KANSAS JOURNAL of MEDICINE

momHealth: A Feasibility Study of a Multi-behavioral Health Intervention for Pregnant and Parenting Adolescent Mothers

Karen A. Wambach, Ph.D.[1], Ann M. Davis, Ph.D.[2], Eve Lynn Nelson, Ph.D.[1], Kelli Snow, M.S.[3], Annie Yungmeyer, BSN[1], Rachel Muzzy, M.S.[2], Karman Romero, Ph.D.[1], Megan Murray, M.S.[2]
University of Kansas Medical Center, Kansas City, KS
[1]School of Nursing
[2]School of Medicine, Department of Pediatrics
[3]Children's Mercy Hospital, Kansas City, MO

Received Oct. 7, 2020; Accepted for publication April 7, 2021; Published online July 9, 2021
https://doi.org/10.17161/kjm.vol14147738

ABSTRACT

Introduction. In 2016, 209,809 babies were born to mothers 15 - 19 years of age, for a live birth rate of 20.3 per 1,000 in this age group. Many health issues surround adolescent mothers and their infants, many of which can be addressed through behavioral change. The main purpose of this study was to examine the feasibility, acceptability, usability, and relevance of momHealth, an innovative multiple health behavior change (MHBC) education and support mHealth intervention, focused on breastfeeding, healthy eating and active living, and depression prevention among pregnant and parenting adolescents. We also evaluated the proposed online surveys and physical outcome measures for feasibility and acceptability (burden, time, ease of use).

Methods. A one-group quasi-experimental longitudinal design was used to examine the intervention components and the breastfeeding, diet/activity, and depression outcome measures. Nine iPad-delivered education modules, text messaging, and virtual individual and group support were provided for 12 weeks, beginning at 32 weeks of pregnancy, with follow-up to three months postpartum. Data on the main behaviors and outcomes were collected at three in-home visits, one telephone call soon after birth, and ten postpartum weekly and biweekly online surveys.

Results. Although recruitment and attrition presented challenges, six participants enrolled in the study during prenatal clinic visits; all were pregnant with their first child, single, and had a mean age of 17.7 years (SD = 1.4). Intervention participation ranged from 59% to 91% for educational module completion, text message reading, and individual virtual support meetings and three virtual peer support groups were held. Intervention acceptability, relevance, and delivery was supported by reports of clear and relevant content, reasonable time burden, iPad ease of use, and acceptable intervention length. Data collection was reported as convenient and non-burdensome, but the diet recall method and activity monitoring challenged some.

Conclusions. This was the first MHBC research in adolescent pregnant women designed to improve breastfeeding outcomes, healthy eating/active living, and depression prevention. Findings demonstrated strengths and challenges of the interventions and methods, support feasibility and acceptability of momHealth, and informed the recruitment and intervention protocols of our pilot randomized trial.

Kans J Med 2021;14:176-181

INTRODUCTION

Although the rate of teenage pregnancy in the United States has declined greatly over the past two decades, teen pregnancy remains a significant public health problem.[1] In 2016, 209,809 babies were born to mothers 15 - 19 years of age, for a live birth rate of 20.3 per 1,000 women in this age group.[2] Multiple health behavior issues more greatly impact pregnant and parenting adolescent mothers in comparison to mothers over the age of twenty. For example, suboptimal breastfeeding initiation and continuation persist[3]; in 2016, 70.5% of adolescent mothers under age 20 initiated breastfeeding in comparison to 80% among mothers over 20 years of age and 27.9% versus 48.2% continued to breastfeed to six months. Second, adolescent mothers tended toward excess pregnancy weight gain,[4] postpartum weight retention,[5-7] and physical inactivity after giving birth.[8] Third, these mothers were at higher risk and had elevated rates of postpartum depression.[9-10] Between 25 and 36% of adolescent mothers' experience postpartum depression, higher than adult postnatal mothers and non-perinatal adolescents. All these health behaviors and/or conditions influence maternal and child long-term health.

