

## Effectiveness of a Pilot Breastfeeding Educational Intervention Targeting High BMI Pregnant Women

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### ABSTRACT

**Introduction.** Overweight and obesity during pregnancy are associated with adverse health outcomes leading to increased maternal and neonatal morbidity and mortality. Women with a high body mass index (BMI) also experience low breastfeeding rates. There is limited evidence of effective educational programs that aim to improve length of breastfeeding among this population. The main objective of this pilot educational intervention was to determine knowledge and skills retention at six weeks after completion of a breastfeeding class.

**Methods.** A two-hour breastfeeding class was offered during the second and third trimester of pregnancy targeting high BMI women. A longitudinal, survey study design was conducted using two data collection points. No comparator group was employed.

**Results.** Baseline mean age of respondents was 26.6 years (SD = 5.7). Respondents who completed post-intervention surveys were largely white (69.2%) followed by Hispanic (15.4%) and non-Hispanic black (15.4%), some college (57.1%), earned less than \$50,000/year (64.3%), had employer-provided insurance (53.8%), and did not receive WIC benefits (78.6%). Most respondents had a pre-pregnancy BMI category of overweight (28.6%) or obese (57.1%). The intervention appeared to have some impact on responses. The following were observed: an increased understanding that baby may be fussy in the evening hours and wants to nurse more often ( $p < 0.002$ ), how to bring baby to the breast ( $p = 0.004$ ), knowing what to do if breastfeeding hurts ( $p = 0.031$ ), and knowing what to do when baby has trouble breastfeeding ( $p = 0.021$ ).

**Conclusion.** Consistent with previous findings, all participants in our study reported increased knowledge to breastfeed. Thus, women's confidence to breastfeed their infant is enhanced through knowledge obtained from breastfeeding education. Additional studies are underway to assess breastfeeding behaviors. *Kans J Med* 2020;13:219-227

### INTRODUCTION

In the United States, 68% of all women are either overweight (27%) or obese (41%).<sup>1</sup> Globally, from 2005 to 2014, the U.S. was the fourth leading country with an increased burden of overweight and obesity among pregnant women, trailing India, China, and Nigeria, respectively.<sup>2</sup> The number of overweight and obese pregnant U.S. women increased from 1,853,400 women in 2005 to 1,923,400 in

2014, a rise of 3.8%. Most notably, in 2014, the U.S. had the highest number of obese pregnant women (1.07 million), followed by China at 1.06 million, India at 1.01 million, and Nigeria at 830,000.

Overweight and obesity during pregnancy are associated with adverse health outcomes for mother and child, including gestational diabetes, preeclampsia, cesarean section, prematurity, shoulder dystocia, and macrosomia, leading to increased maternal and neonatal morbidity and mortality.<sup>3,4</sup> Women with a high body mass index (BMI) also experienced low breastfeeding rates due to an increased likelihood of high intervention births, delayed lactogenesis II, postpartum edema, and psychosocial factors.<sup>5-7</sup>

Breastfeeding duration is associated with a reduction in maternal postpartum weight among overweight and obese women.<sup>8,9</sup> However, there is limited evidence of effective educational programs that aim to improve length of breastfeeding among this population.<sup>10</sup> Given current recommendations that infants be exclusively breastfed for the first six months,<sup>11</sup> a two-hour breastfeeding class was offered during the second and third trimester to pregnant women. The aim of this pilot educational intervention was to determine knowledge and skills retention at six weeks after completion of a breastfeeding educational class offered in an urban and rural setting.

