Maintenance of Smoking Cessation in Korean Single Mothers

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Research article

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Abstract

Background: Single mothers in South Korea are vulnerable to developing smoking habits, due to many difficulties and limitations; however, they have often been overlooked by smoking cessation support services. Therefore, this study aimed to investigate the demographic and smoking-related characteristics of single mothers registered with the Seeking Smoking Cessation Services Program in Seoul, South Korea, to identify factors associated with smoking cessation maintenance at 4, 6, 12, and 24 weeks after they initially quit smoking.

Methods: The participants were 77 single mothers registered at the Seeking Smoking Cessation Services Program. Data were included from a three-year span (January 2017 to December 2019). Smoking cessation counseling, motivational enhancement, and self-exploration counseling were provided for six months. The participants were evaluated on their smoking cessation status at 4, 6, 12, and 24 weeks.

Results: Most participants were aged 22 years or younger. The rates of smoking cessation maintenance were 58.4%, 39%, 28%, and 18% at 4, 6, 12, and 24 weeks, respectively. The rate of smoking cessation maintenance increased as the number of counseling sessions attended increased. Smoking cessation maintenance was also significantly associated with pregnancy status, exhaled carbon monoxide level, and drinking.

Conclusion: A counseling program to effectively promote smoking cessation and enhance motivation to maintain smoking cessation should be developed and provided to single mothers. Smoking cessation counselors have an important role as sources of support for those who want to quit smoking, and should aim to reduce the rate of smoking among single mothers by providing them with consistent counseling.

Background

The South Korean family structure has undergone drastic changes due to social and cultural shifts, resulting in delayed marriage or pregnancy and increased divorce or separation. Thus, more individuals are living alone or within atypical families [1, 2]. The proportion of single parents within the population has also increased as a result of these changes. Moreover, 73% of these are single mothers, accounting for a much higher proportion than single fathers [3].

Several studies have shown that the smoking rate is higher among single mothers than married mothers [4 – 6]. This phenomenon can be attributed to the societal experiences that single mothers have following childbirth that are quite different from those of married mothers. Single mothers experience physically and mentally deteriorating levels of stress as they raise or adopt a child on their own [7]. They are consistently exposed to higher levels of stress from socioeconomic burdens, compared to married mothers [8]. Single mothers are more likely to suffer from depression than married mothers [9 – 11]. The incidence of mental health disorders is also higher among younger single mothers, since they have a short amount of time to adapt to society and tend to have young children who require high levels of parental responsibility [12, 13].

Further, single mothers are not only vulnerable to mental health disorders but also physical health problems. For instance, they are at a higher risk than married mothers for conditions such as hypertension, obesity, and diabetes [14]. Single mothers are often forced to discontinue their education or careers to care for their children, which can lead to financial difficulties. Moreover, the younger a single mother is, the greater the financial burden she faces [13, 15, 16]. Financial difficulties can seriously disrupt a child's social, emotional, and intellectual development [17, 18].

The difficulties that single mothers face can lead to the abuse of substances such as alcohol and nicotine [19], and single mothers are more likely to smoke cigarettes than married mothers [5, 11, 20]. Without effective strategies for coping with difficult situations, individuals often resort to smoking to manage stress. A study on women with low income found that they tended to smoke to control their mood in stressful situations [21]. Notably, smoking not only affects a single mother's health but also that of her fetus or child. As younger people are more generally more affected by smoking, and single mothers tend to give birth at younger ages than married mothers, single mothers and their infants are typically more vulnerable to the risks of smoking [22]. It is well established that smoking during pregnancy increases the prevalence of premature birth, low birth weight, and sudden infant death syndrome [23, 24]. Pregnancy is a strong reason for both temporary and long-term smoking cessation. Smoking relapses often occur during pregnancy, and single mothers are more likely to relapse than married mothers [25, 26].

