Attitude and Practice Toward Use of Cigarettes and Electronic Cigarettes Among Pregnant Women: A Questionnaire-Based Survey

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OBJECTIVE: This study aimed to evaluate attitude and practice toward use of regular tobacco cigarettes and electronic cigarettes among pregnant women: A questionnaire-based survey. Turk Thorac J. 2022;23(6):409-419.

MATERIAL AND METHODS: A total of 1123 pregnant women participated on a voluntary basis in this questionnaire survey. Maternal characteristics, cigarette consumption parameters, and opinions regarding the adverse effects of smoking during pregnancy were evaluated.

RESULTS: Active smokers composed 12.4% (9.4%: regular tobacco cigarettes, 3.0%: electronic cigarettes) of the study population. Smoking during the current pregnancy, particularly via regular tobacco cigarettes, was more likely for women with smoking during previous pregnancies (56.0% vs. 7.8%, P < .001), previous history of low birth weight infant delivery (16.1% vs. 8.6%, P = .013), premature delivery (16.7% vs. 7.0%, P < .001), and stillbirth (22.8% vs. 11.7%, P = .002). The presence versus absence of smoking during pregnancy was associated with a lower likelihood of being a housewife (70.5% vs. 80.5%, P = .010) and a higher likelihood of having an actively smoking mother (25.9% vs. 11.2%, P < .001) or partner (65.7% vs. 46.9%, P < .001). Regular tobacco cigarette users considered electronic cigarettes to have a higher risk of adverse impacts (11.1% vs. 2.9%, P = .012), while electronic cigarette users considered regular cigarettes to have a higher risk of nicotine exposure (55.9% vs. 13.0%, P < .001).

CONCLUSION: Our findings indicate being employed, having an actively smoking mother or partner, as well as smoking in previous pregnancies, to be the risk factors for increased likelihood of smoking during pregnancy.

KEYWORDS: Smoking, pregnancy, regular tobacco cigarette, electronic cigarette, risk factors

INTRODUCTION

Smoking in pregnancy is both a significant public health concern and a significant risk factor for adverse neonatal and maternal outcome. Low birth weight infant (LBWI) delivery, miscarriage, preterm birth, and increased neonatal and maternal morbidity and mortality, as well as long-term consequences in the offspring (i.e., neurodevelopmental, childhood asthma, endocrine dysfunction, and oncogenesis) are among the health risks associated with smoking in pregnancy. However, despite the consistently reported harmful effects of smoking during pregnancy, only 40% of women consider quitting smoking during pregnancy, with more than half relapsing within 6 months, and up to 90% relapsing within 1 year. Moreover, electronic nicotine delivery systems (ENDSs) such as electronic cigarettes are also considered an...
emerging risk factor given their increasing popularity during recent years, as they are commonly marketed as safer alternatives to regular cigarettes without considering the risk of the intrinsic adverse effects of nicotine.² ⁴

Accordingly, pregnant women are considered likely to be susceptible to the increased advertising of electronic cigarettes as safer alternatives to tobacco smoking.² Where there are extensive studies on the effects of tobacco smoking, the effects of ENDSs during pregnancy on maternal or fetal or newborn health have been investigated only by a few studies.⁷ ¹⁰ ¹¹

Moreover, relatively little is known about the effect of public health-directed tobacco control policies and programs among pregnant women² ¹³ and there is a scarcity of available literature on the prevalence of smoking in pregnancy in relation to potential maternal sociodemographic and smoking-related risk factors for continued smoking among pregnant women.² ¹³

Likewise, no study to date has investigated the attitudes and practices regarding tobacco smoking as well as the use of electronic cigarettes among pregnant women in Turkey. This cross-sectional, questionnaire-based survey was therefore designed to determine the prevalence of smoking among Turkish pregnant women and to evaluate the attitude and practices of pregnant women regarding the use of regular tobacco cigarettes and electronic cigarettes during pregnancy in relation to maternal sociodemographic and obstetric characteristics and smoking-related parameters.

MATERIAL AND METHODS

Study Population
A total of 1123 adult pregnant women who were routinely followed up at obstetrics outpatient clinics participated on a voluntary basis in this multicenter, cross-sectional questionnaire survey conducted between September 2017 and December 2017 at 15 tertiary care hospitals in 11 provinces across Turkey.