### METHODS

This project was approved by the university's Institutional Review Board. A longitudinal, survey study design was conducted utilizing two data collection points. No control or comparator group was employed. Maternal baseline data were obtained via a survey instrument administered immediately prior to the breastfeeding class. Approximately four to six weeks after class completion, respondents were contacted via telephone and asked to re-take the survey (post-intervention). The GREET (Guideline for Reporting Evidence-based practice Educational interventions and Teaching) checklist was used to prepare this brief report.<sup>12</sup>

**Curriculum Content.** The breastfeeding curriculum was based on the Office on Women's Health Your Guide to Breastfeeding that is aligned with nutritional requirements set by the U.S. Department of Agriculture's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) including parenting and maternity care practices of specific state-based and nonprofit organizations.<sup>13-15</sup> Content of the two-hour breastfeeding curriculum focused on the following topics: establishing and maintaining a sufficient and safe breast milk supply, breast anatomy and physiology, maternal diet and lifestyle choices, prescription and non-prescription medications, infant stomach capacity, baby behavior feeding cues, breast milk expression, safe handling and storage of breast milk, returning to work, safe preparation of infant formula, biologically appropriate bottle feeding, and local community breastfeeding resources. Participants received the following hand-outs: 1) A hard copy of the Your Guide to Breastfeeding; and 2) A hard copy of the instructor's PowerPoint presentation that was part of the breastfeeding curriculum.

**Participants and Procedures.** The two-hour breastfeeding class was offered at two locations: an obstetrical clinic in a midwestern metropolitan city and a critical access hospital in a rural region of a midwestern state (Table 1). Each of these settings carried a patient

load of pregnant women with an average BMI of 29; therefore, pregnant women with high body mass index (BMI ≥ 25 and < 40) were targeted but no woman who had a BMI outside of these parameters was denied participation in the class. At the urban obstetrical clinic, participants were contacted and recruited by a nurse at their prenatal appointment. The breastfeeding class was held in the early evening hours in a conference room at the obstetrical clinic.

At the rural location, participants were recruited to participate in a comprehensive prenatal program including the breastfeeding class by a prenatal nursing supervisor who was employed with a critical access hospital. The breastfeeding class, Session 4-Feeding your Baby, was offered as part of a prenatal program that comprised six prenatal educational sessions described as follows: Session 1-You and Your Pregnancy; Session 2-Healthy Pregnancy; Session 3-Labor and Delivery; Session 4-Feeding your Baby; Session 5-Newborn and Infant Care; and Session 6-Health after Pregnancy.<sup>16</sup> The breastfeeding class was held in the afternoon in a conference room at the critical access hospital. At both locations, light snacks were provided, and women could bring a support person to class with them.

The principal investigator was present during all classes at both locations. Instruction of all classes was provided in a group setting. Participants spent two hours of face-to-face contact with the instructor; they did not engage in self-directed learning activities. Participants could ask questions at any time during the two-hour breastfeeding class. The curriculum for the breastfeeding class is taught to all pregnant women across Kansas regardless of BMI category; course material was neither modified nor adapted for the learners in the current pilot study. A \$20 gift card was provided to participants upon post-survey completion.

**Table 1. Schedule of breastfeeding classes (educational intervention).**

Class date	Participants	Support personnel	Instructor	Location
Apr. 2017	1	1	1	Urban obstetrical clinic
Apr. 2017	10	5	1	Urban obstetrical clinic
May 2017	5	2	1	Urban obstetrical clinic
	<b>16</b>			
May 2018	3	1	1	Critical access hospital
June 2018	3	1	1	Critical access hospital
Oct. 2018	2	2	1	Critical access hospital
	<b>8<sup>1</sup></b>			

<sup>1</sup>Two additional participants completed the survey instrument but did not attend the breastfeeding class.

Each breastfeeding class was taught in-person by an International Board-Certified Lactation Consultant (IBCLC). An IBCLC is a professional designation for a healthcare professional who specializes in the clinical management of breastfeeding and who is certified by the International Board of Lactation Consultant Examiners.<sup>17</sup> Each instructor taught three classes at the same location. Both instructors

were female, used the same PowerPoint slide deck for each class, and used props including a baby doll and a mock stuffed breast to convey knowledge. Each instructor had a master's degree in nursing and a combination of more than five years of teaching experience in human lactation within academic and/or clinical settings.

