Postpartum smoking relapse among women who quit during pregnancy: cross-sectional study in Japan

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Abstract

Aim: To determine the postpartum smoking relapse rate among women in Japan who quit smoking during pregnancy and to clarify factors related to smoking relapse.

Methods: A self-administered questionnaire survey was conducted as a cross-sectional study of all mothers of children who underwent health checkups after birth in randomly selected municipalities in Japan from May to July of 2009. Using valid data of 20,601 mothers, smoking rate was calculated. In addition, chi-square test and multiple logistic regression analysis were used to clarify related factors to the smoking relapse.

Results: The smoking rates among women were 15.8% at the time when they became pregnant, 5.1% during pregnancy, and 11.3% after giving birth. Among women who smoked at the time they became pregnant, the smoking rate during pregnancy was 31.1%. Among women who quit smoking during pregnancy, the postpartum smoking relapse rate was 41.0%. The odds ratios (95% confidence interval) for factors in smoking relapse were 0.72 (0.60-0.88) for women spending time with their child in a relaxed mood, 0.67 (0.47-0.94) for women having someone to talk to on the Internet about childrearing, 1.94 (1.60-2.35) for women who worked, and 3.37 (2.61-4.35) for women whose partner smoked after they gave birth.

Conclusion: It is hoped that future research will establish methods to further support smoking cessation and the continuation of smoking cessation after childbirth, and develop mechanisms to spread knowledge about the harm of smoking in society and encourage women not to start.

Keywords: postpartum women, pregnancy, smoking, relapse

Introduction

It is well-known that smoking during pregnancy is a risk factor of premature birth, low birth weight infants and placental abruption.[1] Moreover, postnatally, respiratory distress syndrome, sudden infant death syndrome, asthma or obesity during early childhood, increased rate of diabetes, restlessness or sleeplessness from nicotine secreted in the breast milk by the mother, and symptoms such as nausea are likely to be observed in children who were exposed to passive smoking by their mother or father.[2-4] Therefore, as a primary prevention of these diseases, it is important for women not to smoke during pregnancy and after giving birth. “Healthy Parents and Children 21,” the national plan of the early 21st century for the health of mothers and children in Japan, established the goal of “eliminating smoking in the home by both parents during pregnancy and the child rearing by 2010” and promotes anti-smoking measures.

The smoking rate among pregnant women in Japan and other countries is 7.5–15%, the smoking cessation rate during pregnancy is 45–68%, and the postpartum smoking relapse rate among women who stopped smoking during pregnancy is 16.7%–70%.[5–8] Although some interventions have been implemented to prevent relapse of smoking after childbirth, 60–75% of women who quit smoking during pregnancy resume smoking by 6 months after giving birth.[9] Most studies on postpartum smoking relapse by women in Japan are limited regional surveys. To our knowledge, there are no studies on the smoking relapse rate and associated factors in women who quit smoking during pregnancy, with subjects randomly selected from all parts of Japan. The aim of the

present study was to determine the smoking relapse rate among women who quit during pregnancy and associated factors with the smoking relapse in a representative sample in Japan.

Methods

This study was a cross-sectional study conducted from May to July of 2009 as an interim assessment of "Healthy Parents and Children 21." All municipalities in Japan were stratified into four levels by population size (less than 8,000, 8,000 or more to less than 20,000, 20,000 or more to less than 100,000, and 100,000 or more) and randomly selected. A self-administered questionnaire survey on mental and physical state of health of child and caretaker, lifestyle, and other factors was conducted with all caretakers of children that underwent health checks at 3–4 months, 18 months, and 36 months. One hundred thirty-eight municipalities participated in the survey. The questionnaire was distributed to 26,418 people (response rate 81.0 %). The total number of respondents was 21,408. The distributed questionnaires were returned by 5,500 among 6,454 persons (response rate 85.2%) at 3-4 month health checks, 8,311 among 10,300 persons (response rate 80.7%) at 18 month health checks, and 7,597 among 9,664 persons (response rate 78.6%) at 36 month health checks. Participants who met the following criteria were excluded from the analysis: the questionnaire was completed by fathers (n=283), grandparents (n=98), others (n=18) and unknown (n=408).