Written informed consent was obtained from each subject following a detailed explanation of the objectives and protocol of the study which was conducted in accordance with ethical principles stated in the “Declaration of Helsinki” and approved by the ethics committee of Health Sciences University Süreyyapaşa Chest Diseases and Thoracic Surgery Training and Research Hospital (date of approval: 04/09/17, protocol no: KAEEK-116/ 2017/5/019).

The Questionnaire
The questionnaire form was applied via a face-to-face interview method and elicited items on maternal sociodemographic (age, marital status, number of children, occupation, educational level, monthly income) and obstetric (gestational week, gestational diseases, comorbid diseases) characteristics, and smoking-related parameters including current smoking status, type of cigarettes (regular tobacco, electronic), age at smoking onset, partner’s and mother’s smoking status, smoking and related complications during previous pregnancies, personal opinions regarding the adverse effects of smoking during pregnancy, and a comparison of regular versus electronic cigarettes in terms of adverse impacts, degree of dependency, and nicotine exposure. The number of cigarettes smoked per day was also calculated, along with scores for the Fagerström test for nicotine dependence (FTND).¹⁴

Income categories were based on Turkey’s minimum wage level set by the government, while monetary results were converted by using an average of 3.44 USD/TL (U.S. dollar/Turkish lira) exchange rates within the study period. Accordingly, income class, based on monthly income, was categorized as lowest (<1000 TL [USD 290.6]), middle (1000–5000 TL [USD 290.6–1453]), high (5000–10 000 TL [USD 1453–2907]), and very high (>10 000 TL [>USD 2907]).

Study Parameters
Maternal sociodemographic and obstetric characteristics, smoking-related parameters, and personal opinions regarding the adverse effects of smoking during pregnancy were evaluated with respect to presence and type of cigarette smoking during pregnancy.

Statistical Analysis
Analyses were performed using MedCalc Statistical Software version 12.7.7 (MedCalc Software Ltd, Ostend, Belgium; http://www.medcalc.org; 2013). The chi-square (χ²) test was used for the comparison of categorical data, while numerical data were analyzed using the Student’s t-test. Data were expressed as mean ± standard deviation (SD) and percentage (%) where appropriate. A P value <.05 was considered statistically significant.

RESULTS

Maternal Sociodemographic and Obstetric Characteristics
A total of 1123 pregnant women (mean [SD] age: 27.9 years, range 16-50 years) participated in the study. Most of women
### Table 1. Baseline Characteristics (n = 1123)

| Category                                           | Subcategory                        | n (%)   | Mean ± SD  | Median (min.-max.) | n (%)   | Mean ± SD  | Median (min.-max.) | n (%)   | Mean ± SD  | Median (min.-max.) | n (%)   | Mean ± SD  | Median (min.-max.) |
|----------------------------------------------------|------------------------------------|---------|------------|-------------------|---------|------------|-------------------|---------|------------|-------------------|---------|------------|-------------------|
| Maternal characteristics                           |                                    |         |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Age (in years)                                      |                                    |         | 27.9 ± 5.7 | 27 (16-50)        |         |            |                   |         |            |                   |         |            |                   |
| Marital status, n (%)                               | Single                             | 13 (1.2) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Married                            | 1105 (98.8) |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Occupation, n (%)                                   | Employed                           | 890 (79.3) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Housewife                          | 233 (20.7) |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Educational status, n (%)                           | Illiterate                         | 77 (6.9)  |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Primary education                  | 542 (48.3) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Secondary education                | 250 (22.3) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | University                         | 227 (20.2) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Master's degree                    | 27 (2.4)  |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Monthly income, n (%)                               | Lowest                             | 142 (13.7) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Middle                             | 724 (69.9) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | High                               | 132 (12.7) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Very high                          | 38 (3.7)  |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Number of children, n (%)                           | None                               | 385 (34.4) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | 1                                  | 383 (34.3) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | 2                                  | 221 (19.8) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | ≥3                                 | 129 (11.6) |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Obstetric characteristics, n (%)                    | No                                 | 1029 (91.6) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Yes                                | 94 (8.4)  |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Gestational week, n (%)                             | No                                 | 203 (18.1) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | 13–24                             | 292 (26.0) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | 25–36                             | 370 (32.9) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | ≥36                               | 258 (23.0) |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Gestational disease                                 | No                                 | 1029 (91.6) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Yes                                | 94 (8.4)  |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Comorbid disease                                    | No                                 | 960 (85.6) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Yes                                | 162 (14.4) |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Current smoking status                              | Overall, n (%)                     |         |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Nonsmoker                          | 671 (60.3) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Former smoker                      | 329 (29.2) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | **Long-term quitter**              | 249 (22.1) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | **Recent quitter**                | 80 (7.1) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Active smoker                      | 139 (12.4) |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Age at smoking onset (in years)                     |                                    | 18.2 ± 3.1 |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Smoking intensity                                   | Current                            | 8.5 ± 5.9 |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Prior to pregnancy                 | 7.7 ± 4.3 |            |                   |         |            |                   |         |            |                   |         |            |                   |
| FTND score, mean ± SD                               |                                    | 2.44 ± 2.4 |            |                   |         |            |                   |         |            |                   |         |            |                   |
| Smoking during current pregnancy, n (%)             | No                                 | 984 (87.6) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Yes                                | 139 (12.4) |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Regular tobacco cigarettes         | 105 (9.4)  |            |                   |         |            |                   |         |            |                   |         |            |                   |
|                                                   | Electronic cigarettes              | 34 (3.0)  |            |                   |         |            |                   |         |            |                   |         |            |                   |

