
Smoking Hygiene: An Educational Intervention to Reduce Respiratory Symptoms in Breastfeeding Infants Exposed to Tobacco

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Abstract

The American Academy of Pediatrics recently removed nicotine from the category of drugs contraindicated during breastfeeding. Little evidence demonstrates that infants exposed to nicotine through breastfeeding experience increased health risks beyond the airborne risks associated with passive smoking. The purpose of this longitudinal, five-week, quasi-experimental pilot study was to determine whether “smoking hygiene,” an educational intervention, reduces the frequency of respiratory symptoms experienced by infants whose mothers both smoke and breastfeed. Twenty-nine mother-infant pairs entered the study with 28% dropping out. Of the 21 mother-infant pairs who completed the study, 66% of the nine infants in the control group experienced respiratory illness, compared to 42% of the 12 infants in the intervention group ($\chi^2 = .814$; $p > .05$). Thus, the difference was statistically nonsignificant in this small sample, but the trend worsened the anticipated direction. The study demonstrates some of the difficulties of intervening with this group of mothers.

Journal of Perinatal Education, 11(3), 28–37; environmental tobacco smoke, infant, breastfeeding, upper respiratory infection.

Introduction

Maternal smoking during pregnancy is associated with premature birth, intrauterine growth retardation, decreased birth weight, decreased head circumference and length, perinatal complications, sudden infant death syndrome (American College of Obstetricians and Gynecologists, 1993; DiFranza & Lew, 1996), and attention deficit disorder (Becker et al., 1999). In addition, fetal

exposure to nicotine poses an increased risk of future addiction to tobacco (Kandel & Udry, 1999).

After birth, infants and children exposed to environmental tobacco smoke (ETS) continue to experience increased health risks. Infants can also be exposed to the components of tobacco through breast milk when mothers smoke and breastfeed, although health risks related to this route of exposure are not well documented and have not been compared well to the benefits of continued breastfeeding. Recommendations are directed toward reducing exposure via both routes, but none is research-based for women who both smoke and breastfeed.

It has been suggested that smoking and breastfeeding mothers should decrease the cigarettes they smoke to <15 a day to reduce the possible risk of nicotine poisoning of the infants through breast milk (Luck & Nau, 1985). Although the dangers associated with smoking during pregnancy are well documented, it is not clear whether these dangers are also associated with the nicotine-adverse effects to infants through breast milk.

Review of Literature

Nationwide, the number of women of childbearing age who smoke is decreasing (Centers for Disease Control and Prevention [CDC], 2000). However, in Wyoming—where this study took place—the Wyoming Reproductive Health Study (Ellis, Glover, Heilman, & Miner, 1999) reported that 43% of pregnant women used tobacco; however, numbers of women who continued to smoke throughout pregnancy are undocumented. Nationwide, an estimate of 18%–20% of pregnant women smoke during their pregnancies (CDC, 1999). In 1998, the CDC reported that 64% of all infants born in the United States were initially breastfed (Hill, 2000).

Although the number of women who smoke and breastfeed is unclear, these infants are exposed to additional nicotine through breast milk. Research has shown that infants whose mothers smoke and breastfeed are exposed to significantly higher levels of nicotine and its metabolite cotinine than infants of mothers who smoke and feed artificial milks (Mascola, Van Vunakais, Tager, Speizer, & Hanrahan, 1998). Luck and Nau (1985) reported that significant levels of nicotine in breast milk beyond exposure to airborne tobacco smoke might lead to apneic attacks, hyperexcitability, and vomiting in infants who breastfeed. However, literature is limited on

the physiologic effects of the components of tobacco transmitted to the infant through breast milk. One pilot study indicated that infants of mothers who smoke and breastfeed have higher baseline temperatures, heart rates, and respiratory rates than infants whose mothers breastfeed but do not smoke (Flanders-Stepans & Wilkerson, 1993). However, Becker and colleagues (1999) found that the risk of respiratory illness during the first year of life was seven times higher in infants who were fed artificial milk than in infants who were breastfed when mothers smoked. This suggests that, even with increased nicotine intake, breastfeeding may be protective against respiratory illness.