**Survey Instrument.** A survey instrument was designed and administered to measure learners' knowledge of breastfeeding. The following eight constructs were measured: 1) physiology of breastfeeding (six response items); 2) bringing baby to the breast and nursing positions (six response items); 3) birthing experience (six response items); 4) signs breastfeeding goes well (six response items); 5) breast milk supply and supplementation (five response items); 6) common breastfeeding concerns (seven response items); 7) length of breastfeeding (four response items); and, 8) caution with breastfeeding (four response items). The survey instrument was pretested on eight women of reproductive age who were not affiliated with the study. Their feedback was used to shorten a few of the questions, simplify wording, and condense the length of the survey.

The paper version of the survey instrument was administered immediately prior to the breastfeeding class (baseline). Respondents were asked to choose an identifier and enter the code in the upper right-hand corner. Approximately four to six weeks after completion of the breastfeeding class, participants were asked via telephone to re-take the survey (post-intervention). Upon participants' consent, a paper copy of the survey was then mailed to them via regular U.S. mail. Similarly, they were asked to enter their code in the upper right-hand corner of the instrument.

**Data Management and Statistical Analysis.** Research staff entered the baseline- and post-intervention data into Research Electronic Data Capture (REDCap®), a secure web-based application designed to support and manage data capture for research studies.<sup>18</sup> Descriptive statistics were presented on maternal demographics, body mass index (BMI), smoking status, stage of pregnancy, parity, diabetes status, prematurity, and pregnancy complications. Frequencies and percentages were used to summarize all baseline and post-survey data (Table 2). Because data were sparse, all item responses were collapsed into three categories. Matched pair responses were assessed with two-sided, exact sign tests. To adjust for multiple tests, a Bonferroni correction was used to establish the criterion level significance, alpha = 0.05/22 or 0.00227.

**RESULTS**

Maternal demographic and health characteristics are described in Table 2. Baseline mean age of respondents was 26.6 years (SD = 5.7). Respondents who completed post-intervention surveys were largely white (69.2%) followed by Hispanic (15.4%) and non-Hispanic black (15.4%), some college (57.1%), earned less than \$50,000/year (64.3%), had employer-provided insurance (53.8%), and did not receive WIC benefits (78.6%). Most respondents had a pre-pregnancy BMI category of overweight (28.6%) or obese (57.1%), did not smoke

(92.9%), and were in their third trimester of pregnancy (66.7%). More than three quarters of women (78.6%) reported not having had a live birth and did not have prematurity (85.7%). Two women reported that they were diagnosed with type 1 diabetes mellitus and seven women reported their pregnancy was considered high-risk for reasons not known.

Comparison of baseline and post-intervention survey responses are shown in Table 3. Results showed responses differed significantly

for the item “It is normal that my baby may be fussy in the evening hours and wants to nurse more often”: 57.1% agreed or strongly agreed prior to the intervention versus 100.0% after the intervention,  $p < 0.002$ . While no other item differed significantly per the adjusted alpha, the intervention appeared to have some impact on responses. For example, we observed differences in women’s responses to the questions on how to bring baby to the breast ( $p = 0.004$ ), knowing what to do if breastfeeding hurts ( $p = 0.031$ ), and knowing what to do when baby has trouble breastfeeding ( $p = 0.021$ ).