FTND, Fagerström test for nicotine dependence; LBWI, low birth weight infant.
were considered to be similar in terms of adverse impacts (52.8%), while adverse impacts were considered to be more for regular tobacco cigarettes by 24.3% of all participants and degree of dependency was considered to be more for electronic cigarettes by 22.7% of participants (Table 1).

The presence versus absence of smoking during pregnancy was associated with consideration of the potential adverse impacts of regular tobacco and electronic cigarette smoking on baby (P < .001 and P = .003, respectively) and on pregnancy (P < .001 for each) by a lower percentage of women, while consideration of a higher risk of regular tobacco versus electronic cigarettes in terms of adverse impacts (P = .007) and nicotine exposure (P = .001) by a higher percentage of women (Table 2).

Higher percentage of regular tobacco versus electronic cigarette users during pregnancy considered regular tobacco cigarettes to have a lower risk of adverse impacts (P < .001) and electronic cigarettes to have a higher risk of adverse impacts (P = .012). Higher percentage of electronic versus regular tobacco cigarette users during pregnancy considered a higher risk of electronic cigarettes in terms of dependency (61.8% vs. 11.5%, P < .001) but a higher risk of regular tobacco cigarettes in terms of nicotine exposure (55.9% vs. 13.0%, P < .001) (Table 3).

**DISCUSSION**

Our findings revealed the rate of smoking during pregnancy to be 12.4% including use of regular tobacco cigarettes (9.4%) and electronic cigarettes (3.0%), along with a low intensity of smoking (1-10 cigarettes/day) in the majority of pregnant smokers. Smoking during current pregnancy was more likely in those smoking in previous pregnancies, in employed women and in those with actively smoking mother or partner, while the use of electronic cigarettes rather than regular cigarettes was more likely for younger age, and single and employed women with high-income class.

Our findings on the prevalence of using regular tobacco cigarettes and electronic cigarettes in pregnancy seem consistent with previous studies of obstetric populations that revealed the self-reported rate of tobacco smokers to range from 7.2% to 30.0% among pregnant women, and that of electronic cigarette smokers to range from 0.6% to 15.0% among pregnant women. Although younger age, lower educational level, and housewifery have been reported to be associated with an increased likelihood of continuing smoking during pregnancy, our findings revealed a correlation between housewifery and a lower likelihood of smoking and a higher likelihood of regular tobacco versus electronic cigarette usage, and no significant impact of age or educational level on the likelihood of smoking during pregnancy.

At least half of pregnant smokers were at >25 gestational weeks of pregnancy in the current study, while the first trimester was the time of smoking cessation among the majority of quitters. Notably, in a past study among pregnant women, the authors indicated the overall rate of smoking during pregnancy to be 7.1% and higher in the first trimester, particularly for younger and less-educated women, than in
Table 2. Study Variables with respect to Presence of Smoking during Pregnancy

