteed, leaving women vulnerable to erroneous counsel and support. Healthcare workers should use postnatal visits to the health center to urge women to seek help when they are having issues.

Taking current knowledge and applying it to new situations to address these knowledge gaps, active teaching and learning tactics such as dialogues, lectures, slides, and presentations could be used. The results of this study revealed that the majority of women are aware that breast milk can be preserved for later use. In contrast to the findings of Boateng's (2018) study on exclusive breastfeeding among rural lactating women, which revealed that most mothers were unaware that breastmilk may be saved and used in the future; either for convenience or in the absence of the nursing mother.

The findings of this study revealed that a significant number of women were aware that breast milk can be preserved for future use. The discrepancy in results could be due to the difference in study subjects and setting; rural vs. urban people. If information about breast milk storage is effectively provided to mothers, particularly working mothers, and the rate of exclusive breastfeeding among working moms may be improved if the work environment was made friendly enough to allow for breast milk storage, a private space to nurse, or planned breaks to feed baby.

Practice of exclusive breastfeeding

Sixty two percent of the mothers practiced EBF. This is far higher than the 46 % of Ghanaian children aged less than6 months being exclusively breastfed in 2011 (Ghana Statistical Service [GSS], 2011) but lower than the 64 % reported by Tampah-Naah &Kumi-Kyeremee (2013) using data from the 2008 Ghana Demographic and Health Survey (GDHS) (GDHS, 2008). The prevalenceof EBF found in this study is far below the WHO recommended prevalence of 90 % (Jones et al., 2003) demonstrating a wide gapbetween the desired and the actual practice of exclusive breastfeeding. The low prevalence of exclusive breastfeeding could be attributed to misconceptions regarding the inadequacy of breastmilk to meet the nutritional needs of the child, misunderstanding certain signs of the child to mean she/he is

showing signs of wanting food to eat and misunderstanding healthcare professional's advice. Similar misconceptions have been reported previously in rural Ghana and in other West African countries (Aryeetey & Goh, 2013; Issaka et al., 2014; Apanga, 2014). Otoo et al., 2013). Education on exclusive breastfeeding is usuallydisseminated to mothers in the form of health talks by midwives, nurses or nutritionists during antenatal andpostnatal clinic visits. As suggested by previous studies (Sadoh, Sadoh & Oniyelu, 2011; Abaasiati et al., 2014; Onah et al., 2014), the findings of this study call for an evaluationof the content of such health talks and the mothers understanding of the messages provided to them as significantgaps in knowledge of exclusive breastfeeding.

Factors associated with practice of exclusive breastfeeding

Mothers with higher level of education were more likely to report higher practice of exclusive breastfeeding than their counterparts. Maternal level of education has been found to be an important determinant of infant feedingpractices in several studies in Ghana (Iddrisu, 2014; Aidam, Pérez-Escamilla & Larte, 2005). Mothers with higher levels of education may be able to comprehendand appreciate the benefits of EBF to their infants and more motivated to practice it (Onah et al., 2014). Suggestively, exclusivebreastfeeding promotion programs should be made more appealing to mothers who have lower levels of education. For instance, healthcare providers could emphasis on the fact that exclusive breastfeeding is not only beneficial to the infant but also for the mother regarding delayed return of ovulation, reduction in the risk of developing breast cancer and protection against postpartum bleeding (Aidam, Pérez-Escamilla & Larte, 2005).

Another important determinant of the practice of exclusive breastfeeding was the age of the child. Significantly,mothers with babies younger than 3 months were more likely to practice exclusive breastfeeding comparedto those having babies aged 3 months or older. Similar

findings have been reported previously in Ghana andother parts of West Africa (Iddrisu, 2013; Otaigbe, Alikor & Nkanginieme, 2008). As the age of the child increases, mothers are more likely to begin tointroduce other foods as they perceive that breast milk alone might not be sufficient to meet the nutritional needs of the child. These finding suggests that healthcare professionals should pay special attention to lactatingmothers as the baby grows, by encouraging and supporting them to overcome barriers that may preventthem from exclusively breastfeeding. Given the fact that most mothers may return to work as the child growsolder, and their lack of confidence to express and store breast milk, it is plausible that mothers may begin tointroduce other foods to the child in order to have time to work and attend to other activities (Abasiatai, 2014). Misconceptionsof mothers regarding expressing and storing breast milk should be identified and given attention infuture EBF promotion programs. Mother should be encouraged and supported to gain the appropriate knowledgeand confidence to be able to express and store breastmilk that could be used to feed the child while they were at work. Notwithstanding the above, we recommend that future studies should explore the contributingfactors responsible for the decrease in the practice of exclusive breastfeeding as the baby grows older in thissetting. Another factor that was found to be associated to the practice of exclusive breastfeeding was having knowledge of EBF. Mothers who had higher knowledge were more likely than their counterparts with low knowledge in EBF to report practicing it. Similar to our findings, studies that report high maternal knowledge on EBF also report high prevalence of the practice of exclusive breastfeeding (Sriram et al., 2013; Dhammika &Gunawardena, 2012; Utoo, Ochejele, Obulu & Utoo, 2012) and the reverse is true (Motee et al., 2013).Lack of knowledge of the benefits of breastfeeding has been reported to contribute to the low level of exclusivebreastfeeding practice in Sub-Saharan Africa (Abasiattai et al., 2014).

In line with the work by Mohammed et al. (2014), mothers' age did not have much influence on the knowledge and practice of exclusive breastfeeding. Almost all mothers irrespective of their age at the time of giving birth were familiar with the concept, unlike the results from the study by Fosu-Brefo &Arthur 2015, which showed a significant relationship between maternal age and the knowledge in exclusive breastfeeding. Majority of mothers showed prominent level of understanding about the essence of breastfeeding an infant. For instance, its role in protecting an infant from diseases, an ideal source of nutrients, family planning methods and its health benefits on lactating mothers. They also acknowledged to the fact that breastfeeding promotes the relationship between mother and child. Even though majority of mothers explained how safe,convenient and economical it is to breastfeed a baby, not every mother was able to practice it (Oche et al. 2011).

CONCLUSION

The reflection of a child's general health condition is evident in his or her nutritional status. Quality diet minimizes diseases and increases growth. Exclusive breastfeeding is a well campaigned child feeding practice noted for child health and survival. This study presented data on mother's level of knowledge, attitude and practice of exclusive breastfeeding. This study results affirm a greater level of understanding about mothers' knowledge in the importance of exclusive breastfeeding. The general responses concerning breastfeeding were positive especially about knowledge in breastfeeding, its recommendation and benefits.The lactating mothers' knowledge of EBF were generally favourable. However, their practice of EBF was suboptimal. Mothers' misconceptions and misunderstanding of EBF messages may play an importantrole in determining the practice of EBF. Maternal knowledge, maternal level of education and age of the childmay also be important in promoting the practice of EBF. Healthcare professionals should go beyond the mere dissemination of information to encouraging and helping mothers to overcome barriers of practicing EBF. Health advocates and health workers were identified as the main agents of information dissemination. This study acknowledges the support from health care providers.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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