The multiple health behavior change paradigm (MHBC)[11] offers a framework to address multiple health behaviors through simultaneous intervention. Despite the significance of adolescent pregnancy and the behavioral health issues noted, there is no known MHBC research involving this vulnerable population. Therefore, we designed and conducted a technology-based intervention and assessed its feasibility (i.e., can it be done?), acceptability (i.e., is it desirable?), usability (i.e., does it work?), and relevance for a sample of middle- to late-adolescent pregnant and parenting women.

METHODS

This study was approved by the university's Institutional Review Board. A one-group, quasi-experimental, longitudinal design was used and conducted between July 2016 and March 2017 in a metropolitan area in Kansas. Recruitment took place in prenatal clinics at two university affiliated family medicine and obstetric practices. Recruitment efforts and assessment of the sampling pool was tracked by the research team throughout the study; after two months of recruitment efforts, the age criterion was changed from an upper limit of 18 years to 19 years, due to low numbers of pregnant adolescents under 19 years. Therefore, the final sample inclusion criteria included English-speaking, pregnant adolescents between 15 - 19 years of age, low risk pregnancy, intending to keep their first baby, and between 26 - 34 weeks gestation at screening. Exclusion criteria included prenatal complications and/or high-risk pregnancy conditions, such as preterm labor and gestational diabetes, diagnosed depression, and other untreated clinical mental health conditions. Participants provided their own informed consent; parental/guardian consent was not required because of the "no more than minimal risk nature" of the study and on the basis that recruitment and enrollment would be impaired because most pregnant adolescents attend their prenatal visits without a parent.

Study Timeline, Data Collection, and Measures. The time frame for study participation from enrollment to final data collection was 20 weeks. Data collection was conducted during three home visits at baseline (32 weeks), five weeks postpartum, and three months postpartum. A single telephone call was made to participants shortly after giving birth to collect birth information and hospital infant-feeding data. In addition, after giving birth, participants received automated e-mail invitations for 10 weekly brief online surveys for the main study outcomes. All data were collected using the Research Electronic Data Capture (REDCap®) secure web platform, including the home-visit measures that were collected by research staff.[12-13] Further detail regarding data collection, time points, and interventions are included in Figure 1 and Table 1.

Demographic data included age, education level, marital status, and Women and Infant Supplemental Nutrition (WIC) program eligibility and status collected at the baseline home visit. Physical data included pre-pregnancy weight and current weight and height at the home visits. Main outcome data regarding breastfeeding intention (prenatal), initiation, and continuation were self-reported post-birth and at the postpartum home visits. Healthy eating and physical activity data were collected with three 24-hour diet recalls and Actigraph monitoring sessions (initiated at each home visit). Depression symptoms were self-reported using the Edinburg Postnatal Depression Scale (all home visits). During the second post-intervention home visit and final home visit at three months, interviews/surveys were used to evaluate the acceptability, relevance, usefulness, and burden of the intervention and convenience and burden of data collection measures, respectively.

Data Management and Analysis. Data were stored securely in REDCap® and a secure web server. Descriptive statistics were used for demographic data presentation. Frequencies and percentages were used to describe participation counts for the intervention components (actual number of completed interventions divided by total number of potential components). Content analysis was used for text-based narratives regarding evaluation of the intervention and data collection measures.

Intervention. All participants were consented at clinic recruitment or at the baseline home visit. Participants were lent an iPad Mini™ tablet with a cellular data connection and provided with instructions for tablet use and care, a phone number to call for technical support, instruction on the project timeline, how to use the education modules, text messaging, and virtual support meetings. The intervention period covered approximately eight weeks prenatally and four weeks postpartum (Figure 1). Nine educational modules, three in each area (breastfeeding, healthy eating/active living, and stress management and self-care for depression prevention) were delivered via narrated slide presentations pre-loaded on the tablet and web-based applications and resources. Health professionals (i.e., two psychologists and a board-certified lactation consultant) and trained research assistants provided the content and narration for each topical area. Daily text messages, sent Monday through Friday, accompanied and mirrored each module to provide additional tips and web-based resources. Weekly individual professional support and counseling tied to the content areas were provided via teleconferencing using the tablet. Finally, a weekly virtual support group among study participants to enhance content sharing was planned; however, with limited numbers of participants simultaneously enrolled, only three groups were conducted.