| Maternal characteristics | Smoking during pregnancy (regular tobacco or electronic cigarettes) |  |  |
|--------------------------|---------------------------------------------------------------------|---|---|
|                          | No (n = 984)             | Yes (n = 139) | P |
| Age (in years), mean ± SD| 28.0 ± 6.0               | 29.0 ± 6.0    | .097² |
| Maternal status, n (%)  | Single                  | 10 (1)         | 3 (2.2) | .213 |
|                         | Married                  | 969 (99)       | 136 (97.8) |
| Occupation, n (%)       | Employed                 | 192 (19.5)     | 41 (29.5) | .010 |
|                         | Housewife                | 792 (80.5)     | 98 (70.5) |
| Educational status, n (%)| Illiterate               | 66 (6.7)       | 11 (7.9) | .181 |
|                         | Primary education        | 478 (48.6)     | 64 (46) |
|                         | Secondary education      | 212 (21.5)     | 38 (27.3) |
|                         | University               | 201 (20.4)     | 26 (18.7) |
|                         | Master’s degree          | 27 (2.7)       | 0 (0) |
| Monthly income, n (%)   | Lowest                  | 127 (14)       | 15 (11.5) | .274 |
|                         | Middle                  | 637 (70.4)     | 87 (66.4) |
|                         | High                    | 109 (12)       | 23 (17.6) |
|                         | Very high               | 32 (3.5)       | 6 (4.6) |
| Obstetric characteristics, n (%) |           |               |     |
| Gestational disease     | No                      | 909 (92.4)     | 120 (86.3) | .021 |
|                         | Yes                     | 75 (7.6)       | 19 (13.7) |
| Comorbid disease        | No                      | 850 (86.5)     | 110 (79.1) | .028 |
|                         | Yes                     | 133 (13.5)     | 29 (20.9) |
| Environmental factors, n (%) |                  |               |     |
| Active smoking by own mother |           |               |     |
|                         | 109 (11.2)              | 36 (25.9)     | <.001 |
| Active smoking by partner |           |               |     |
|                         | 446 (46.9)              | 90 (65.7)     | <.001 |
| Electronic cigarette usage by partner |         |               |     |
|                         | 49 (5.5)                | 12 (10.2)     | .062 |
| Obstetrician recommended on cessation of smoking |           |               |     |
|                         | 163 (56.6)              | 85 (68.0)     | .038 |
| Opinions on smoking during pregnancy, n (%) |         |               |     |
| Regular tobacco cigarette smoking |           |               |     |
| Has adverse impact on baby | Absolutely no          | 26 (2.8)       | 8 (5.8) | <.001 |
|                         | No                      | 15 (1.6)       | 4 (2.9) |
|                         | Possible                | 61 (6.5)       | 26 (18.7) |
|                         | No idea                 | 67 (7.1)       | 13 (9.4) |
|                         | Absolutely yes          | 776 (82.1)     | 88 (63.3) |
| Has adverse impact on pregnancy | Absolutely no          | 26 (2.7)       | 12 (8.7) | <.001 |
|                         | No                      | 10 (1.1)       | 4 (2.9) |
|                         | Possible                | 117 (12.3)     | 32 (23.2) |
|                         | No idea                 | 74 (7.8)       | 15 (10.9) |
|                         | Absolutely yes          | 723 (76.1)     | 75 (54.3) |
| Electronic cigarette smoking |           |               |     |
| Has adverse impact on baby | Absolutely no          | 204 (20.9)     | 41 (29.5) | .003 |
|                         | No                      | 39 (4)         | 13 (9.4) |
|                         | Possible                | 127 (13)       | 17 (12.2) |
|                         | No idea                 | 250 (25.6)     | 33 (23.7) |
|                         | Absolutely yes          | 357 (36.5)     | 35 (25.2) |

(Continued)
in the second or the third trimester and found that high rates of smoking during the first trimester to be associated with quitting of smoking in the third trimester among 20% of women.\textsuperscript{13} Hence, high rates of third trimester smoking in our study population seems notable given the association between higher intensity of smoking later in pregnancy with the increasing stress of advancing pregnancy and guilt about not being able to quit smoking, particularly for heavy smokers who find it more difficult to quit smoking upon entering pregnancy.\textsuperscript{13,22,23}

In the current study, smoking versus nonsmoking during pregnancy and the use of regular tobacco versus electronic cigarettes by smokers were both more common in pregnant women with actively smoking mothers or partners. Likewise, in a past study on characteristics associated with quitting smoking during pregnancy and relapse postpartum, authors reported that compared to pregnant smokers, pregnant quitters had more favorable relationship characteristics, including being more likely to be married and less likely to have a significant other who smokes.\textsuperscript{2} In addition, the authors indicated that having a significant other who smokes was also among the predictors of postpartum relapse.\textsuperscript{2} Indeed, the familial transmission of nicotine dependence has also been suggested to be an important factor, given the fact that the majority of women who smoke during pregnancy developed their addiction to tobacco in early life.\textsuperscript{24}