Smoking among single mothers is a high-priority public health concern, and healthcare services must be actively provided to reduce the rate of smoking among single mothers, since smoking is a major preventable risk factor [27]. Despite the need for smoking cessation programs tailored to single mothers, research on systematic health promotion programs for single mothers is lacking. This study aimed to

investigate smoking-related characteristics and factors associated with smoking cessation maintenance among single mothers by providing smoking cessation counseling services tailored to this population.

Methods

Participants

Data were collected from participants registered in the Smoking Cessation Service Integrated Information System(nosmk.khealth.or.kr) from January 1, 2017 to December 31, 2019. The participants were single women who were pregnant or had given birth and resided in a facility for single mothers at the time of service registration. A total of 77 participants were included. This study was approved by the Institutional Review Board of the Catholic University of Korea (MC20ZESI0011).

Measurement

Demographic characteristics

The following demographic characteristics were examined age, pregnancy status, drinking, weekly amount of drinking, exercise, weekly amount of exercise, and education level. Drinking was classified as either “yes” or “no,” depending on whether the participant had consumed alcohol in the last year. The weekly amount of drinking was expressed as the number of glasses. Exercise was classified as either “yes” or “no,” depending on whether a participant engaged in at least 10 minutes of moderate-intensity exercise once per week. Weekly amount of exercise was expressed in minutes.

Smoking-related factors

Smoking-related factors included age of first smoking, exhaled carbon monoxide (CO) level, cigarettes per day, number of counseling sessions attended, total smoking period, nicotine dependence, whether they attempted to quit smoking in the past year, and scores on the “importance,” “confidence” and “readiness” motivation rulers for smoking cessation.

Nicotine dependence was measured using the Fagerström Test (FTND), in which items are scored from 0 – 10 points, with higher scores indicating higher levels of nicotine dependence. According to FTND score, nicotine dependence can be classified as low (0 – 3 points), moderate (4 – 6 points), or high (7 – 10 points) [28]. Three motivation rulers were used to assess participants’ motivation for smoking cessation. Importance was assessed using the following item, “How important is stopping smoking to you (0 = Not important at all; 10 = Most important goal of my life)?” Confidence was assessed by, “How confident are you that you will quit smoking within the next month (0 = Not at all; 10 = 100% confident)?” Readiness was assessed by, “How ready are you to quit smoking within the next month (0 = Not at all; 10 = 100% ready)?” [29, 30].

Smoking cessation supporters

To know whether they had support from others in their smoking cessation efforts, participants were asked the question “Who helps you quit smoking?” ten groups were identified as supporters for smoking cessation, parents/grandparents, siblings, partner, children, friends/school peers, coworkers, teachers, healthcare professionals, others and no one.

Reasons for smoking cessation

Participants were asked to list one reasons why they wanted to quit smoking. Nine possible responses were provided: “advice from family or others around me,” “for my health,” “financial reasons,” “environmental reasons such as expansion of nonsmoking areas,” “to have a clean image,” “for the health of those around me,” “to show my willingness to cease smoking,” “due to society’s view on smokers,” and “others.”

Counseling process

A smoking cessation counselor, who was also a member of the current research team, created an environment conducive to smoking cessation within a single mother facility located in Seoul. Throughout the research period, the counselor provided smoking cessation education to encourage voluntary participation in smoking cessation counseling. The smoking cessation education program informed the participants of the effects of smoking on mothers and fetuses/infants using visual and auditory media, such as images and videos. The program also taught participants why smoking is more lethal to women and infants than to men and the harmful effects of secondhand smoke. Prior to counseling, all participants were provided informed consent and gave the signature.

The participants attended approximately nine tailored smoking cessation counseling sessions over six months after registering Smoking Cessation Service Program. A smoking cessation counselor visited the single mother facility to provide counseling. If face to face counseling was not possible, a telephone interview was conducted. Exhaled CO level, lung volume, and blood pressure were measured at each counseling session to assess their physical condition. The success of smoking cessation was determined based on whether exhaled CO level was measured at 6 ppm or below and cotinine levels. During the tailored counseling program, the participants took part in activities including examining stress test, self-efficacy score, my strengths, my values, drawing a tree for my future plans, and looking back on my achievements, while gaining knowledge on smoking. In the last session, a congratulatory ceremony was held among the participants who maintained smoking cessation for six months (Table 1).