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Because breastfeeding provides unique nutritional and immunological advantages to the infant (American Academy of Pediatrics [AAP], 1997; Minchin, 1991; Picciano, 2001), mothers that smoke cigarettes must not be discouraged from continuing to breastfeed. The AAP recommends breastfeeding for the first 12 months because extensive research documents that human milk is “uniquely superior for infant feeding” and results in “health, nutritional, immunologic, developmental, psychological, social, economic and environmental benefits” (AAP, 1997, p. 1035). They recommend that health care professionals should encourage all women to breastfeed. However, questions have been raised as to the extent that the advantages of breastfeeding outweigh the disadvantages of feeding breast milk contaminated with nicotine (AAP, 2001). As a response, in 2001 the AAP Committee on Drugs removed nicotine from the category of drugs contraindicated during breastfeeding because there is “no evidence to document whether this amount of nicotine presents a health risk to the nursing infant” (p. 776). This action supports the continuation of breastfeeding in infants of smoking mothers.

Along with the exposure that the infant receives from contaminated breast milk, the infant is also passively

Smoking Hygiene

exposed to all the components of tobacco through environmental tobacco smoke, also known as ETS (Schulte-Hobein, Schwartz-Bickenbach, Abt, Plum, & Nau, 1992). All infants whose mothers smoke are at an increased risk of respiratory illness (Becker et al., 1999; DiFranza & Lew, 1996; Gergen, Fowler, Maurer, Davis, & Overpeck, 1998; Li, Peat, Xuan, & Berry, 1999; Marini, Agosti, Motta, & Mosca, 1996). Stoddard and Gray (1997) estimated that, in 1987, \$661 million was spent to care for respiratory problems in children whose mothers smoked. This is similar to findings in which adults exposed to passive smoke have been linked to increased risks of heart attack, stroke, and peripheral vascular disease (Cruikshanks et al., 1998).

One goal of the Healthy People 2010 initiative is to increase smoking cessation and maintain abstinence during pregnancy (CDC, 2000). Cessation is recommended because of the known risks of exposure to environmental tobacco smoke and the suspected added risks of exposure from contaminated breast milk. Although smoking cessation is the ideal goal for mothers, it may not be realistic in every situation. Beeber (1996) suggested that “primary care providers need to inform parents about alternatives to cessation that can protect their children from this dangerous exposure” (p. 58). Along with ways to decrease the exposure of their infant and/or child to environmental tobacco smoke, health care providers should also address helpful tips to aid in smoking cessation among parents who smoke. Breastfeeding and smoking (Mascola et al., 1998), the number of cigarettes smoked by the mother (Becker, et al., 1999; Flanders-Stepans & Fuller, 1999), smoking while feeding, and smoking while near or in the same room as the infant (Woodward, Grgurinovich, & Ryan, 1986) have all been shown to increase the amount of infants’ exposure to the components of tobacco.

Along with ways to decrease the exposure of their infant to environmental tobacco smoke, health care providers should also address helpful tips to aid in smoking cessation among parents who smoke.

The issue of mothers who smoke and breastfeed is relevant to nursing because nurses are commonly the

health care professionals providing educational information to patients. The purpose of this study was to explore the effectiveness of an intervention that provided education to mothers in order to decrease the occurrence of respiratory symptoms experienced by their infants and to determine the practical application of the intervention.

Smoking Hygiene: An Educational Intervention

Recommendations are available to advise mothers on strategies that would theoretically reduce infant exposure to nicotine and ETS (Flanders-Stepans & Fuller, 1999; Flanders-Stepans & Wilkerson, 1993; Minchin, 1991). No improved outcomes from these recommendations have been documented thus far. The following recommendations operationally define a strategy named “smoking hygiene”:

- If women are unable to quit smoking, provide them with strategies to reduce the number of cigarettes smoked and to smoke away from the infant.
- Caution mothers never to smoke in the car or near the infant in closed areas.
- Advise mothers to smoke only immediately after breastfeeding and at least 90 minutes prior to breastfeeding.
- Recommend the use of an air purifier for use inside the home.
- Advise mothers not to take the infant into smoky environments.