Overall, our participants considered regular tobacco cigarette smoking and electronic cigarette smoking to be similar in terms of nicotine exposure, while the adverse impact of smoking on baby and pregnancy was reported to be higher for regular tobacco cigarettes, and dependency potential was reported to be higher for electronic cigarettes. Specifically, the adverse impact of smoking on baby and pregnancy was confirmed by >70% of participants for regular tobacco cigarettes, but only by 40% of participants for electronic cigarettes. Likewise, in a past study on knowledge, attitudes, and practice of pregnant women regarding electronic cigarette use, the authors reported that most pregnant women understood the risk of smoking during pregnancy, whereas 45% of respondents considered electronic cigarettes to be less

| Table 2. Study Variables with respect to Presence of Smoking during Pregnancy (Continued) | Smoking during pregnancy (regular tobacco or electronic cigarettes) | No (n = 984) | Yes (n = 139) | \(P^1\) |
|---|---|---|---|
| Has adverse impact on pregnancy | Absolutely no | 63 (7.9) | 24 (22.2) | <.001 |
| | No | 5 (0.6) | 3 (2.8) | |
| | Possible | 137 (17.2) | 20 (18.5) | |
| | No idea | 261 (32.7) | 26 (24.1) | |
| | Absolutely yes | 332 (41.6) | 35 (32.4) | |
| Partner and smoking | Absolutely | 382 (78) | 45 (47.9) | <.001 |
| | Maybe | 48 (9.8) | 23 (24.5) | |
| | No idea | 39 (8) | 20 (21.3) | |
| | No | 21 (4.3) | 6 (6.4) | |
| Regular tobacco versus electronic cigarettes | Adverse impact | Similar | 326 (38.1) | 38 (30.6) | .007 |
| | More for regular tobacco cigarettes | 197 (23) | 41 (33.1) | |
| | More for electronic cigarettes | 38 (4.4) | 11 (8.9) | |
| | No idea | 295 (34.5) | 34 (27.4) | |
| Degree of dependency | Similar | 239 (30.9) | 33 (29.5) | .186 |
| | More for regular tobacco cigarettes | 34 (4.4) | 9 (8) | |
| | More for electronic cigarettes | 171 (22.1) | 30 (26.8) | |
| | No idea | 330 (42.6) | 40 (35.7) | |
| Nicotine exposure | Similar | 386 (52.9) | 53 (51.5) | .001 |
| | More for regular tobacco cigarettes | 95 (13) | 28 (27.2) | |
| | More for electronic cigarettes | 18 (2.5) | 1 (1) | |
| | No idea | 230 (31.6) | 21 (20.4) | |