Table 1
Manual for counseling

Session	Schedule	Topics
1	Enrollment (Day 1)	<ul style="list-style-type: none"> - Quitting smoking education (the harmful effects of smoking in women and pregnant women, indirect smoking in fetuses and infants) - Introduction and guidance of programs - Providing information on consent & Writing registration card - Assessment of smoking history and smoking behavior - Providing Fagerström Test of Nicotine Dependence (FTND) - Determine to quit smoking and establish the start day - Check the stress situation - Measuring exhaled carbon monoxide
2	Abstinence at 2-week (Day 14)	<ul style="list-style-type: none"> - Measuring exhaled carbon monoxide - Confirm whether participants began quitting smoking - Self-esteem test and psychological test - Finding My Strength - Check my values
3	Abstinence at 4-week (Day 28)	<ul style="list-style-type: none"> - Measuring exhaled carbon monoxide & Check maintenance of abstinence - Check for withdrawal symptoms - Learn how to deal with withdrawal symptoms
4	Abstinence at 6-week (Day 42)	<ul style="list-style-type: none"> - Measuring exhaled carbon monoxide & Check maintenance of abstinence - My first experience of smoking and history of smoking - Check the amount of smoking by converting it into money - Examine the benefits of quitting
5	Abstinence at 8-week (Day 56)	<ul style="list-style-type: none"> - Measuring exhaled carbon monoxide - Think of a situation where it's hard for me to refuse cigarettes. - Practicing Refusing Tobacco Through a Situation Play - Planning to replace smoking habits
6	Abstinence at 12-week (Day 84)	<ul style="list-style-type: none"> - Measuring exhaled carbon monoxide & Check maintenance of abstinence - Knowing the dangers of e-cigarettes and drug addiction
7	Abstinence at 16-week (Day 112)	<ul style="list-style-type: none"> - Measuring exhaled carbon monoxide - Check for withdrawal symptoms - Check my change of body after quitting smoking - Making My Own quitting smoking Prescriptions
8	Abstinence at 20-week (Day 140)	<ul style="list-style-type: none"> - Measuring exhaled carbon monoxide - Learn the rules for preventing re-smoking - Drawing my future plans tree (My Past, Present, and Future) - Writing down my experience of achievement

Session	Schedule	Topics
9	Abstinence at 6-month (Day 168)	<ul style="list-style-type: none"> - Validation of abstinence at 6-month (measuring exhaled carbon monoxide/urine cotinine test) - Guidance on further consultation - Commemorating the success of 6-month smoking cessation - Providing a souvenir for a successful quitting

Statistical analysis

SPSS version 26.0 was used to perform statistical analyses. A chi-squared test and t-test were used to examine the differences in rates of smoking cessation at 4, 6, 12, and 24 weeks, according to participants' demographic and smoking-related characteristics. Logistic regression analysis was performed using four variables (pregnancy, number of counseling sessions attended, exhaled CO level, and drinking), which were found to significantly associate with smoking cessation maintenance.

Results

Demographic characteristics and smoking cessation

Of the 77 single mothers who participated in the program, 47% were aged 20 years or younger. The rate of smoking cessation maintenance at 24 weeks was significantly higher among older mothers. Most participants (48%) had attend 10 – 12 years of education. The rate of smoking cessation maintenance at 12 weeks was significantly higher among participants with a high level of education. 29% of the participants were pregnant during the research period, and 15.6%, 15.8%, 26.5%, and 27% of these mothers responded that they smoked during pregnancy at 4, 6, 12, and 24 weeks, respectively. The rate of smoking cessation maintenance at 4 and 6 weeks was significantly higher among pregnant mothers. 35% of the participants consumed alcohol, and the rate of smoking cessation maintenance at 4 and 6 weeks was significantly higher among those who did not consume alcohol compared to those who did. The rate of smoking cessation maintenance at 4 weeks was significantly higher among mothers who had low levels of alcohol consumption. Regarding exercise, 73% of all participants did not exercise regularly, no significant difference in the rate of smoking cessation maintenance was observed according to exercise habits (Table 2).