Research Question

As an educational intervention, can smoking hygiene reduce the frequency of respiratory symptoms experienced by infants whose mothers smoke and breastfeed?

Method

The nursing intervention of introducing smoking hygiene in this study relied on all of the above strategies intended to reduce both forms of exposure to the infant. This study was undertaken to evaluate the effectiveness of the intervention on reducing the occurrence of signs and symptoms of respiratory illness experienced by the infant. Equally important was determining the ease of implementation of the intervention for mothers.

Design

A longitudinal, quasi-experimental design was used in this pilot study. The frequency of respiratory symptoms experienced by the infants in an intervention group was compared to a control group over a five-week period. In addition, information was gathered from mothers in the intervention group about the ease or difficulty of following the intervention guidelines.

Sample and Sampling Procedure

Sampling criteria. To be eligible for participation in the study, the mothers must have smoked >5 cigarettes a day prenatally, planned to breastfeed, planned to be discharged with the baby, and had no significant health problems. The infants were required to have met the following eligibility requirements: birth weight of at least 2500 grams, 37 or more weeks gestation, total bilirubin less than 15 mg/dl at 24–48 hours after birth, and oxygen therapy for less than 24 hours after birth.

Sampling plan. Twenty-nine mother-infant pairs were recruited into the study from four maternal-child postpartum units in Wyoming. Approval was obtained from each unit's review boards, as well as from the University of Wyoming.

Procedure. Members of the inpatient maternity staff were asked to complete a solicitation guide to determine each potential participant's eligibility. If eligible, the mother received an invitation to participate in the study. If she expressed interest, she was asked to sign a consent form and complete a demographic questionnaire. Free diapers were given at each of the three home visits and, upon completion of the study, the women were paid \$40.

Mother-infant pairs were randomly assigned to either the control or intervention group. The participants were not aware of their assignment to the control or intervention group. However, in order to provide the intervention, the data collectors knew to which group each participant was assigned.

Instrumentation. A demographic questionnaire was completed by each of the mothers in the study. Questionnaire results provided the following information: 1) mother's age, 2) marital status, 3) number of years

of school completed, 4) total family income, 5) smoking history during pregnancy, 6) number of cigarettes/day both during pregnancy and since giving birth, 7) complications during pregnancy, 8) complications during labor, 9) infant's complications after birth, 10) infant problems now, 11) mother's due date, 12) infant's birth date, 13) sex of the infant, 14) birth weight, length and APGAR score, 15) number times/day currently breastfeeding, and 16) amount of formula in 24 hours. Much of this information (items 6–16) was used to verify that the mother-infant pair was eligible to participate in the study.

A questionnaire was used to determine the mother's smoking habits. The smoking habits questionnaire was evaluated in a previous research study and found to be at a seventh-grade reading level and provided valid information about the conditions in which the infant was exposed to ETS (Flanders-Stepans & Fuller, 1999). In addition to asking the mother how many cigarettes she smoked per day, the questionnaire asked the infant's proximity to her when she smoked and the number of other smokers in the household. The smoking habits questionnaire was completed by each of the mothers in the control group at both postpartum Weeks 2 and 5 visits, and the intervention group completed the smoking habits questionnaire at postpartum Week 2.

A smoking hygiene questionnaire was completed by each of the mothers in the intervention group at Week 5. This questionnaire evaluated the mother's adherence to the guidelines of the intervention and asked her to describe her experience implementing the intervention; thus, this smoking hygiene questionnaire was more comprehensive than the smoking habits questionnaire.