LBWI, Low birth weight infant. Values in bold indicate statistical significance (\(P < .05\)).\(^1\)\(\chi^2\) test, \(^2\)Student’s t-test.
| Study Variables with Respect to Type of Smoking During Pregnancy | Smoking during Pregnancy | \( n \) (%) | \( n \) (%) | \( p \) |
|---|---|---|---|---|
| Maternal characteristics | | | | |
| Age (in years), mean ± SD | Regular Tobacco Cigarettes (n = 105) | 29 ± 6 | 26 ± 5 | **.028** |
| Marital status | | | | |
| Single | | 1 (1) | 2 (5.9) | **.033** |
| Married | | 104 (99.0) | 32 (94.1) | | |
| Occupation | | | | |
| Employed | | 25 (23.8) | 16 (47.1) | **.001** |
| Housewife | | 80 (76.2) | 18 (52.9) | | |
| Educational status | | | | |
| Illiterate | | 11 (10.5) | 0 (0) | **.199** |
| Primary education | | 47 (44.8) | 17 (50) | | |
| Secondary education | | 29 (27.6) | 9 (26.5) | | |
| University | | 18 (17.1) | 8 (23.5) | | |
| Master’s degree | | 0 (0) | 0 (0) | | |
| Monthly income | | | | |
| Lowest | | 15 (15.5) | 0 (0) | **<.001** |
| Middle | | 70 (72.2) | 17 (50) | | |
| High | | 7 (7.2) | 16 (47.1) | | |
| Very high | | 5 (5.2) | 1 (2.9) | | |
| Obstetric characteristics | | | | |
| Gestational disease | | No | 89 (84.8) | 31 (91.2) | **.028** |
| Yes | | 16 (15.2) | 3 (8.8) | | |
| Comorbid disease | | No | 83 (79) | 27 (79.4) | **.071** |
| Yes | | 22 (21) | 7 (20.6) | | |
| Current smoking status, mean ± SD | | | | |
| Age at smoking onset (year) | | | 18.0 ± 3.0 | 18.0 ± 2.0 | **.099** |
| Smoking intensity (cigarettes/day) | | Current | 9.0 ± 6.0 | 12.0 ± 3.0 | **.271** |
| Prior to pregnancy | | 3.0±6.0 | 9.0 ± 2.0 | **<.001** |
| FTND score | | 3.0±2.0 | 4.0 ± 2.0 | **.491** |
| Environmental factors | | | | |
| Active smoking by own mother | | 30 (28.6) | 6 (17.6) | **<.001** |
| Active smoking by partner | | 78 (75.7) | 12 (35.3) | **<.001** |
| Electronic cigarette usage by partner | | 3 (3.6) | 9 (26.5) | **<.001** |
| Obstetrician recommended on cessation of smoking | | 54 (58.1) | 31 (96.9) | **<.001** |
| Opinions on smoking during pregnancy | | | | |
| Regular tobacco cigarette smoking | | Absolutely no | 8 (7.6) | 0 (0) | **<.001** |
| No | | 4 (3.8) | 0 (0) | | |
| Possible | | 21 (20) | 5 (14.7) | | |
| No idea | | 11 (10.5) | 2 (5.9) | | |
| Absolutely yes | | 61 (58.1) | 27 (79.4) | | |
| Has adverse impact on baby | | Absolutely no | 12 (11.5) | 0 (0) | **<.001** |
| No | | 4 (3.8) | 0 (0) | | |
| Possible | | 23 (22.1) | 9 (26.5) | | |
| No idea | | 15 (14.4) | 0 (0) | | |
| Absolutely yes | | 50 (48.1) | 25 (73.5) | | |

(Continued)
harmful than tobacco cigarettes. Accordingly, our findings support the likelihood of the marketing of electronic cigarette use as a supposedly safer alternative to cigarette smoking to result in increasing use, even in pregnancy, with the use of electronic cigarettes during pregnancy by otherwise tobacco-smoking women considered to be safer than tobacco cigarettes.\(^7,19,20,25,26\)

However, in a systematic review of 41 articles on the use of electronic cigarettes in pregnancy, the authors reported that the amount of nicotine consumed by electronic cigarette users was comparable to that consumed by cigarette smokers.\(^19\) Given that younger age and single women with high-income class in our study population were more likely to use electronic cigarettes than regular tobacco cigarettes, our findings seem to support the increasing popularity of electronic cigarettes among young women to add to the increased risk of prenatal smoking exposure.\(^13,27\)

Notably, the risk of prenatal exposure and adverse pregnancy outcomes in smoking pregnant women has been associated not only with prevalence but also with smoking

| Study Variables with Respect to Type of Smoking During Pregnancy (Continued) |
|---------------------------------|-------------------------------|-------------------|-----------------|
| **Smoking during Pregnancy**    | **Regular Tobacco Cigarettes (n = 105)** | **Electronic Cigarettes (n = 34)** | **P**  |
| **Electronic cigarette smoking** | | | |
| Has adverse impact on baby      | Absolutely no 26 (24.8) | 15 (44.1) | **<.001** |
|                                 | No 3 (2.9) | 10 (29.4) | |
|                                 | Possible 14 (13.3) | 3 (8.8) | |
|                                 | No idea 33 (31.4) | 0 (0) | |
|                                 | Absolutely yes 29 (27.6) | 6 (17.6) | |
| Has adverse impact on pregnancy | Absolutely no 4 (5.4) | 20 (58.8) | **<.001** |
|                                 | No 3 (4.1) | 0 (0) | |
|                                 | Possible 11 (14.9) | 9 (26.5) | |
|                                 | No idea 26 (35.1) | 0 (0) | |
|                                 | Absolutely yes 30 (40.5) | 5 (14.7) | |
| **Partner and smoking**         | | | |
| Partner should quit smoking during pregnancy | Absolutely 36 (43.9) | 9 (75) | **<.001** |
|                                 | Maybe 21 (25.6) | 2 (16.7) | |
|                                 | No idea 20 (24.4) | 0 (0) | |
|                                 | No 5 (6.1) | 1 (8.3) | |
| **Regular tobacco vs. electronic cigarettes** | | | |
| Adverse impact                  | Similar 25 (27.8) | 13 (38.2) | **.012** |
|                                 | More for regular tobacco cigarettes 29 (32.2) | 12 (35.3) | |
|                                 | More for electronic cigarettes 10 (11.1) | 1 (2.9) | |
|                                 | No idea 26 (28.9) | 8 (23.5) | |
| Degree of dependency            | Similar 30 (38.5) | 3 (8.8) | **<.001** |
|                                 | More for regular tobacco cigarettes 7 (9) | 2 (5.9) | |
|                                 | More for electronic cigarettes 9 (11.5) | 21 (61.8) | |
|                                 | No idea 32 (41) | 8 (23.5) | |
| Nicotine exposure               | Similar 39 (56.5) | 14 (41.2) | **<.001** |
|                                 | More for regular tobacco cigarettes 9 (13) | 19 (55.9) | |
|                                 | More for electronic cigarettes 1 (1.4) | 0 (0) | |
|                                 | No idea 20 (29) | 1 (2.9) | |