Table 2
Smoking abstinence according to demographic characteristics

Variable	smoking abstinence								
N(%)	4weeks		6weeks		12weeks		24weeks		Total
or	Smoking	Abstinence	Smoking	Abstinence	Smoking	Abstinence	Smoking	Abstinence	N = 77(100%)
M ± SD	N = 32(41.6%)	N = 45(58.4%)	N = 38(49.4%)	N = 39(50.6%)	N = 49(63.6%)	N = 28(36.4%)	N = 63(81.8%)	N = 14(18.2%)	
Age									
≤ 20	16(50)	20(44.4)	19(50)	17(43.6)	26(53.1)	10(35.7)	32(50.8)	4(28.6)	36(47)
21–25	14(43.8)	13(28.9)	15(39.5)	12(30.8)	17(34.7)	10(35.7)	23(36.5)	4(28.6)	27(35)
> 25	2(6.3)	12(26.7)	4(10.5)	10(25.6)	6(12.2)	8(28.6)	8(12.7)	6(42.9)	14(18)
p -Value	0.061		0.223		0.152		0.020		
Education level									
Unknown	8(25.0)	7(15.6)	8(21.1)	7(17.9)	14(28.6)	1(3.6)	14(22.2)	1(7.1)	15(19.5)
≤ 9y	5(15.6)	10(22.2)	6(15.8)	9(23.1)	10(20.4)	5(17.9)	12(19.0)	3(21.4)	15(19.5)
10-12y	16(50.0)	21(46.7)	19(50.0)	18(46.2)	20(40.8)	17(60.7)	31(49.2)	6(42.9)	37(48)
> 12y	3(9.4)	7(15.6)	5(13.2)	5(12.8)	5(10.2)	5(17.9)	6(9.5)	4(28.6)	10(13)
p -Value	0.600		0.878		0.045		0.198		
Pregnancy									
No	27(84.4)	28(62.2)	32(84.2)	23(59.0)	36(73.5)	19(67.9)	46(73.0)	9(64.3)	55(71)
Yes	5(15.6)	17(37.8)	6(15.8)	16(41.0)	13(26.5)	9(32.1)	17(27.0)	5(35.7)	22(29)
p -Value	0.034		0.014		0.600		0.513		
Drinking									
No	14(43.8)	36(80.0)	20(52.6)	30(76.9)	29(59.2)	21(75.0)	40(63.5)	10(71.4)	50(65)
Yes	18(56.3)	9(20.0)	18(47.4)	9(23.1)	20(40.8)	7(25.0)	23(36.5)	4(28.6)	27(35)
p -Value	0.001		0.026		0.162		0.573		
Amount of drinking									
M±	13.19±	4.72±	11.11±	5.45±	9.67±	5.74±	8.51±	7.02±	77(100)
SD	20.34	12.61	19.25	13.42	17.78	14.56	16.90	16.22	
p -Value	0.042		0.138		0.322		0.769		
Exercise									
No	26(81.3)	30(66.7)	29(76.3)	27(69.2)	37(75.5)	19(67.9)	44(69.8)	12(85.7)	56(73)
Yes	6(18.8)	15(33.3)	9(23.7)	12(30.8)	12(24.5)	9(32.1)	19(30.2)	2(14.3)	21(27)
p -Value	0.157		0.485		0.468		0.228		
Amount of Exercise									
M±	215±	282±	204.44±	306.67±	280.83±	238.89±	245.26±	430±	77(100)
SD	178.42	221.40	150.18	239.41	226.65	190.56	206.70	183.85	
p -Value	0.519		0.276		0.659		0.242		

Smoking-related characteristics and smoking cessation

A significant difference in number of counseling sessions attended was found between the participants who maintained smoking cessation and those who smoked with the former attending at least three more counseling sessions than the latter. Significant differences in exhaled CO level were found at 4, 6, and 12 weeks between the participants who smoked with scores of 5 – 6 ppm and the participants who maintained smoking cessation with scores of 1 – 2 ppm the participants with low exhaled CO level had a higher rate of smoking cessation. The rate of smoking cessation maintenance was significantly higher for the participants with high scores on the readiness ruler at 4 weeks, confidence ruler at 6 weeks, and importance ruler at 12 weeks (Table 3).