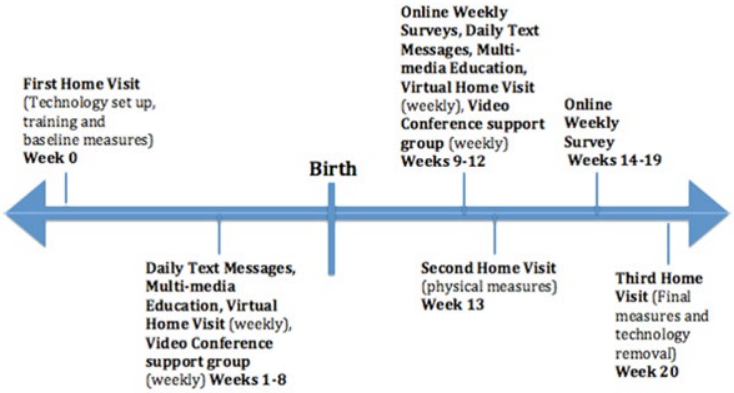

Figure 1. Study timeline including intervention and data collection points.

RESULTS

Participants. A sample size of eight to ten was desired; nine teens were screened and eight consented. Two participants (25%) withdrew prior to baseline data collection, and six (75%) were enrolled for the final sample. Post-enrollment attrition occurred for two participants (33%); one did not complete any intervention and withdrew prior to giving birth and one completed the intervention and withdrew at five weeks postpartum following the second home visit. Participant ages ranged from 16 - 19; the mean age was 17.7 years (SD = 1.4). All were single (100%) and two (33%) were living with the father of the baby. Four (67%) had completed middle school and two completed high school (33%). All were eligible for the Women and Infant Supplemental Nutrition (WIC) program and 50% received WIC benefits.

Feasibility. As noted in the methods section, some challenges in recruiting from the medical center clinics were experienced and altered our sampling criterion for age. Notes and observations were recorded along with the listing of potential recruits each week during recruitment. Challenges included slower than expected recruitment, a limited number of eligible potential recruits despite adequate pre-study estimates, and twice to three times weekly recruitment coverage in each clinic. Limited clinical staff support was experienced for assisting our research personnel during recruitment visits. On the participant side, some potential recruits did not show for appointments, some study recruits decided not to participate after agreeing to take part and/or before the home visit for baseline data collection, and refused participation due to being too busy.

Rate of intervention component completion for the five participants who completed the intervention were as follows: 28 out of 45 education module presentations (62%), module texts received and read (response = yes/no) in 42 of 45 cases (93%), and 35 out of 45 individual support sessions attended (78%). Individual participant rates of completion, including the participant who dropped out of the study before giving birth, ranged from 0 to 100% for each intervention approach (Table 2).

Table 1. Study measures and educational modules description.