The survey items were age of mother at time of childbirth, birth order of the index child, mother's parenting satisfaction, time mother spends with child in a relaxed mood, mother's childrearing confidence, employment of mother at the time of the survey, mother's maltreatment of child, mother's alcohol consumption status, having someone for mother to talk to about childrearing (partner, grandparent, neighbor, friend, doctor,

public health nurse/midwife, nursery school/kindergarten teacher, telephone counselor, Internet, no one), partner's smoking status, partner's childrearing behavior, and whether or not partner plays with child. Questions on smoking status at the time women became pregnant and during pregnancy were asked retrospectively.

An ethical review of the study was done and the study was approved by the ethics committee of the University of Yamanashi Faculty of Medicine (No. 739).

The smoking rate of all women who participated in the survey at the time they became pregnant, during pregnancy, and after giving birth was obtained at the time of each survey. In addition, the smoking rate during pregnancy of women who smoked at the time they became pregnant, and the postpartum smoking rate of women who were smokers when they became pregnant and quit smoking during pregnancy were obtained.

The smoking relapse rate among women who smoked at the time they found out they were pregnant and quit smoking during pregnancy was obtained with respect to the status of various factors and each of the survey periods after birth. The chi-square test was used to clarify factors related to these rates.

A logistic regression analysis was conducted with whether or not a woman resumed smoking after giving birth as the dependent variable and each factor as independent variables. A logistic regression analysis was done with no adjustment and with adjustment for the two variables of a woman's age at time of childbirth and time of survey after birth. SPSS ver. 15 statistical software was used in the analysis.

Results

Among 21,408 responses received, the questionnaire was completed by 20,601 mothers of children (Fig. 1). Furthermore, 2,135 women who smoked at time they

became pregnant and quit smoking during pregnancy were included in the analyses for postpartum smoking relapse.

The smoking status is shown in Table 1. Smoking rates at the time women became pregnant, during pregnancy and after childbirth were 15.8%, 5.1% and 11.3%, respectively. Among women who smoked at the time they became pregnant, the smoking rate during pregnancy was 31.1%. The postpartum smoking relapse rate among women who quit during pregnancy was 41.0%. Among these women, the relapse rate was 22.5% in the 3, 4 month survey, 43.4% in the 18 month survey, and 51.4% in the 36 month survey after childbirth. A significant relation was observed between survey time after childbirth and smoking relapse rate ($p=0.004$).

Looking at the postpartum smoking relapse rates by region, the highest rate was 48.1% in the Hokkaido and Tohoku region, the second highest was 47.9% in the Kyushu and Okinawa region, followed by 46.0% in the Chugoku-Shikoku region, 44.2% in the Kinki region, 38.5% in the Kanto region, and 38.4% in the Hokuriku and Tokai region.

The smoking relapse rate by characteristics among women who quit smoking during pregnancy is shown in Table 2. The smoking relapse rate tended to be low when women were satisfied with parenting, spent time with their child in a relaxed mood, talked with their partner about parenting, talked about parenting on the Internet, drank alcohol at the time they became pregnant, had a partner who participated in childrearing, and had a partner who played with the child. The smoking relapse rate tended to be high when the child was second or later in the birth order, the women was employed at time of survey, and the partner smoked.

The odds ratios for factors in smoking relapse among women who quit smoking during pregnancy are shown in Table 3. Adjusted odds ratios indicate that factors associated with a lower likelihood of smoking relapse after childbirth were spending time with the child in a relaxed mood (odds ratio (OR) = 0.72, 95% confidence interval (CI) = 0.60-0.88), talking about parenting on the Internet (OR:0.67, 95% CI:0.47-0.94), and drinking alcohol at the time when woman became pregnancy. On the other hand, factors associated with higher likelihood of postpartum smoking relapse were the child being second or later in the birth order (OR:2.13, 95% CI:1.77-2.57), a partner who smoked at the time the woman became pregnant (OR: 1.60, 95% CI: 1.19-2.16), during her pregnancy (OR: 2.11, 95% CI: 1.66-2.68), and after she gave birth (OR: 3.37, 95% CI: 2.61-4.35), and the woman being employed at time of the survey after childbirth (OR: 1.94, 95% CI: 1.60-2.35).