The infant respiratory signs and symptoms that were queried at each of the three home visits (Weeks 2, 3, and 5) included wheezing, cough, upper respiratory infection (cold), ear infection, pneumonia, bronchitis, and hospitalization. These signs and symptoms were chosen from a literature review on the effects of ETS on infants and children and incorporated into a home-visit guide.

Intervention

The intervention group received the smoking hygiene education intervention (Flanders-Stepans & Wilkerson, 1993; Woodward et al., 1986). Smoking hygiene, as operationally defined above, was taught using an educa-

tional pamphlet and reinforced at each home visit. Those in the intervention group were also given a Honeywell Envirocare HEPA room air cleaner to use in the infant's room for the duration of the study. This air filter is advertised to remove 99.7% of pollutants from the air, including environmental tobacco smoke. The mothers were instructed to leave the air cleaner on the "low" setting, continuously.

Study Design and Data Collection

Intervention Group

Week 2. When the infant was 2 weeks old, a data collector made a home visit and taught the mother about smoking hygiene. The pamphlet on smoking hygiene was discussed and a room air cleaner was given to the mother. Mothers were instructed to place the infant in the infant's room while he/she was sleeping. The mother was also instructed to take the room air cleaner with her if overnight travel was planned. Respiratory illness signs and symptoms were recorded at the visit. The mothers completed a smoking habits questionnaire.

Week 3. Respiratory illness data were obtained at a home visit, as in Week 2. Smoking hygiene education was reinforced at this visit.

Week 5. Respiratory illness data were collected on the infant in the same way as obtained during the Weeks 2 and 3 visits. The smoking hygiene questionnaire was completed.

Control Group

Week 2. When the infant was 2 weeks old, a data collector made a home visit and recorded respiratory illness signs and symptoms. The smoking habits questionnaire was completed.

Week 3. When the infant was 3 weeks old, respiratory illness signs and symptoms were recorded.

Week 5. When the infant was 5 weeks old, respiratory illness data were again collected. The second smoking habits questionnaire was collected. At the completion of the study, the mothers were then given the smoking hygiene pamphlet with instructions related to protecting the infant from exposure to tobacco.

Statistical Analysis Independent sample t-tests were used to determine whether differences in demographic data existed between the intervention group and the

control group. Paired t-tests were used to compare the mean number of cigarettes smoked per day at Week 2 and Week 5 for all of the mothers in the study. The following null hypothesis was developed: The frequency of respiratory illness experienced by infants in the intervention group will be the same as the frequency of respiratory illness experienced by infants in the control group. Chi-square was used to determine whether to accept or reject the null hypothesis. The level of significance assigned was .05.

Findings

Description of the Sample

Twenty-nine mother-infant pairs were enrolled. Demographic data were collected on 26 of the participants. Twenty-one mother-infant pairs remained in the study through Week 5. Eight mother-infant pairs (25%) did not complete the study for reasons described below.

Four participants from the control group dropped out of the study. The data collector was unable to contact two of these participants at home following enrollment during their stay in the hospital. The other two of these participants had stopped breastfeeding prior to the first home visit. In the intervention group, another four participants did not complete the study. Two of these participants had stopped breastfeeding prior to the Week 2 visit. Another participant quit breastfeeding following the Week 2 visit when her infant became ill. Another participant quit smoking following the Week 2 visit.

Thus, 12 participants completed the study in the intervention group while nine completed the study in the control group. The random assignment of the participants to each group resulted in unequally sized groups.

Demographics. The t-tests revealed no significant differences between groups in maternal age, income, level of education, number of years smoked, total number of smokers living in the household, number of cigarettes smoked at Week 2, or number of cigarettes smoked at Week 5 (see Table 1).