**Table 2. Maternal demographic and health characteristics.**

Description	Baseline		Post-intervention	
	n	%	n	%
What is your age? mean + sd	26.6 + 5.7		26.4 + 5.1	
What is your ethnicity/race?				
White, not of Hispanic origin	14	53.8	9	69.2
Black, not of Hispanic origin	2	7.7	2	15.4
Hispanic	4	15.4	0	0
White, of Hispanic origin	4	15.4	2	15.4
Asian or Pacific Islander	1	3.8	0	0
Multiracial	1	3.8	0	0
What is the highest level of education that you have completed?				
Some high school	2	8	1	7.1
Graduated from high school	4	16	0	0
Some college	8	32	8	57.1
Graduated with an associate degree	2	8	1	7.1
Graduated with a bachelor’s degree	4	16	1	7.1
Advanced degree (e.g., Masters, Ph.D., M.D., J.D.)	5	20	3	21.4
During the last 12 months before your current pregnancy, what was your gross yearly total household income before taxes?*				
\$9,999 or less	4	16	2	14.3
\$10,000 to \$24,999	3	12	4	28.6
\$25,000 to \$49,999	6	24	3	21.4
\$50,000 to \$74,999	5	20	2	14.3
\$75,000 to \$99,999	3	12	0	0
\$100,000 or more	4	16	3	21.4
Do you currently have health insurance?				
No	1	4.2	0	0
Yes	23	95.8	13	100
If yes, please check one of the following:				
Private (employer provided)	13	56.5	7	53.8
Public (e.g., Medicaid, KanCare)	10	43.5	6	46.2
During your current pregnancy, are you on WIC (the Special Supplemental Nutrition Program for Women, Infants, and Children)?				
No	21	80.8	11	78.6
Yes	5	19.2	3	21.4
BMI category 3 months prior to pregnancy				
Normal 18.5-24.9	3	12	2	14.3
Overweight 25.0-29.9	6	24	4	28.6
Obese 30+	16	64	8	57.1

**Table 2. Maternal demographic and health characteristics.** *cont.*

Description	Baseline		Post-intervention	
	n	%	n	%
Do you currently smoke cigarettes?				
No	25	96.2	13	92.9
Yes	1	3.8	1	7.1
How far along are you in your pregnancy?				
2nd trimester	10	38.5	4	33.3
3rd trimester	16	61.5	8	66.7
Not including your current pregnancy, how many live births have you had?				
None	17	65.4	11	78.6
1 birth	4	15.4	1	7.1
2 births	4	15.4	2	14.3
3 births	1	3.8	0	0
If you have been diagnosed with pre-gestational diabetes, please indicate what type:				
Type 1 diabetes	2	100	2	100
Type 2 diabetes	0	0	0	0
Have you had a pre-term delivery (your baby was born before 37 weeks of pregnancy)?				
No	24	92.3	12	85.7
Yes (reason given: premature rupture of membranes)	2	7.7	2	14.3
Why is your current pregnancy considered high risk? Check all that apply.				
Other reason	10	41.7	7	50
Not considered a high-risk pregnancy	7	29.2	2	14.3
Gestational diabetes (diabetes associated with pregnancy)	4	16.7	1	7.1
Abnormal fetal testing (for example: abnormal sonogram findings, abnormal growth, etc.)	2	8.3	1	7.1
Family history of birth defect or genetic condition	2	8.3	0	0
Pre-gestational diabetes (diabetes diagnosed before pregnancy)	2	8.3	2	14.3
Gestational hypertension or pre-eclampsia (high blood pressure associated with pregnancy)	1	4.2	2	14.3
Thyroid disease	1	4.2	0	0
Chronic hypertension (high blood pressure before pregnancy)	0	0	1	7.1
Vaginal bleeding	0	0	1	7.1

\* Includes your income, your spouses or partners income, and any other income you may have received.

Response differences also were observed regarding women's awareness of baby being more awake and crying more during the second night after birth ( $p = 0.016$ ), being more comfortable expressing milk by hand ( $p = 0.016$ ), and understanding that when using formula during the early days would mean that she will produce less breast milk later ( $p = 0.039$ ). Last, response differences were found in women's understanding that baby's colickiness is not a sign of low milk supply ( $p = 0.021$ ). There were no statistically significant differences to the response items on the following breastfeeding constructs: physiology of breastfeeding, signs that breastfeeding goes well, length of breastfeeding, and caution with breastfeeding.

## DISCUSSION

This study's objective was to determine knowledge and skills retention of breastfeeding after completion of an educational class. Consistent with previous findings that breastfeeding education enhances women's knowledge and skills to breastfeed,<sup>19,20</sup> all participants in our study reported increased knowledge of bringing baby to the breast. Thus, women's confidence to breastfeed their infant is enhanced through knowledge obtained from breastfeeding education. As such, breastfeeding education becomes an important strategy to improve breastfeeding rates.

