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Tobacco use and secondhand smoking among pregnant women in Al-Madinah, Saudi Arabia

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ABSTRACT

Objectives: This study investigated the prevalence of tobacco smoking and second-hand smoking among pregnant women in Al-Madina, Saudi Arabia, as well as the factors associated with it. *Method:* A cross-sectional analytic study was conducted on 534 pregnant women who attended antenatal care units in 10 primary healthcare centers in Al-Madina in 2022. The mothers completed a self-reported questionnaire that collected data on socio-demography, tobacco use and second-hand smoking. *Results:* Active smokers among the pregnant women were 9.2% and 46.8% were second-hand smokers. A significant association was found between being a passive smoker and having the highest level of education as secondary school (odds ratio (OR) = 2.36; confidence interval (CI) = 1.53-3.66) as well as between being employed and the probability of being a smoker (OR = 4.3; CI = 2.10-9.02). Only 25.4% of the participants were asked about smoking history during their clinical visits over the preceding 12 months. *Conclusion:* Public health education should be given to pregnant women and their husbands about the harmful effects of smoking during pregnancy, to develop a smoke-free environment at home and to promote smoking cessation among them.

Keywords: Pregnancy, smoking, nicotine, Saudi Arabia, secondhand smoking.

1. INTRODUCTION

Tobacco use is known to be a behavior that has major adverse health effects on individuals worldwide (World Health Organization, 2017). The smoking prevalence globally remained relatively high in 2022 compared to previous years, with an estimated 36.7% in male adults and 7.8% in females (World Health Organization, 2019). Individuals who do not actively smoke tobacco but are still exposed to its smoke are known as passive smokers (World Health Organization, 2017). In 2022, developed countries with higher incomes showed a prevalence of 30% for second-hand smoking, while middle- and

low-income countries showed a prevalence of 22% and 45%, respectively (World Health Organization, 2021).

In Saudi Arabia, according to the GATS KSA, (2019), the prevalence was 27.5% among males and 3.7% among females, while second-hand smoking reached up to 9.2% in females and 16.6% in males. In Madinah, a study conducted among 3,210 students reported that the prevalence of second-hand smoking was as high as 32.7% inside the home, 49.3% outside it and 25% both inside and outside (Al-Zalabani et al., 2015). There are several ways to consume tobacco other than cigarettes, such as through a water-pipe (also known as Shisha) and more recently, e-cigarettes. All of these, however, can cause harm (Kadhum et al., 2015).

The Centers for Disease Control and Prevention (CDC) reported that for every person who dies due to tobacco use, at least 30 people live with a serious smoking-related disease (US Department of Health and Human Services, 2014). Smoking is linked to many health issues such as cancer, heart disease, stroke and lung diseases (US Department of Health and Human Services, 2014). The harmful consequences of smoking do not only affect active smokers; however, it often extends to those who are exposed to second-hand smoke in the environment and even to fetuses. Smoking during pregnancy raises the risk of both maternal and fetal health issues. This risk is increased by using tobacco products, including nicotine-containing e-cigarettes.

Pregnant women who are exposed to nicotine are more likely to experience stillbirth, congenital anomalies, low birth weight, abnormal fetal growth, miscarriage and respiratory tract infections in their infants (Wahabi et al., 2013; Jafari et al., 2021). Globally, the prevalence of smoking among pregnant women is 1.7% (Lange et al., 2018). In Sri Lanka, a study found that mothers below the age of 30, as well as those with low monthly incomes and whose spouses had lower education levels, also had significant associations with active smoking (Perera et al., 2021).

The prevalence of second-hand smoking during pregnancy ranges between 69.9% and 64.5% for pregnant women who were exposed to second-hand smoke (SHS) in southern India and Vietnam, respectively, to 20.9% in northern India (Krishnamurthy et al., 2018; Gupta et al., 2015). Several studies around the world have detailed the relationship between maternal smoking and passive smoking, with demographic and psychosocial factors. A study conducted in Iran found that women with low education, elderly women and those with unemployed husbands were more likely to be exposed to SHS during pregnancy (Mahmoodabad et al., 2019).