Measure	Baseline - home visit	Birth (telephone self-report)	5-weeks postpartum home visit	3-months postpartum home visit	Weekly or bi-weekly online brief surveys via REDCap®	Educational module description
Demographic, physical, and social data	Age, race, education, pre-pregnancy weight, and current weight	Infant gender, birth weight, and gestational age	Return to work and/or school (yes/no)	-	-	-
Breastfeeding	5-point rating scale for self-report prenatal intention to breastfeed, intention to exclusively breastfeed (yes/no); intended duration of breastfeeding (months).	Breastfeed only, breastfeed partial (mother's milk and formula) or formula feed in hospital	Breastfeeding Experience Scale[14] to assess early breastfeeding problems and severity, as well as feeding patterns and weaning.	2 items on infant feeding method	10 weekly post- birth online surveys including items on breast and/or formula feeding. If discontinued breastfeeding, when?	The decision: Benefits of breastfeeding and exclusive breastfeeding, planning for breastfeeding, getting help from professionals and others. Early breastfeeding in hospital and after hospital discharge, early challenges, who to call for help. Maintaining milk supply, getting help from family and professionals, dealing with baby's growth spurts, return to work and school, family planning.
Healthy Eating/ Active Living	24-hour diet recall during the home visit with the National Cancer Institute Automated Self-Administered 24-hour Recall™ (ASA24™), a free, multiple-pass food recall tool for research and clinical practice based upon the USDA Automated Multiple-Pass Method.[15] ActiGraph activity monitoring[16] for 7 days following visit. Weight and height via scale and stadiometer.	-	24-hour diet recall during visit and ActiGraph activity monitoring for 7 days following visit. Weight and height via scale and stadiometer.	24-hour diet recall during visit and ActiGraph activity monitoring for 7 days following visit. Weight and height via scale and stadiometer.	Weekly: Number of red food servings previous day.[17] Minutes of physical activity the previous day.	Stop Light Diet 3 parts, making healthy food choices, diet planning, reading food labels. Exercise and keeping balance. Self-esteem and positive body image. Planned and incidental exercise.
Depression	Edinburg Postnatal Depression Scale (EPDS).[18] Ten item scale to assess depressive symptoms over the previous two weeks. Widely used among adult and adolescent mothers (post- and antenatal) with adequate psychometrics, sensitivity, and specificity.[18-20]	-	Edinburg Postnatal Depression Scale (EPDS)			
Perceptions of the content, technology ease of use, and participant burden.			Structured interview - example questions: What did you find useful or helpful about the breastfeeding education program? Was the technology user-friendly?			

Table 2. Individual rates of component completion.

Participant	Education Module Completion (completed independently by each participant)	Module Text Messages Received and Read (Yes/No)	Module Individual Support Received (mean length of session in minutes)
#1	4/9 (44%)	7/9 (78%)	8/9 (89%) (X = 20.1 min., SD = 11.7)
#2	9/9 (100%)	9/9 (100%)	9/9 = 100% (X = 24.2 min., SD = 2.2)
#3 (Dropped prior to giving birth)	0/9 (0%)	0/9 (0%)	0/0 (0%)
#4 (Dropped after intervention)	2/9 (22%)	4/9 (44%)	7/9 = 78% (X = 35.3 min., SD = 14.7)
#5	4/9 (44%)	9/9 (100%)	5/9 = 56% (X = 24 min., SD = 4.2)
#6	9/9 (100%)	9/9 (100%)	9/9 = 100% (X = 24.4 min., SD = 14.8)

Challenges of intervention delivery were recorded by research team members in module completion notes and included participant issues in scheduling and keeping support appointments including not responding to study personnel to schedule, not showing up for scheduled support meetings, and delayed responsiveness owing to reported "busy or hectic lives" (see Results on rates of intervention completion and Table 2). Technology issues included periodic limited internet bandwidth/connectivity during teleconference support meetings, tablet operation difficulty by one participant (e.g., charger failure), and one case of difficulty retrieving equipment at study completion (one lost activity monitor and one iPad charger).

Intervention Acceptability, Relevance, Burden, and Usefulness. Of the five participants who received the intervention, four (80%) completed the intervention evaluation interview. All (100%) reported that the content provided was understandable and relevant, and no changes were suggested. All four respondents reported that the tablet was easy to use (one tablet charger needed replacement during the intervention, but this was not mentioned in the evaluation). No burden of time for the interventions was reported. No changes for study design were recommended except for one of the four (25%) respondents who recommended shortening the study to less than three months after the birth of baby. The individual component evaluation (i.e., education modules, texts, individual support, and peer support) were appraised as most useful and least useful. Participants reported the module presentations (n = 3) and individual support (n = 2) were most useful with daily text messages only getting one "most useful rating". The peer support meetings were rated the least useful by three of the four respondents (75%). Regarding the text messaging, two of the four respondents thought more "new" information would be useful as opposed to information already shared in the education modules.