Discussion

This study, using a representative sample from Japan, was the first to show the status of postpartum smoking relapse in women nationwide. The only previously reported studies are a small number of studies limited to specific regions.[10-12] According to surveys conducted 18 months after women gave birth, the smoking relapse rate was 54.8% in the four prefectures of the Tohoku region,[10] 70.3% in Itabashi-ku, Tokyo,[11] and 46.0% in Hyogo Prefecture.[12] The relapse rate in the present survey is the lowest among these surveys. This survey is the most recent and reasons for the low relapse rate are thought to be that smoking cessation education by local governments and health professionals is increasing nationally each year, and the places to smoke are decreasing

because of the increase in public buildings with separated smoking areas or smoke-free facilities.[13]

In the USA, the smoking relapse rate at 12 months after giving birth was 70.5% in a 1985 survey.[14] In a survey conducted from 1993 to 1999, the smoking relapse rate within 2–6 months after giving birth was 51.1%,[15] and in a survey from 2003 to 2006, the smoking relapse rate 6 months after giving birth was 65%.[16] In France, a 1993–1994 survey found the smoking relapse rate to be 48% five months after giving birth and 53% after 12 months.[17] In Norway, the smoking relapse rate was found to be 28.9% six months after giving birth.[18] Compared with these countries, the postpartum smoking relapse rate in the present survey tended to be low. Reasons for this are conjectured the differences in income, education, and employment state in the women in each country.

In this study, the postpartum smoking relapse rate increased with the length of time after giving birth. In a survey in the USA, the smoking relapse rate was 27% within the first month after giving birth and then rose to about 65% at six months and remained at about the same level until 12 months. There is a need to start supporting women soon after they give birth to aid their efforts not to resume smoking.

One factor in preventing smoking relapse is the woman spending time with her child in a relaxed mood. Fang reported that the stress of taking care of children and social pressures are factors in postpartum smoking relapse.[19] In a study in Japan, the stress of child rearing was one factor in postpartum smoking relapse.[12] Partners and grandparents provide important social support to women in childrearing, and help to alleviate their stress.[20]

In this study, a trend was seen for women who talked about parenting on the Internet to be less likely to resume smoking. The number of women in Japan who use the

Internet to gather information on childrearing is increasing.[20] For women who have little child-rearing experience and live in an environment that tends to be cut off from the outside, the Internet is useful as a means to ask questions and resolve anxieties with regard to parenting. It also contributes to the relief of child-rearing stress in women who are full-time homemakers and somewhat isolated from society.[21] In Japan, the rate of Internet use among men and women from 15 to 29 years of age is around 90%. It turns out that use of the Internet is widely established.[22] The Internet can also be used in smoking cessation support after giving birth.

This study found that mothers of second or later children were more likely than mothers of first children to resume smoking. A similar finding is reported by Colman and Joyce.[15] A first child is a woman's first experience of pregnancy, and these mothers tend to adopt behaviors that are better for the health of their unborn child and themselves. Partners, grandparents, and friends are also solicitous about the health of the pregnant women and child, and tend to pay more attention to the life attitude of the woman.[17]

In this study, smoking by the woman's partner at the time when she became pregnant, during her pregnancy, or after she gave birth was a factor strongly related to postpartum smoking relapse. This has also been reported in many previous studies.[18]

The odds ratio for postpartum smoking relapse in women who were regular alcohol drinkers at the time they became pregnant was 0.73. However, previous studies demonstrated that pregnant women who drink also tend to smoke.[23,24] The postpartum smoking rate itself was higher in women who drank at the time they became pregnant (13.1%) than in women who did not drink (10.9%). Therefore, a low odds ratio for

alcohol drinking at the time of pregnancy cannot be considered a protective factor for postpartum smoking.

The limitations of this study are that responses were made from memory. Since smoking is an issue affected by social pressure, there is a possibility that people did not respond honestly. However, previous studies have reported correlations between self-administered questionnaire surveys on smoking and nicotine levels in urine, a biochemical test indicator.[25,26] Another limitation is that, since this was a cross-sectional study, it is difficult to directly infer causes and effects even when relationships are seen between various factors and smoking relapse.

Chushi emphasized the importance of education for women so that they never start smoking, because once they start it is difficult for them to quit when they become pregnant, even though they recognize the harmful effects of smoking on fetuses and infants.[27] It is hoped that future research will establish methods to further support smoking cessation and the continuation of smoking cessation after childbirth, and develop mechanisms to spread knowledge about the harm of smoking in society and encourage women not to start.