**Table 3. Comparison of pre- and post-intervention survey responses.**

Constructs	Baseline		Matched pairs		Post-intervention		p
	n	%	n	%	n	%	
<b>Physiology of breastfeeding</b>							
The nutrients and antibodies contained in early breast milk (called colostrum) is just the right amount for my baby.							
Agree: strongly-somewhat	24	92.3	13	92.9	14	100.0	0.180
Don't know	1	3.8	0	0.0	0	0.0	
Disagree: somewhat-strongly	1	3.8	1	7.1	0	0.0	
In the early days, my baby's stomach is very small so that he/she only needs less than 1 ounce at each feeding.							
Agree: strongly-somewhat	20	76.9	11	78.6	13	92.9	0.625
Don't know	3	11.5	1	7.1	0	0.0	
Disagree: somewhat-strongly	3	11.5	2	14.3	1	7.1	
By about one month of age, my baby needs about 2.5 to 5 ounces of breast milk per feeding.							
Agree: strongly-somewhat	18	69.2	10	71.4	13	92.9	0.375
Don't know	7	26.9	3	21.4	1	7.1	
Disagree: somewhat-strongly	1	3.8	1	7.1	0	0.0	
<b>Bringing baby to the breast and nursing positions</b>							
I know how to bring my baby to the breast so that he/she can get a good latch.							
Agree: strongly-somewhat	14	53.8	5	35.7	14	100.0	0.004
Don't know	9	34.6	7	50.0	0	0.0	
Disagree: somewhat-strongly	3	11.5	2	14.3	0	0.0	
I know what to do if breastfeeding hurts.							
Agree: strongly-somewhat	15	57.7	7	50.0	13	92.9	0.031
Don't know	7	26.9	4	28.6	1	7.1	
Disagree: somewhat-strongly	4	15.4	3	21.4	0	0.0	
I know what to do when my baby has trouble breastfeeding.							
Agree: strongly-somewhat	14	53.8	8	57.1	12	85.7	0.021
Don't know	7	26.9	3	21.4	2	14.3	
Disagree: somewhat-strongly	5	19.2	3	21.4	0	0.0	
Most babies will nurse 8 feedings or more in 24 hours with more being very common.							
Agree: strongly-somewhat	21	80.8	10	71.4	14	100.0	0.125
Don't know	4	15.4	3	21.4	0	0.0	
Disagree: somewhat-strongly	1	3.8	1	7.1	0	0.0	
<b>Birthing experience</b>							
Skin-to-skin contact right after birth will help my baby learn how to breastfeed.							
Agree: strongly-somewhat	22	84.6	12	85.7	14	100.0	0.500
Don't know	3	11.5	1	7.1	0	0.0	
Disagree: somewhat-strongly	1	3.8	1	7.1	0	0.0	
It is normal that my baby will be more awake and cry more during the second night after birth.							
Agree: strongly-somewhat	10	38.5	6	42.9	13	92.9	0.016
Don't know	16	61.5	8	57.1	1	7.1	
Disagree: somewhat-strongly	0	0.0	0	0.0	0	0.0	