Evaluation of Data Collection Measures. Four of the five participants (80%) who completed the intervention provided responses to the survey regarding the study measures at the final home visit. First, convenience of home visits was reported as positive (n = 3), but one reported inconvenience stating the final visit was difficult to schedule due to responsibilities of work, school, and the baby. One participant noted that in-home visits were better than going outside the home for data collection and intervention. The weekly post birth online surveys were described by all four participants as easy to access using the REDCap® e-mail invitations; two participants noted that reminder emails did not always "pop up" as expected. Among the five participants who completed the online weekly surveys, four (80%) completed all ten surveys and one (20%) completed only two surveys.

The 24-hour diet recalls were judged as convenient by three of the four respondents (80%), however, one reported having difficulty remembering the schedule for the recalls. Activity monitoring issues were reported by three of the four (75%) respondents; two had difficulty remembering to put on the monitor in the morning or remove it at night and one had difficulty remembering to mail the monitor back to the project staff. One participant felt there were no barriers (25%), that project staff reminders helped, and the device was easy to wear.

Outcomes-Selected Results. Detailed data analysis for effectiveness was not intended for the behavioral outcomes for this feasibility study. However, some selected outcomes are reported here. Five participants (100%) who maintained post-birth study participation breastfed their infants; one (20%) maintained breastfeeding until three months postpartum and four (80%) discontinued breastfeeding before the final data collection (one at 3 weeks, one at 1 month, and two at 2.5 months). Also notable was prenatal baseline data indicated that one participant was unsure about feeding prenatally and another planned to formula-feed, yet these two mothers breastfed their newborns. For the healthy eating outcome, based in the online weekly surveys, five participants (100%) reported eating 0 - 4 red food servings (X = 1.3, SD = 1.3) and between 0 and 120 minutes of physical activity for the previous day (X = 27.7 minutes, SD = 24.9; median/mode = 30 minutes). For the depression symptom outcomes, EPDS scores were highest at the prenatal baseline (X = 5.7, SD = 3.7 [n = 6]), lowest at five weeks postpartum (X = 1.6, SD = 2.19 [n = 5]), and increased again at three months postpartum (X = 3.5, SD = 2.21 [n = 4]).

DISCUSSION

This feasibility study provided important data on several aspects of the momHealth project for sample recruitment and retention; intervention e-delivery feasibility (ease of use); content acceptability, relevance, burden, and usefulness; and our data collection and online survey methods convenience and burden.

We experienced challenges of slower-than-expected sample recruitment and apparent recruitment pool inadequacy within the two clinic settings. We suspected that the significant decline in teenage pregnancy rates across the United States was manifested in our local area and our sample. According to Martin and colleagues[2], "since 2009, the teen

birth rate has fallen to a new low each year. The rate for this group has declined 51% (or an average of 8% per year) since 2007 (p. 4)". In addition, two months after recruitment began, the limited numbers of potential recruits in our original age range of 15 to 18 years required us to modify our age criterion to 15 to 19 years. Indeed, the final sample included no 15-year-olds, one 16-year-old, one 17-year-old, one 18-year-old, and three 19-year-olds. In response to these issues, for our subsequent pilot randomized controlled trial (RCT), the expanded age range was used and the number of recruitment sites increased to six in medical centers and county health department clinics across our bi-state metropolitan area and two out-state sites. "Word of mouth" recruitment also was included to the sampling protocol.

We experienced attrition after screening and/or enrollment. However, based on our previous research with an adolescent pregnant and parenting sample in a longitudinal experimental design[22] and other work,[23-24] this was not completely unexpected. To address this in our pilot RCT, we enhanced our recruitment staff training to focus on clear, unrushed explanation of study requirements during the invitation and consent processes, and improved our study advertising flyer to include a clearer, simple description of study requirements and a photograph of a pregnant adolescent on the flyer.[24] We also built in additional training for our research staff in relation to communicating and working with pregnant and parenting adolescent mothers, including flexibility and persistence in scheduling and clarifying response expectations with participants.[23] Finally, enhanced engagement methods for participant retention were incorporated, including larger monetary incentives.