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Disclosure

The authors have no conflict of interest related to this article.

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Figure legend

Figure 1 Participants flow with smoking status

Table 1 Smoking status of women at the time they became pregnancy, during pregnancy, and after childbirth

	Smokes		Does not smoke		Total		
	n	%	n	%	n	%	p†
Smoking status among all women at the time they became pregnancy							
3, 4 month survey	834	15.8	4,432	84.2	5,266	100.0	0.01
18 month survey	1,194	15.0	6,775	85.0	7,969	100.0	
36 month survey	1,168	16.8	5,764	83.2	6,932	100.0	
Total	3,196	15.8	16,971	84.2	20167†	100.0	
Smoking status among all women during pregnancy							
3, 4 month survey	297	5.6	4,972	94.4	5,269	100.0	0.02
18 month survey	352	4.6	7,321	95.4	7,673	100.0	
36 month survey	362	5.2	6,555	94.8	6,917	100.0	
Total	1,011	5.1	18,848	94.9	19859†	100.0	
Smoking status among all women after childbirth							
3, 4 month survey	452	8.5	4,878	91.5	5,330	100.0	0.004
18 month survey	918	11.5	7,075	88.5	7,993	100.0	
36 month survey	919	13.3	5,988	86.7	6,907	100.0	
Total	2,289	11.3	17,941	88.7	20230†	100.0	
Smoking status during pregnancy among women who smoked at time they became pregnancy							
3, 4 month survey	282	34.0	548	66.0	830	100.0	0.08
18 month survey	336	29.7	797	70.3	1133	100.0	
36 month survey	353	30.5	803	69.5	1156	100.0	
Total	971	31.1	2148	68.9	3119‡	100.0	
Smoking status after childbirth among women who smoked at time they became pregnancy and quit during pregnancy							
3, 4 month survey	123	22.5	424	77.5	547	100.0	0.004
18 month survey	344	43.4	448	56.6	792	100.0	
36 month survey	409	51.4	387	48.6	796	100.0	
Total	876	41.0	1259	59.0	2135 §	100.0	

Chi-square test was used to test of association between smoking status and survey time.

†Missing data were excluded from the full sample (n=20,601).

‡Missing data were excluded (n=77).

§ Missing data were excluded (n=13).

Table 2 Smoking relapse rate by characteristics among women who quit smoking during pregnancy

		3,4 month survey		18 month survey		36 month survey		
		Smokes (%)	p	Smokes (%)	p	Smokes (%)	p	Smokes (%)
Neighbor								
	Yes	20.5	0.74	47.7	0.40	48.6	0.54	43.1
	No	22.7		42.9		51.8		40.2
Friend								
	Yes	22.2	0.83	43.5	0.96	49.4	0.16	38.6
	No	23.0		43.3		54.5		41.1
Doctor								
	Yes	25.0	0.78	45.3	0.79	44.8	0.47	40.3
	No	22.4		43.0		51.6		41.1
Public health nurse or midwife								
	Yes	25.8	0.65	44.2	0.06	33.3	0.21	47.5
	No	22.3		42.8		51.7		39.7
Nursery school or kindergarten teacher								
	Yes	28.9	0.49	45.6	0.11	49.5	0.53	53.3
	No	22.2		42.2		52.1		40.9
Telephone counselor								
	Yes	33.3	0.52	80.0	0.10	50.0	0.96	29.2
	No	22.4		43.2		51.4		42.2
Internet								
	Yes	33.3	0.32	52.4	0.10	51.1	0.33	37.1
	No	23.2		44.3		51.8		41.5
None								
	Yes	20.0	0.28	78.6	0.01	53.0	0.37	43.5
	No	22.7		42.8		51.5		32.2
Partner								
Smoking at time woman became pregnant								
	Yes	30.0	0.17	48.6	0.02	62.3	<0.001	54.5
	No	21.6		40.1		38.5		32.3
Maltreatment of child								
	Yes	22.6	0.71	45.5	0.002	52.5	0.08	42.3
	No	20.4		20.4		41.7		31.1
Smoking during pregnancy								
	Yes	23.8	0.88	47.8	0.38	46.0	0.17	44.2
	No	22.4		42.9		52.5		40.2
Alcohol drinking at time woman became pregnant								
	Yes	23.9	0.07	47.8	<0.001	55.0	<0.001	44.5
	No	16.1		26.6		37.0		27.2
Smoking after childbirth								
	Yes	20.2	0.20	37.6	0.003	48.6	0.10	37.7
	No	24.7	<0.001	48.2	<0.001	55.3	<0.001	45.2
Alcohol drinking during pregnancy								
	Yes	30.2	0.19	32.2	0.07	44.3	0.20	36.1
	No	21.9	0.36	44.1	0.05	50.1	0.65	38.9
Participation in childrearing								
Person to talk to								
	No	28.6		52.3		47.7		46.6
Play with child								
Partner								
	Yes	21.6	0.02	41.8	0.18	49.6	0.95	39.0
	No	24.4	0.54	44.1	0.06	49.7	0.15	39.0
Grandmother/grandfather		46.7		52.5		50.0		50.5
	Yes	20.7	0.10	42.4	0.32	52.7	0.31	40.1
	No	27.4		46.3		48.9		43.1