Table 3. Comparison of pre- and post-intervention survey responses. *cont.*

Constructs	Baseline		Matched pairs		Post-intervention		p
	n	%	n	%	n	%	
<b>Signs breastfeeding goes well</b>							
How likely are you to identify your baby's mid hunger cues (for example, stretching, increasing physical movement, hand to mouth)?							
Very likely-Likely	16	64.0	7	53.8	13	92.9	0.063
Somewhat likely	8	32.0	5	38.5	1	7.1	
Not likely-Not likely at all	1	4.0	1	7.7	0	0.0	
I understand it is normal for my baby to lose some weight in the first few days of life.							
Agree: strongly-somewhat	22	84.6	10	71.4	13	92.9	0.625
Don't know	2	7.7	2	14.3	0	0.0	
Disagree: somewhat-strongly	2	7.7	2	14.3	1	7.1	
Sleeping through the night for baby means 5 hours in a row.							
Agree: strongly-somewhat	18	69.2	10	71.4	13	92.9	0.625
Don't know	7	26.9	3	21.4	0	0.0	
Disagree: somewhat-strongly	1	3.8	1	7.1	1	7.1	
<b>Breast milk supply and supplementation</b>							
I am comfortable expressing my milk by hand.							
Very comfortable-Comfortable	6	24.0	2	15.4	9	64.3	0.016
Somewhat comfortable	11	44.0	8	61.5	4	28.6	
Not comfortable-Not comfortable at all	8	32.0	3	23.1	1	7.1	
In the early days, using formula because my milk has not come in yet will mean I will make less breast milk later.							
Agree: strongly-somewhat	12	46.2	4	28.6	11	78.6	0.039
Don't know	9	34.6	5	35.7	1	7.1	
Disagree: somewhat-strongly	5	19.2	5	35.7	2	14.3	
<b>Common breastfeeding concerns</b>							
Engorgement is the result of milk building up and can lead to plugged ducts or a breast infection.							
Agree: strongly-somewhat	22	84.6	11	78.6	14	100.0	0.250
Don't know	3	11.5	2	14.3	0	0.0	
Disagree: somewhat-strongly	1	3.8	1	7.1	0	0.0	
As my baby experiences growth spurts, it is important to nurse my baby more so that my breasts produce more milk.							
Very important-Important	22	84.6	10	71.4	13	100.0	0.125
Somewhat important	4	15.4	4	28.6	0	0.0	
Not important-Not important at all	0	0.0	0	0.0	0	0.0	
It is normal that my baby may be fussy in the evening hours and wants to nurse more often.							
Agree: strongly-somewhat	17	65.4	8	57.1	13	100.0	0.002*
Don't know	8	30.8	5	35.7	0	0.0	
Disagree: somewhat-strongly	1	3.8	1	7.1	0	0.0	
I understand that if my baby is colicky, this is not a sign of low milk.							
Agree: strongly-somewhat	12	46.2	5	35.7	11	78.6	0.021
Don't know	12	46.2	7	50.0	2	14.3	
Disagree: somewhat-strongly	2	7.7	2	14.3	1	7.1	

**Table 3. Comparison of pre- and post-intervention survey responses. cont.**

Constructs			Matched pairs				p
	Baseline		Baseline		Post-intervention		
Description/responses	n	%	n	%	n	%	
<b>Length of breastfeeding</b>							
Exclusive breastfeeding means that my baby will not be given any foods or liquids other than breast milk for the first 6 months.							
Agree: strongly-somewhat	22	84.6	11	78.6	14	100.0	0.250
Don't know	3	11.5	2	14.3	0	0.0	
Disagree: somewhat-strongly	1	3.8	1	7.1	0	0.0	
It is recommended that infants should breastfeed for at least 12 months with exclusive breastfeeding for the first 6 months.							
Agree: strongly-somewhat	23	88.5	12	85.7	14	100.0	0.500
Don't know	3	11.5	2	14.3	0	0.0	
Disagree: somewhat-strongly	0	0.0	0	0.0	0	0.0	
<b>Caution with breastfeeding</b>							
If a breastfeeding mother drinks a single serving of alcohol, then she should wait at least 2 hours before breastfeeding her baby.							
Agree: strongly-somewhat	16	61.5	10	71.4	14	100.0	0.125
Don't know	8	30.8	3	21.4	0	0.0	
Disagree: somewhat-strongly	2	7.7	1	7.1	0	0.0	
I understand that in rare circumstances, it is not in the best interest for me and my baby to continue breastfeeding.							
Agree: strongly-somewhat	21	80.8	11	78.6	14	100.0	0.250
Don't know	4	15.4	2	14.3	0	0.0	
Disagree: somewhat-strongly	1	3.8	1	7.1	0	0.0	

Results are from 2-tailed exact Sign tests with the binomial distribution.