Table 3
Smoking abstinence according to smoking related characteristics

Variable	smoking abstinence								
N(%)	4weeks		6weeks		12weeks		24weeks		Total
or	Smoking	Abstinence	Smoking	Abstinence	Smoking	Abstinence	Smoking	Abstinence	N = 77(100%)
M ± SD	N = 32(41.6%)	N = 45(58.4%)	N = 38(49.4%)	N = 39(50.6%)	N = 49(63.6%)	N = 28(36.4%)	N = 63(81.8%)	N = 14(18.2%)	
Age of first smoking (year)									
M ± SD	16.25 ± 2.44	16.53 ± 4.09	16.82 ± 3.30	16.03 ± 3.65	16.41 ± 3.87	16.43 ± 2.73	16.33 ± 3.69	16.79 ± 2.39	77(100)
p -Value	0.727		0.323		0.980		0.663		
CO level (ppm)									
M ± SD	6.25 ± 6.47	2.27 ± 2.84	5.63 ± 6.24	2.26 ± 2.76	5.10 ± 5.75	1.86 ± 2.53	4.24 ± 5.35	2.50 ± 3.28	77(100)
p -Value	0.002		0.004		0.001		0.248		
Cigarettes per day									
M ± SD	11.88 ± 9.25	8.91 ± 6.6	11.00 ± 8.78	9.31 ± 6.93	9.63 ± 8.53	11.04 ± 6.69	9.78 ± 7.92	11.79 ± 7.82	77(100)
p -Value	0.105		0.350		0.457		0.393		
Number of counseling									
M ± SD	2.59 ± 1.74	5.29 ± 2.56	2.55 ± 1.62	5.74 ± 2.42	2.67 ± 1.52	6.79 ± 1.97	3.30 ± 1.95	8.07 ± 1.27	77(100)
p -Value	0.000		0.000		0.000		0.000		
Smoking period (year)									
M ± SD	6.28 ± 3.25	7.69 ± 5.17	6.45 ± 3.87	7.74 ± 5.01	6.63 ± 4.49	7.93 ± 4.50	6.76 ± 4.30	8.64 ± 5.23	77(100)
p -Value	0.147		0.209		0.227		0.159		
Nicotine dependence									
Low	24(75.0)	32(71.1)	28(73.7)	28(71.8)	37(75.5)	19(67.9)	47(74.6)	9(64.3)	56(73)
Mild	6(18.8)	8(17.8)	8(21.1)	6(15.4)	10(20.4)	4(14.3)	11(17.5)	3(21.4)	14(18)
High	2(6.3)	5(11.1)	2(5.3)	5(12.8)	2(4.1)	5(17.9)	5(7.9)	2(14.3)	7(9)
p -Value	0.765		0.459		0.121		0.679		
Past year quit attempt									
No	11(34.4)	11(24.4)	14(36.8)	8(20.5)	16(32.7)	6(21.4)	18(28.6)	4(28.6)	22(29)
Yes	21(65.6)	34(75.6)	24(63.2)	31(79.5)	33(67.3)	22(78.6)	45(71.4)	10(71.4)	55(71)
p -Value	0.342		0.113		0.294		1.000		
Motivation rulers/ Importance									
1–3	6(18.8)	4(8.9)	6(15.8)	4(10.3)	8(16.3)	2(7.1)	8(12.7)	2(14.3)	10(13)
5–7	14(43.8)	15(33.3)	18(47.4)	11(28.2)	22(44.9)	7(25.0)	25(39.7)	4(28.6)	29(38)
8–10	12(37.5)	26(57.8)	14(36.8)	24(61.5)	19(38.8)	19(67.9)	30(47.6)	8(57.1)	38(49)