Chi-square test was used to test association between smoking status and each factor stratified by survey time.

Table 3 Factors associated with postpartum smoking relapse in women who quit smoking during pregnancy

				Unadjusted odds ratio†			
			Reference	OR	95%CI		p
Woman							
Age at childbirth	≤19 y.o.	／	25～29 y.o.	0.60	0.28	1.27	0.18
	20～24 y.o.	／		1.33	0.74	2.40	0.34
	30～34 y.o.	／		0.73	0.58	0.91	0.01
	35～39 y.o.	／		0.63	0.49	0.80	<0.001
	≥40 y.o.	／		0.62	0.45	0.85	0.004
Birth order	2nd or later child	／	1st child	1.85	1.54	2.21	<0.001
Parenting satisfaction	Satisfied	／	Dissatisfied	0.69	0.52	0.92	0.01
Time with child in relaxed mood	Yes	／	No	0.64	0.53	0.77	0.00
Lack of confidence in childrearing	Yes	／	No	1.08	0.88	1.31	0.47
Employment at time of survey	Yes	／	No	2.49	2.08	2.98	<0.001
Maltreatment of child	Yes	／	No	1.19	0.91	1.55	0.20
Alcohol drinking at time woman became pregnant	Yes	／	No	0.72	0.60	0.86	<0.001
Alcohol drinking during pregnancy	Yes	／	No	0.81	0.59	1.12	0.21
Person to talk to:							
Partner	Yes	／	No	0.76	0.63	0.92	0.004
Grandmother/grandfather	Yes	／	No	0.89	0.74	1.08	0.23
Neighbor	Yes	／	No	1.10	0.84	1.44	0.49
Friend	Yes	／	No	0.90	0.75	1.07	0.24
Doctor	Yes	／	No	0.90	0.57	1.41	0.64
Public health nurse or midwife	Yes	／	No	0.97	0.59	1.59	0.90
Nursery school or kindergarten teacher	Yes	／	No	1.37	1.10	1.72	0.01
Telephone counselor	Yes	／	No	1.65	0.60	4.56	0.34
Internet	Yes	／	No	0.57	0.41	0.79	0.001
No one	Yes	／	No	1.71	0.76	3.83	0.19
Partner							
Smoking at time woman became pregnant	Yes	／	No	1.62	1.21	2.17	0.001
Smoking during pregnancy	Yes	／	No	2.14	1.70	2.70	<0.001
Smoking after childbirth	Yes	／	No	3.15	2.46	4.04	<0.001
Participation in childrearing	Yes	／	No	0.73	0.55	0.96	0.02
Play with child	Yes	／	No	0.63	0.43	0.93	0.02

†Logistic regression analysis was used to calculate odds ratio for postpartum smoking resumption by each factor. ‡Data are adjusted for age at childbirth ar
ratio; CI, confidence interval.