\*Significant difference using Bonferroni correction:  $\alpha = 0.05/22 = 0.00227$

Many studies reported on the positive relationship between breastfeeding knowledge and breastfeeding initiation and duration.<sup>21-24</sup> In our study, participants reported increased understanding that it was normal for baby to be fussy in the evening hours, wanting to nurse more often, and that coliciness was not a sign of low milk supply. This knowledge appears critical when continuing to breastfeed, as fussiness and nursing frequency could lead a mother to believe that the infant may not be getting enough milk, leading to formula supplementation that would reduce one's milk supply.

Most women reported that they knew what to do when breastfeeding would hurt and that they knew what to do if baby had trouble breastfeeding. It would have been interesting to find out what problem-solving techniques women would apply when faced with these situations as breastfeeding pain and baby's trouble with breastfeeding frequently are reported as barriers to continue breastfeeding.<sup>25,26</sup> Thus, follow-up studies in this area of research are warranted.

Most women reported their knowledge on the composition of breastmilk and feeding practices in the early days had increased. Women's knowledge and skills also increased on their ability to identify hunger cues, understanding that some weight loss in the early days would be normal, and understanding infant sleeping patterns. Further, all participants understood the definition of exclusive breastfeeding and agreed with the recommended breastfeeding

guidelines. Last, participants agreed about what course of action should be followed when drinking alcohol while breastfeeding.

Findings indicated that the majority of high BMI pregnant women in our study obtained increased knowledge and skills from breastfeeding education that could lead to increased confidence to breastfeed their infant. Breastfeeding reduces postpartum weight and improves women's long-term cardiovascular health.<sup>9,27,28</sup> Women who fall into higher BMI categories stand to benefit the most from breastfeeding and can be as successful breastfeeding their infant as women in normal BMI categories.

As Kendall-Tackett, one of the leading experts on breastfeeding, so eloquently stated, "let's not automatically assume that a high BMI woman will fail or will have problems breastfeeding just because of her size".<sup>29</sup> When developing educational interventions to increase breastfeeding rates among high BMI women, the following factors should be considered: (1) Be aware of the traumatic impact of high-intervention births leading to potential breastfeeding problems, (2) Understand that weight affects ethnically and racially diverse women differently requiring a more culturally sensitive approach toward intervention programming, and (3) Adopt follow-up techniques with all women after birth to help her achieve her breastfeeding goals.

**Limitations and Future Direction.** There are several limitations to this study. First, small sample size limits generalization of study findings. Though the majority of women in our study were overweight or obese, a few pregnant women with normal BMI were included. As there were only two women with normal BMI who completed post-intervention data, we did not feel that this would influence the outcome of our study so these women were included in the analysis. Second, there was no control or comparison group comprising of normal BMI pregnant women. As the curriculum for this breastfeeding class is taught to all pregnant women across Kansas regardless of BMI category, a follow-up study with a control or comparison group of normal weight BMI women is needed to determine the true impact of this intervention. Third, this was an educational intervention to assess breastfeeding knowledge and skills retention; there was no follow-up after participants gave birth to assess whether they started breastfeeding and for how long they continued breastfeeding. However, the breastfeeding curriculum used in this study also was used in a follow-up feasibility three-arm randomized controlled trial (RCT) with high BMI pregnant women where participants receive consistent breastfeeding follow-up upon birth through six months postpartum. Results of this feasibility RCT will show whether high BMI women are able to translate their increased breastfeeding knowledge to breastfeeding initiation and duration. Altogether, breastfeeding knowledge and breastfeeding confidence leading to behavioral change among high BMI women should continue to be examined in prospective future studies.

## CONCLUSION

This pilot study shed light on a breastfeeding curriculum offered to pregnant women with predominantly high BMI. Findings indicated that women's knowledge and skills to breastfeed their infant are improved. Study results present opportunities for additional education surrounding the idea that perhaps high BMI women may require intense follow-up upon delivery. Additional studies are underway to assess breastfeeding behaviors among this population.

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