Our electronic mHealth intervention was judged acceptable, relevant, useful, and the technology was easy to use. Other researchers of feasibility of technology-based interventions for adolescent mothers or mother/infant dyads have had similar favorable outcomes, including interventions for depression treatment[23-25] and education for infant feeding.[26] The intervention in our subsequent pilot RCT was largely unchanged from the pilot although some of the text messaged information was enhanced with less repetitive information.

Likewise, our online automated data collection methods were reported as non-burdensome in number and easy to use. For the subsequent pilot RCT, our REDCap® surveys and reminders were revised and fixed where necessary. Our measures of healthy eating and physical activity were accomplished using standard dietary recall and activity monitoring and compared similarly to other research in adolescent mothers.[27] However, those measures appeared to be more challenging to our sample according to their reports. Thus, we incorporated enhanced instruction for participants in those measures and included automated e-mail reminders in our subsequent pilot RCT for both measures. We also gave participants the choice to do diet recalls by telephone or via online automated approach.

Limitations of the Study. We had a small sample from two university-affiliated prenatal clinics and fewer participants than we planned. However, our previous research indicated that this type of intervention focusing on multiple behaviors was attractive to pregnant women and pregnant adolescents.[28] Thus, it was important to gain feasibility information before going forward to a larger pilot RCT.

In conclusion, the findings partially supported the feasibility of the momHealth intervention. Although recruitment and retention were our greatest challenges, we have used that information in our pilot RCT to great benefit. Finally, the e-intervention and physical data collection were largely supported by our sample. We believe that the feasibility findings were useful in our securing our pilot RCT funding and conduct of that study.

ACKNOWLEDGEMENTS

This work was supported by the MacArthur Interprofessional Research Award (University of Kansas Medical Center Endowment Association). It was presented in 2017 as a poster at the Midwest Nursing Research Society Annual Conference, Minneapolis, MN.

REFERENCES

[1] Power to Decide. National and State Data. The National Campaign to Prevent Teen and Unplanned Pregnancy. https://powertodecide.org/what-we-do/information/national-state-data/national.%20Accessed%207-1-2020. Accessed November 2, 2020.
[2] Martin JA, Hamilton BE, Osterman MJK, Driscoll AK, Drake P. Births: Final data for 2016. Natl Vital Stat Rep 2018; 67(1):1-55. PMID: 29775434.
[3] U.S. Centers for Disease Control and Prevention. Rates of Any and Exclusive Breastfeeding by Sociodemographics Among Children Born in 2017 2020. October 4, 2020. https://www.cdc.gov/breastfeeding/data/nis_data/rates-any-exclusive-bf-socio-dem-2017.html. Accessed November 2, 2020.
[4] Howie LD, Parker JD, Schoendorf KC. Excessive maternal weight gain patterns in adolescents. J Am Diet Assoc 2003; 103(12):1653-1657. PMID: 14647096.
[5] Black MM, Papas MA, Bentley ME, et al. Overweight adolescent African-American mothers gain weight in spite of intentions to lose weight. J Am Diet Assoc 2006; 106(1):80-87. PMID: 16390669.
[6] Lemay CA, Elfenbein DS, Cashman SB, Felice ME. The body mass index of teen mothers and their toddler children. Matern Child Health J 2008; 12(1):112-118. PMID: 17551821.
[7] Chang T, Choi H, Richardson CR, Davis MM. Implications of teen birth for overweight and obesity in adulthood. Am J Obstet Gynecol 2013; 209(2):110.e1-e7. PMID: 23587742.
[8] Behrens TK, Bradley JE, Kirby JB, Nanney MS. Physical activity among postpartum adolescents: A preliminary report. Percept Mot Skills 2012; 114(1):310-318. PMID: 22582698.
[9] Lanzi RG, Bert SC, Jacobs BK, Centers for the Prevention of Child Neglect. Depression among a sample of first-time adolescent and adult mothers. J Child Adolesc Psychiatr Nurs 2009; 22(4):194-202. PMID: 19930300.
[10] Logsdon MC, Birkimer JC, Simpson T, Looney S. Postpartum depression and social support in adolescents. J Obstet Gynecol Neonatal Nurs 2005; 34(1):46-54. PMID: 15673645.
[11] Prochaska JJ, Spring B, Nigg CR. Multiple health behavior change research: An introduction and overview. Prev Med 2008; 46(3):181-188. PMID: 18319098.
[12] Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009; 42(2):377-381. PMID: 18929686.
[13] Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: Building an international community of software platform partners. J Biomed Inform 2019; 95:103208. PMID: 31078660.
[14] Wambach KA. Breastfeeding intention and outcome: A test of the theory of planned behavior. Res Nurs Health 1997; 20(1):51-59. PMID: 9024477.
[15] Subar AF, Kirkpatrick SI, Mittl B, et al. The Automated Self-Administered 24-hour dietary recall (ASA24): A resource for researchers, clinicians, and educators from the National Cancer Institute. J Acad Nutr Diet 2012; 112(8):1134-1137. PMID: 22704899.
[16] Brage S, Brage N, Wedeerkopp N, Froberg K. Reliability and validity of the computer science and applications accelerometer in a mechanical setting. Meas Phys Educ Exerc Sci 2003; 7(2):101-119.