The range of family income among the participants was \$10,000–\$19,000 per year. Fifty-two percent of the mothers were married at the time of the study. Ninety-five percent of the participants smoked during their pregnancy. The one participant who did not smoke during

Table 1 Comparison of Means of Demographic Data between Intervention (n = 12) and Control (n = 9) Groups

Variable	Mean	SD	t	p
Education			1.552 ₍₁₉₎	0.137
Intervention	13.25	2.42		
Control	11.89	1.17		
Age			1.879 ₍₁₉₎	.076
Intervention	28.42	7.00		
Control	23.33	4.69		
# Years Smoking			1.417 ₍₁₉₎	.173
Intervention	12.25	6.22		
Control	8.56	5.46		
Total # Smokers			0.267 ₍₁₉₎	.792
Intervention	2.00	1.04		
Control	1.89	.78		
# Cigarettes during Pregnancy			2.269 ₍₁₈₎	.036
Intervention	20.75	13.94		
Control	12.11	5.58		
# Cigarettes/Day Week 2			0.496 ₍₁₉₎	.626
Intervention	17.00	8.22		
Control	15.00	10.27		
# Cigarettes/Day Week 5			1.58 _(17,20)	.132
Intervention	16.17	9.10		
Control	11.33	4.69		

p < .05

pregnancy chewed nicotine gum, but resumed smoking cigarettes following the birth of her infant. Because of this, she was not included in the analysis of number of cigarettes smoked during pregnancy. Tests revealed a significant difference in the number of cigarettes smoked during pregnancy between the intervention and control groups (*p* = .026). The women in the intervention group smoked more cigarettes (*M* = 20.75) throughout pregnancy than the women in the control group smoked (*M* = 12.11). The difference in the number of cigarettes smoked between the groups was no longer present at the two-week visit (*M* = 17 and 15, respectively), but trended back toward pregnant rates by Week 5 (*M* = 16.17 and 11.33, respectively).

Illness

During each home visit, mothers were asked if their infant had experienced any respiratory signs and/or symptoms since they were last seen (see Table 2). Chi-square was used to analyze the illness data (see Table 3). At Week 2, no difference occurred between the two

Table 2 Summary of Illness Data (N = 21)

	Week 2	Week 3	Week 5
Intervention Group			
Wheezing			
Cough	33%	17%	25%
URI			
*Sneezing/Congestion	8%	8%	8%
Control Group			
Wheezing			
Cough	44%	44%	22%
URI			
*Sneezing/Congestion	0%	0%	0%

*These symptoms were not included in analysis.

groups at the beginning of the intervention ($\chi^2 = .269$; *p* = .67). The episodes of illness after intervention at Weeks 3 and 5 were combined and compared to examine the effect of the intervention. The difference between the groups when episodes of illness were compared did not reach statistical significance ($\chi^2 = .814$; *p* > .05). However, 67% (6 out of 9) of the infants in the control group

Smoking Hygiene

Table 3 Comparison of Episodes of Respiratory Illness between Infants in the Intervention (n = 12) and the Control (n = 9) Groups at Weeks 2, 3, and 5

Group	Episodes of Illness	χ^2	<i>p</i>
Week 2			
Intervention	4 (33%)	.269	.673
Control	4 (44%)		
Weeks 3 & 5			
Intervention	5 (42%)	.814	.666
Control	6 (66%)		

p < .05

experienced at least one episode of respiratory symptoms during the study, while 42% (5 out of 12) of the infants in the intervention group experienced respiratory symptoms at least once. Thus, the trend was in the anticipated direction.

It is also worth mentioning that the infant of the heaviest smoker in the intervention group experienced significant respiratory illness throughout the study. Reported illnesses were wheezing, coughing, urinary tract infections, and one instance of sneezing/congestion. No instances of ear infections, pneumonia, bronchitis, medical visits, or hospitalizations were reported. Mothers were not queried about changes in sleeping and eating behavior, nor were temperatures taken or reported.