Variable	smoking abstinence								
p -Value	0.174		0.095		0.048		0.738		
Motivation rulers/ Confidence									
1–3	8(25.0)	6(13.3)	9(23.7)	5(12.8)	11(22.4)	3(10.7)	12(19.0)	2(14.3)	14(18)
5–7	18(56.3)	20(44.4)	22(57.9)	16(41.0)	26(53.1)	12(42.9)	30(47.6)	8(57.1)	38(49)
8–10	6(18.8)	19(42.2)	7(18.4)	18(46.2)	12(24.5)	13(46.4)	21(33.3)	4(28.6)	25(32)
p -Value	0.078		0.031		0.113		0.805		
Motivation rulers/ Readiness									
1–3	8(25.0)	12(26.7)	9(23.7)	11(28.2)	14(28.6)	6(21.4)	16(25.4)	4(28.6)	20(26)
5–7	17(53.1)	12(26.7)	19(50.0)	10(25.6)	20(40.8)	9(32.1)	24(38.1)	5(35.7)	29(38)
8–10	7(21.9)	21(46.7)	10(26.3)	18(46.2)	15(30.6)	13(46.4)	23(36.5)	5(35.7)	28(36)
p -Value	0.036		0.072		0.381		0.969		

Smoking cessation supporters

Of all the participants, 22% reported that they had no one supporting their smoking cessation efforts. The most commonly identified source of support for participants' smoking cessation efforts was parents/grandparents, followed by teachers, friends/school peers, others, children, and siblings (Fig. 1).

Reasons for smoking cessation

The most common reason participants provided for wanting to quit smoking was 'for my health' (24%), followed by 'other' reasons, 'advice from family or others around me,' 'for the health of those around me,' 'financial reasons,' 'to have a clean image,' 'environmental reasons such as expansion of nonsmoking areas,' 'to show my willingness to cease smoking,' and 'due to society's view on smokers' (Fig. 2).

Factors associated with smoking cessation maintenance

The number of counseling sessions attended was significantly associated with successful smoking cessation maintenance at 4 (OR = 3.18, CI = 1.73 – 5.85), 6 (OR = 3.47, CI = 1.87 – 6.42), 12 (OR = 19.90, CI = 2.13 – 186.07), and 24 weeks (OR = 19.89, CI = 1.59 – 61.50). The likelihood of maintaining smoking cessation was 19.89 times higher when the number of sessions attended at 24 weeks increased. Drinking was significantly associated with smoking cessation maintenance at 4 (OR = 0.045, CI = 0.00 – 0.35), 6 (OR = 0.09, CI = 0.01 – 0.69), and 12 weeks (OR = 0.008, CI = 0.00 – 0.63). The likelihood of maintaining smoking cessation decreased when participants consumed alcohol. Exhaled CO level was significantly associated with smoking cessation maintenance at 4 (OR = 0.71, CI = 0.54 – 0.93) and 6 weeks (OR = 0.80, CI = 0.64 – 0.99), the lower the exhaled CO level, the higher the likelihood of maintaining smoking cessation. Pregnancy was significantly associated with smoking cessation maintenance at 6 weeks (OR = 8.78, CI = 1.40 – 54.91)(Table 4).