FTND, Fagerström test for nicotine dependence; LBWI, low birth weight infant. Values in bold indicate statistical significance (P < .05).  
\(^1\) \(^2\) test, \(^2\) Student’s t-test.
intensity status during pregnancy.\textsuperscript{13} While higher versus lower smoking intensity, as measured by the number of cigarettes smoked per day, has been reported to be more harmful on the fetus, no level of smoking during pregnancy is actually considered safe.\textsuperscript{13,26,27} In this regard, it should be noted that electronic versus regular tobacco cigarette users in the current study were found to have a nonsignificant tendency for higher smoking intensity (average 9 vs. 12 cigarettes per day, respectively), and significantly higher FTND scores during the current pregnancy, along with a significantly higher smoking intensity prior to pregnancy (average 3 vs. 9 cigarettes per day).

Risk perception, that is, the perceived susceptibility to a threat, is considered an important determinant of health behavior.\textsuperscript{30} While smoking pregnant women are considered less likely to acknowledge and understand the health risks of both tobacco smoking and electronic cigarette usage during pregnancy.\textsuperscript{2} Similarly, in the current study, the potential adverse impacts of smoking on baby and pregnancy were reported by only a lower percentage of women who smoked during current pregnancy, particularly by regular tobacco cigarette users. Regular tobacco cigarette smokers also considered electronic cigarettes to be associated with a higher risk of adverse impact on pregnancy/baby, while electronic cigarette smokers considered regular tobacco cigarette smoking to be associated with higher nicotine exposure.

Moreover, our findings indicated that the likelihood of smoking during current pregnancy, as well as the use of regular tobacco versus electronic cigarettes, was more common in women smokers who had continued smoking in their previous pregnancies, along with those who had a history of LBWI delivery, premature delivery, and stillbirth in those pregnancies. Our findings are consistent with the association of prenatal maternal smoking with adverse neonatal outcomes such as an estimated 13%-19% LBWI deliveries, 5%-8% preterm deliveries, and 5%-7% preterm-related infant deaths found by Frank Wolf et al.\textsuperscript{31} Hence, our findings emphasize the need for improved harm awareness strategies on nicotine exposure and associated complications among pregnant smokers, particularly given the increased likelihood of continued smoking in future pregnancies despite experience of significant maternal-fetal complications.\textsuperscript{7}

Our findings also revealed higher rates of receiving smoking-related consultation by obstetricians among pregnant smokers, particularly those using electronic cigarettes during their pregnancy. Several authors have emphasized that while the assessment of tobacco use has been recommended as a routine part of pregnancy care, many healthcare providers may still not address the use of electronic cigarettes, however.\textsuperscript{28-32} Another study reported that 13.5% of participants in a survey of practicing obstetricians-gynecologists did not perceive any health risks associated with the use of electronic cigarettes in pregnancy.\textsuperscript{32} Our findings seem to indicate the likelihood of continued smoking during pregnancy, not only despite the previous experience of maternal-fetal adverse outcomes, but also against physicians’ recommendations, as well as the likelihood of previous tobacco smokers to prefer electronic cigarette usage in accordance with the recommendations specific to tobacco smoking.