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Smoking Hygiene

Women in the intervention group were asked whether they found it easy or difficult to follow the smoking hygiene suggestions. Seventy-five percent of the mothers said it had been easy to follow the suggestions of the intervention pamphlet. Their compliance was inconsistent. Half of the mothers stated they *usually* were able to limit their smoking to 90 minutes prior to breastfeeding, while another half stated they *sometimes* were able to

do this. Eight of the mothers stated they usually kept the room air cleaner in the room where the infant slept. When asked whether they and others had consistently smoked in another room away from the infant, only four (33%) of the mothers said they were *usually* able to do so. Only one mother reported that both she and others *always* smoked in another room away from the infant. One mother reported never smoking away from the infant (see Table 4). This participant was an outlier in that she smoked 30–40 cigarettes a day and her infant had significant respiratory illness throughout the study.

Data were also collected to determine whether the control group used some forms of smoking hygiene without having been presented with the smoking hygiene intervention. None of the women in the control group smoked while breastfeeding; four (44%) did not smoke while being in the same room with their infants. These actions paralleled some aspects of smoking hygiene intervention without the education program.

Paired t-tests for the intervention group revealed no significant differences between the number of cigarettes smoked at Week 2 and the number smoked at Week 5 (*p* = .363), although the trend was towards an increase. The number of cigarettes smoked at Weeks 2 and 5 by the women in the control group also did not significantly differ (*p* = .219), but the trend was towards the reported prenatal level. See Table 5.

Limitations

Although the demographics of the sample for this pilot study are similar to those in other studies of this nature (Flanders-Stepans & Fuller, 1999; Greenberg et al., 1994; Woodward, Owen, Grgurinovich, Griffith, & Linke, 1987), generalizing the findings to other populations is limited due to the small sample size of this pilot study.

Because it is unethical to control smoking behaviors or infant care practices, some women in the control group decided to implement smoking hygiene behaviors on their own. Thus, the overall difference in exposure among infants in the control and experimental groups was less than anticipated.

The smoking hygiene questionnaire completed by mothers in the intervention group needs revision. The choices for responses to questions about following the smoking hygiene guidelines were written as *usually*,

Table 4 Results of Smoking Hygiene Questionnaire—Intervention Group, Week 5 ($n = 12$)

	Sometimes	Usually	Not at All
Followed Smoking Timing Guidelines	6 (50%)	6 (50%)	0
Infant Slept in Room with Air Cleaner	4 (33%)	8 (67%)	0
Smoked Away from Infant	6 (50%)	5 (42)	1 (8%)
Use of Smoking Hygiene	<i>Easy</i> : 8 (67%)	<i>Difficult</i> : 4 (33%)	

Table 5 Comparison of Number of Cigarettes Smoked at Weeks 2 and 5

	Mean	SD	t	p
Intervention Group				
Week 2	17.00	8.22	.950 ₍₁₁₎	.363
Week 5	16.17	9.10		
Control Group				
Week 2	15.00	10.27	1.33 ₍₈₎	.219
Week 5	11.33	4.69		

sometimes, or *not at all*. Some participants asked for an explanation of the difference between “sometimes” and “usually.” Development of more objective responses would provide a more accurate measure of how closely the intervention is followed.

Discussion

Smoking hygiene shows promise in helping mothers who smoke and breastfeed to reduce infant respiratory illness. Although mothers reported the intervention was, overall, easy to implement, 50% of the intervention group usually did not follow all the principles of smoking hygiene and 44% of the control group spontaneously used some aspects of smoking hygiene. Modifications of this intervention and/or study design are needed before it becomes a useful way to educate mothers to increase precautions related to tobacco.

Illness

The educational intervention, smoking hygiene, may have had a positive influence on the health of infants whose mothers smoked and breastfed. Even though a statistical difference did not occur between the two groups, a positive trend occurred toward the reduction

of infant exposure to tobacco and symptoms rate in infants whose mothers smoke and breastfeed. This trend might be amplified by a larger sample size and with statistical techniques to assure comparisons of a more consistent adherence to the intervention. Also, the trend is consistent with those found in a study by Schulte-Hobein and colleagues (1992) who compared the number of respiratory infections in infants of smokers versus the number in infants of nonsmokers.