Table 4
Factors associated with smoking abstinence according to quit duration

Variable	4weeks	6weeks	12weeks	24weeks
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Pregnancy	6.20(0.92–41.69)	8.78(1.40-54.91)	1.50(0.08–27.75)	0.18(0.00-6.95)
p -Value	0.061	0.020	0.786	0.361
CO level	0.71(0.54–0.93)	0.80(0.64–0.99)	0.62(0.37–1.05)	1.25(0.89–1.75)
p -Value	0.013	0.038	0.076	0.201
Number of counseling	3.18 (1.73–5.85)	3.47 (1.87–6.42)	19.90 (2.13-186.07)	19.89(1.59–61.50)
p -Value	0.000	0.000	0.009	0.014
Drinking	0.045(0.00-0.35)	0.09(0.01–0.69)	0.008 (0.00-0.63)	0.04(0.00-1.12)
p -Value	0.003	0.020	0.030	0.580

Discussion

In this study, pregnancy was found to increase the likelihood of short-term smoking cessation (6 weeks) in single mothers. Although women were likely to attempt smoking cessation during pregnancy [31, 32], over 60% of mothers who quit smoking during pregnancy relapsed within six months after childbirth. This phenomenon might occur because mothers only had external motivation to quit smoking, such as concerns for their children's health, but lack internal motivation, and thus only temporarily ceased smoking during pregnancy [33]. Adolescent mothers were also more likely to begin smoking again after cessation [34]. One study reported that pregnant adolescents aged 15 – 19 years had the highest rate of smoking among all pregnant mothers [35]. In the present study, adolescent mothers who smoked accounted for 50% of all participants, indicating that adolescent mothers were more vulnerable to developing smoking habits. These results demonstrated that a smoking relapse prevention program tailored to single mothers and an intensive counseling program for adolescent mothers would be necessary to help single mothers maintain long-term smoking cessation, even after childbirth.

In this study, the likelihood of short-term smoking cessation maintenance (4 and 6 weeks) increased as participants' Exhaled CO level decreased. This is consistent with a previous report that the rate of successful smoking cessation increased as Exhaled CO level decreased in male university students [36]. The measurement of Exhaled CO level is noninvasive, unlike blood or urine tests, and allows for immediate assessment in all clinical settings [37]. Immediately checking Exhaled CO level also allows individuals to be aware of their smoking status and reinforces their motivation for smoking cessation.

In this study, abstaining from alcohol was an important factor that promoted smoking cessation maintenance in single mothers. This result was consistent with a previous report that smoking was strongly associated with drinking, and those who abuse or were dependent on alcohol would be more likely to smoke and had higher rates of tobacco consumption compared with the general population [38, 39]. Another study reported that adult smokers who had high alcohol consumption levels or previously abused alcohol had higher nicotine dependence and poorer smoking cessation treatment outcomes [40]. While smoking and drinking were independent risk factors for cancer and cardiovascular disease, alcohol and cigarettes could interact when used together to drastically increase the risk of disease [41]. Smoking and alcohol use during pregnancy can significantly affect the neurological and cognitive function of the fetus, causing symptoms of ADHD and learning and memory deficits [42]. However, it has been reported that mothers vary in their levels of awareness about the risks of smoking and drinking. While mothers have been found to follow public health recommendations regarding smoking cessation during pregnancy and acknowledge the need to quit smoking, they are also reported to believe that alcohol consumption during pregnancy is safe as long as it is within a certain amount, due to the lack of clear, standard guidelines written by experts [43, 44]. These results suggest that counselors must emphasize the dangers of smoking and drinking during pregnancy, even in small amounts, through an education and counseling program, as well as recommend smoking cessation and alcohol abstinence.

Most smokers voluntarily attempt to cease smoking but fail to maintain their efforts. The mean likelihood of successfully quitting smoking within 6 – 12 months after the initiation of smoking cessation is 5% or below [45, 46]. This indicates that it is difficult for smokers to quit on their own, and that they require help from others to do so successfully. Such difficulties can be resolved through consistent counseling with an experienced smoking cessation counselor [47]. In this study, the number of counseling sessions attended had the most significant impact on smoking cessation maintenance of single mothers. As the number of smoking cessation counseling sessions tailored for single mothers increased, participants were 3 – 19 times more likely to maintain smoking cessation. This result was consistent with a previous report that a smoking cessation program tailored to pregnant women could effectively promote smoking cessation [48, 49]. Counseling also plays an important role in enhancing motivation to maintain smoking cessation [36]. Motivational enhancement counseling teaches individuals that everyone can have the motivation to change and reinforces internal motivation by explaining in detail the steps required for making the changes necessary for smoking cessation [50].