In this regard, our findings emphasize the potential role of improved awareness among women on the significant health risks of smoking, including electronic cigarettes, in pregnancy, as well as implementation of smoking cessation interventions as early as possible to maintain cessation and prevent postpartum relapse.\textsuperscript{13,33} However, cessation of smoking during pregnancy is an ongoing challenge given that none of the methods under investigation, such as psychological interventions, nicotine replacement therapy, group therapy, motivational interviewing and exercise, have been considered an effective antenatal model of care for smokers.\textsuperscript{1,13,34,35} Certain limitations to this study should be considered. First, the self-reported survey design involves the potential for recall bias. Second, although data were gathered using a multicenter design at 15 centers across Turkey, a potential lack of generalizability seems another important limitation due to the relatively small sample size, particularly for smoking subgroups. Third, the exclusion of women aged <18 years is another limitation with potential impact on the estimated prevalence rates found in this study. Despite these limitations, our findings nevertheless seem to represent a valuable contribution to the literature given the restricted amount of data available on this subject area.

**CONCLUSION**

In conclusion, our findings revealed 12.4% of pregnant women to smoke either regular tobacco cigarettes (9.4%) or electronic cigarettes (3.0%) during their pregnancy, along with low smoking intensity in the majority of participants, and continued third trimester smoking in at least half of interviewees. Being employed, smoking in previous pregnancies, and having an actively smoking mother or partner were the risk factors for increased likelihood of smoking during pregnancy. Our findings emphasize the increasing popularity of electronic cigarettes and their consideration as a safer alternative to regular tobacco cigarettes further increase the risk of prenatal smoking exposure, particularly among young pregnant women. In this regard, our findings underscore the potential role of improved awareness among women on the seriousness of smoking-related adverse neonatal outcomes and health risks, for both regular tobacco and electronic cigarettes, the need for promoting increased awareness among the public and healthcare providers about the risks of electronic cigarette use in pregnancy, as well as the implementation of smoking cessation interventions, ideally before conception, or at least in early pregnancy, to maintain cessation and prevent relapse. Further large-scale studies are needed to evaluate smoking prevalence among pregnant women in relation to sociodemographic characteristics, smoking intensity, and type of smoking product to better understand the risk factors for continued smoking and to develop effective interventions for smoking cessation in pregnancy.

Data Availability The data underlying this article will be shared on reasonable request to the corresponding author.
Ethics Committee Approval: This study was approved by Ethics Committee of Health Sciences University SÜreyyapaşa Chest Diseases and Thoracic Surgery Training and Research Hospital, (Approval No: KAEK-116/ 2017/5/019, Date: 04/09/17).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

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**Supplementary Table 1.** Adverse Pregnancy Outcomes and Smoking during Previous Pregnancies

| Smoking during previous pregnancy, n (%) | Total (n = 1123) | Smoking during Current Pregnancy | Type of Smoking during Current Pregnancy | P | \( \chi^2 \) test |
|-----------------------------------------|------------------|---------------------------------|------------------------------------------|---|------------------|
|                                         | No (n = 984)     | Yes (n = 139)                  | P                                        | \( \chi^2 \) test |
| Smoking during previous pregnancy       | 132 (14.4)       | 62 (7.8)                       | 70 (56.0)                                | \(<.001\) | <.001 |
| Previous LBWI delivery, n (%)           | Yes             | 88 (9.6)                       | 68 (8.6)                                 | 20 (16.1) | 17 (18.5) | 3 (9.4) | .010 | <.001 |
| Smoking during pregnancy                | 40 (6.1)         | 20 (3.5)                       | 20 (22.5)                                | \(<.001\) | <.001 |
| Previous premature delivery, n (%)      | Yes             | 91 (8.2)                       | 68 (7)                                   | 23 (16.7) | 21 (20.2) | 2 (5.9) | <.001 |
| Smoking during pregnancy                | 30 (4.7)         | 10 (1.8)                       | 20 (23.5)                                | \(<.001\) | <.001 |
| Previous stillbirth, n (%)              | Yes             | 120 (13.2)                     | 92 (11.7)                                | 28 (22.8) | 20 (22)   | 8 (25)  | .003 |
| Smoking during pregnancy                | 44 (6.8)         | 17 (3)                        | 27 (31.4)                                | \(<0.001\) | \(<.001\) |

LBWI, low birth weight infant. Values in bold indicate statistical significance (P < .05).

\( \chi^2 \) test.