[17] Epstein L, Squires S. The Stoplight Diet for Children: An Eight-week Program for Parents and Children. New York: Little Brown & Co., 1988. ISBN: 978-0316245753.
[18] Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry 1987; 150(6):782-786. PMID: 3651732.
[19] Wisner KL, Parry BL, Piontek CM. Clinical practice. Postpartum depression. N Engl J Med 2002; 347(3):194-199. PMID: 12124409.
[20] Gaynes BN, Gavin N, Meltzer-Brody S, et al. Perinatal depression: Prevalence, screening accuracy, and screening outcomes. Evid Rep Technol Assess (Summ) 2005; (119):1-8. PMID: 15760246.
[21] Richardson LP, Rockhill C, Russo JE, et al. Evaluation of the PHQ-2 as a brief screen for detecting major depression among adolescents. Pediatrics 2010; 125(5):e1097-e1103. PMID: 20368315.
[22] Wambach KA, Aaronson L, Breedlove G, Domian EW, Rojjanasrirat W, Yeh HW. A randomized controlled trial of breastfeeding support and education for adolescent mothers. West J Nurs Res 2011; 33(4):486-505. PMID: 20876551.
[23] Pinto-Foltz MD, Logsdon MC, Derrick A. Engaging adolescent mothers in a longitudinal mental health intervention study: Challenges and lessons learned. Issues Mental Health Nurs 2011; 32(4):214-219. PMID: 21355755.
[24] Logsdon MC, Martin VH, Stikes R, et al. Lessons learned from adolescent mothers: Advice on recruitment. J Nurs Scholarsh 2015; 47(4):294-299. PMID: 25968179.
[25] Logsdon MC, Barone M, Lynch T, et al. Testing of a prototype web based intervention for adolescent mothers on postpartum depression. Appl Nurs Res 2013; 26(3):143-145. PMID: 23473677.
[26] Taki S, Lymer S, Russell CG, et al. Assessing user engagement of an mHealth intervention: Development and implementation of the growing healthy app engagement index. JMIR mHealth uHealth 2017; 5(6):e89. PMID: 28663164.
[27] Davis AM, Gallagher K, Taylor M, et al. An in-home intervention to improve nutrition, physical activity, and knowledge among low-income teen mothers and their children: Results from a pilot study. J Dev Behav Pediatr 2013; 34(8):609-615. PMID: 24131884.
[28] Davis AM, Wambach KA, Nelson EL, et al. Health behavior change in pregnant women: A two-phase pilot study. Telemed J E Health 2014; 20(12):1165-1169. PMID: 25289706.

Keywords: adolescent pregnancy, breastfeeding, health behaviors, healthy nutrition, depression