In this study, the likelihood of smoking cessation increased as scores on the readiness, confidence, and importance rulers increased at 4, 6, and 12 weeks, respectively, indicating that different motivations must be enhanced at different points during counseling. Counselors should discuss in detail with individuals how to prepare for smoking cessation for the first four weeks, and then focus on enhancing individuals' confidence in their ability to cease smoking until the end of the sixth week. Further, counselors should emphasize the importance of smoking cessation until the end of the twelfth week, to consistently enhance single mothers' motivation to maintain smoking cessation.

In this study, the most common reason to quit smoking was "for my health". Smoking cessation counseling program focusing on single mothers' health might effectively promote the maintenance of smoking cessation. It had previously been reported that counseling pregnant women briefly for 3 – 5 minutes during a medical examination and providing them with information about smoking increased the rate of smoking cessation by 30 – 70% [51, 52], suggesting that consistent and frequent smoking cessation counseling positively affected the maintenance of smoking cessation. In this study, most participants responded that they had no one to support their efforts to quit

smoking, thereby further demonstrating the need for smoking cessation counselors. This finding suggests that counselors should provide high-quality counseling and fulfill their role in providing smoking cessation support, which was in line with a previous study reporting that receiving support from others increased the success rate of smoking cessation [53].

This study has some limitations that should be noted. First, the results cannot be generalized, since the study only included single mothers who were smokers from a certain area of Seoul. Repeated follow-up studies involving single mothers from different regions across the country should be necessary. Second, since this study used secondary data, only the variables related to smoking cessation services could be examined. Third, the sample size was small, due to the difficulty of finding and enrolling single mothers who were also smokers. The number of participants who maintained smoking cessation for 24 weeks was even smaller.

However, despite these limitations, this study is the first to use data collected by a smoking cessation counselor who regularly visited a single mother facility over six months. This study is meaningful in that it examined factors associated with smoking cessation maintenance in single mothers that were not sufficiently discussed in previous studies. The results of this study may be used as basic data for improving the quality of counseling provided by smoking cessation support services.

Conclusion

Despite single mothers' vulnerability to developing smoking habits, research on smoking among single mothers was insufficient. This study was conducted with Korean single mothers who smoke to investigate factors associated with smoking cessation maintenance. Pregnancy, alcohol consumption, and Exhaled CO level were identified as factors that affect smoking cessation maintenance, as was the number of counseling sessions attended, at 4, 6, 12, and 24 weeks.

A smoking cessation counseling program tailored to single mothers should be developed to effectively help single mothers quit smoking, and different types of intensive motivational enhancement counseling should be provided over the course of the smoking cessation period. Furthermore, alcohol abstinence should be promoted along with smoking cessation, and single mothers need to be informed about the harmful effects of smoking and drinking on their health and the health of their children. Finally, smoking cessation counselors should consistently produce tailored counseling sessions to provide the support single mothers need to maintain smoking cessation over the long term.

List Of Abbreviations

Carbon monoxide, CO; Fagerström Test for Nicotine Dependence (FTND);

Declarations

Ethics approval and consent to participate

The full study protocol and all study materials were reviewed and approved by the Institutional review board of the Catholic University of Korea.

All participants provided written informed consent prior to any study procedures as discussed in the methods section. This was done to maintain privacy.

Consent for publication

The datasets generated and/or analyzed during the current study are not publicly available due to protect personal information but are available from the corresponding author on reasonable request.

Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare no conflict of interest.

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Authors contributions

M.-J.L. and K.-S.L. conceptualized the study. M.-J.L. conducted the literature review conducted analyses, with guidance from K.-S.L. reviewed results, and M.-J.L. and K.-S.L. drafted the paper. All authors have read and approved the manuscript.

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Figures

Figure 1

The supporters for smoking abstinence in Korean single mothers

Figure 2

The reasons for smoking abstinence in Korean single mothers