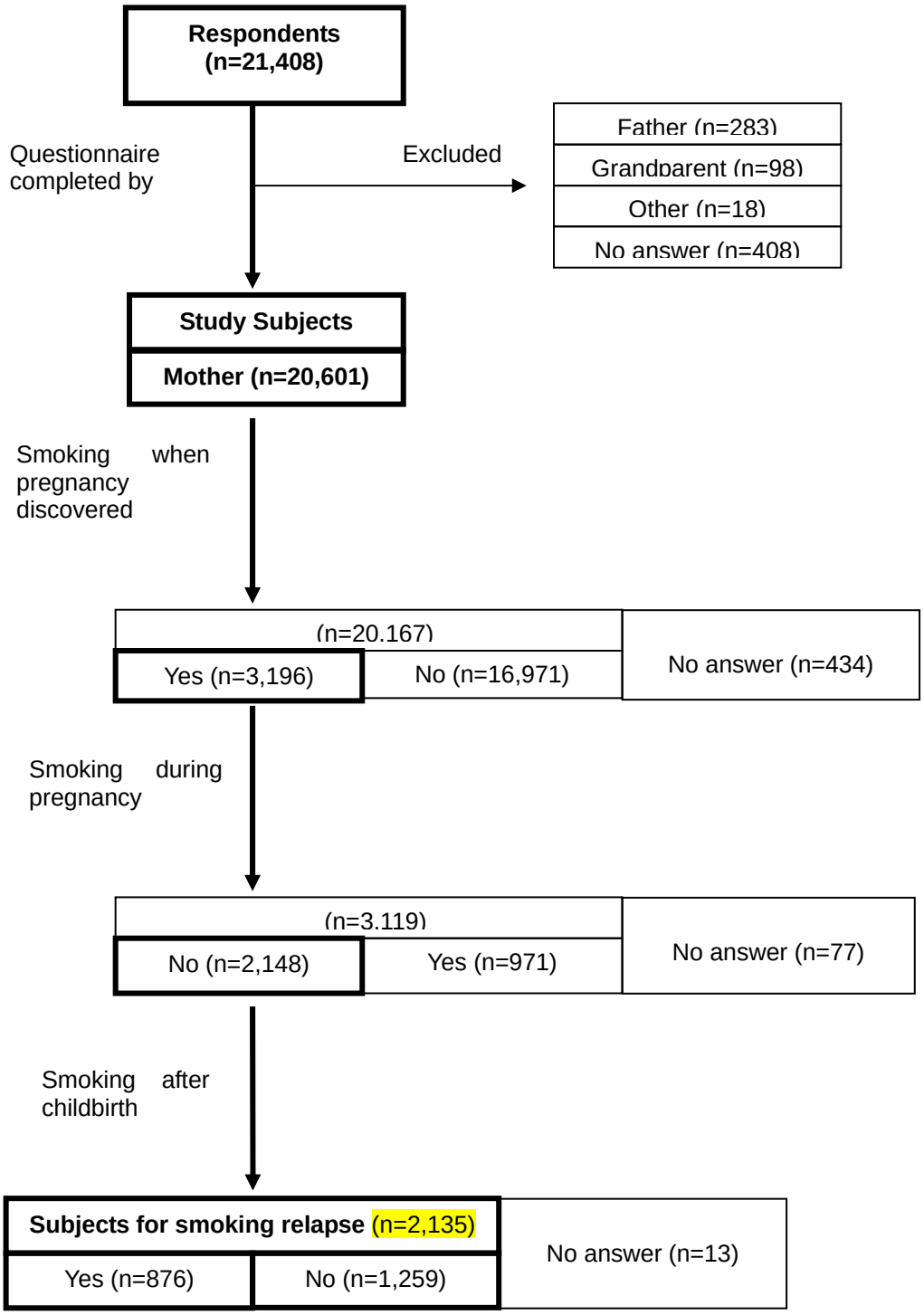
Respondents
(n=21,408)
Questionnaire completed by
Excluded
Father (n=283)
Grandparent (n=98)
Other (n=18)
No answer (n=408)
Study Subjects
Mother (n=20,601)
Smoking when pregnancy discovered
(n=20,167)
Yes (n=3,196)
No (n=16,971)
No answer (n=434)
Smoking during pregnancy
(n=3,119)
No (n=2,148)
Yes (n=971)
No answer (n=77)
Smoking after childbirth
Subjects for smoking relapse (n=2,135)
Yes (n=876)
No (n=1,259)
No answer (n=13)

Figure 1