Smoking Hygiene Intervention

Another finding is that most mothers stated that the intervention was easy to implement. However, only 33% of the intervention mothers smoked in another room away from the infant, and only 50% timed their smoking relative to breastfeeding according to the smoking hygiene guidelines. Thus, the intervention was not well implemented. These findings may help to explain the results of other studies. Woodward and colleagues (1987) found no difference in the cotinine levels of infants following the implementation of an educational intervention. Greenberg et al. (1994) found a decrease in reported exposure to tobacco based on parental report but found no association between the intervention and infant urinary cotinine levels. The results of this pilot study provide some insight into a potential reason for these findings. Although women may say that an intervention is easy to implement because it is easy to understand, women who are addicted to tobacco may not actually apply the educational intervention.

Several modifications to the design and implementation of the study could potentially enhance the efficiency and effectiveness of the intervention. Because lactation consultants regularly visit maternal-child health units, they are well placed for postpartum recruitment of participants, as well as for follow-up and data collection with mothers. The decision to approach some pregnant mothers regarding the study at a pre-admission interview

at 36 weeks gestation proved to be useful and effective. These women had an opportunity to contemplate their decision if they were unsure about participating in a research study. Larger studies in the future should consider longer follow-up procedures and statistical control for the level of actual intervention implementation.

Overall Meaning of the Findings

The findings of this study suggest that, with modification, smoking hygiene may become a valuable educational tool that can be used by health care professionals to help women who smoke and breastfeed decrease the health risks to their infants. The short length of time of the intervention (four weeks) and the small sample may have contributed to the lack of the difference between the groups reaching statistical significance. A reduction in the amount of health care dollars spent treating infant respiratory illnesses would potentially save health care dollars each year and contribute to infant well-being. Given the potential benefits, the evidence from this pilot study is strong enough to support the need for a larger, more definitive study.

Implications for Research

Using this intervention, the larger studies similar to this pilot that need to be performed should employ appropriately modified and expanded questionnaires and data collection methods to increase the accuracy of the results and make them easier to interpret. In particular, outcome measures need to be expanded. Replication research will help develop and refine educational interventions that will help mothers who smoke and breastfeed to reduce their infants' amount of exposure to tobacco.

Additional research should be done to evaluate the effects of this intervention on measurable outcomes such as nicotine and cotinine in breast milk and urine (Woodward et al., 1986). Based on the finding that women often did not adhere to the guidelines of the intervention, research is needed to explore how to assist women to act on the smoking hygiene education they have received.

When the mother smokes, infants who are breastfed have a significantly lower risk of respiratory illness during the first year of life versus infants who are fed artificial milk when the mother smokes (Lawrence, 1994; Woodward, Douglas, Graham, & Miles, 1990). Smoking

hygiene may further reduce this risk and the costs associated with treating their illness.

Use of a qualitative question to describe the use of the intervention may provide further insight into why the mothers may or may not follow the intervention guidelines. Determining whether the mother is on the continuum of considering to quit smoking would help guide individualization of the intervention to include the appropriate education for smoking cessation.

Implications for Practice

Providing appropriate education to women who smoke is a responsibility. Many advertisements warn about the dangers of smoking during pregnancy, but minimal literature is available to counsel new mothers who smoke. It is important to discuss the benefits of breastfeeding and encourage mothers to do so. It is crucial that new mothers who smoke be told or informed that it may be better to smoke and breastfeed than to smoke and bottle-feed. Women should be counseled and encouraged to quit smoking throughout their lives, but especially during pregnancy and lactation. If they cannot quit, smoking hygiene may help to reduce the occurrence of respiratory symptoms in infants. By providing guidelines on smoking behaviors, smoking hygiene may serve as a tool for health care professionals to educate mothers.

Many advertisements warn about the dangers of smoking during pregnancy, but minimal literature is available to counsel new mothers who smoke.

Acknowledgments

This study was made possible by funding provided by the Wyoming Chapter of the March of Dimes, the American Nurses Foundation (99-168), and the University of Wyoming College of Health Sciences.

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