Other factors reported were ignorance, low family status and lack of awareness among pregnant women to demand a smoke-free environment at home (Sharma and Khapre, 2021; Qutob et al., 2022). In a recent Emirates study of 8,586 pregnant women, the smoking prevalence was 0.7%, while 34.8% were exposed to SHS (Taha et al., 2022). High-level educated pregnant women and those with higher gravidity were unlikely to be exposed to SHS (Taha et al., 2022). There are a limited number of published studies assessing the prevalence and risk factors of active and passive smoking during pregnancy in Saudi Arabia and some studies are outdated. Hardly any of the studies addressed active smoking. Meanwhile, the prevalence of exposure to SHS among pregnant women in a study carried out in Riyadh, was reported to be 31% in 2013 (Alghamdi et al., 2016).

However, the prevalence was lower in another study carried out in Riyadh in 2016 among pregnant women, with a similar age distribution of 24% (Wahabi et al., 2013). Mothers, who were unemployed, had lower levels of education, were younger or had lower parity, had higher exposures to second-hand smoking (Alghamdi et al., 2016; Wahabi et al., 2013). To the best of our knowledge, no studies on this topic have been conducted to-date in Al-Madinah, Saudi Arabia. We therefore aimed to assess the prevalence and risk factors of tobacco use and passive smoking in pregnant women in Al-Madinah, Saudi Arabia.

2. MATERIALS AND METHODS

Study design, setting and participants

This was a cross-sectional analytic study. The sample size was calculated using the Openepi online calculator with the following assumptions: Expected frequency of 24% (based on SHS estimates in previous studies), accepted margin of error of 3% and confidence level of 95%. A total of 534 pregnant women who attended antenatal care units in 10 primary healthcare centers (PHCC) in Al Madinah, Saudi Arabia in 2022 were included in the study.

All pregnant women who were at least 18 years old and could provide informed consent were eligible to participate. Pregnant women who did not understand Arabic or were unwilling to participate were excluded. Participants were interviewed by trained nurses or medical students using an electronic form questionnaire. The questionnaire included three sections: Demographics, tobacco use and general health status.

Variables and measurement

Data were collected using a valid and reliable questionnaire developed by the World Health organization (WHO) (Global Adult Tobacco Survey (GATS)) and translated into Arabic by the Saudi national tobacco control program. This survey has been used in

the Saudi National GATS survey in 2018. Permission to use the Arabic version of the questionnaire was obtained from the Saudi tobacco control program. The questionnaire is composed of three parts: Socio-demographics, tobacco use and general health status.

The socio-demographic questions included socio-demographics and pregnancy-related characteristics, including age, employment status (employed, housewife/unemployed, student or retired), educational level (elementary educational level or less, middle, secondary, bachelor or higher education) and gestational age (weeks). The tobacco uses portion contains seven sections: current tobacco uses, tobacco use before pregnancy, dependency level, type of tobacco use products (shisha smokers, electric cigarettes or vaping), passive smokers and smoking cessation.

Current tobacco uses or active smoking was defined as current use of any type of tobacco products, including cigarettes, water-pipes or e-cigarettes, during pregnancy. Passive smokers were defined as women who had only been exposed to tobacco smoke products either at home or at work (including cigarette, water-pipes, e-cigarettes or vaping) during pregnancy. General health status questions included height, weight, chronic illnesses and number of times the subject had been asked about smoking status during clinic visits over the last 12 months.

Statistical analysis

Demographic and socioeconomic characteristics (age, occupation, education level) and related factors were compared between active smokers, passive smokers and non-smokers. Descriptive quantitative variables are presented as means and standard deviations ± ranges, while qualitative variables are presented as frequency distributions, percentages and ratios. The associations between factors related to tobacco use and passive smokers during pregnancy were assessed using a regression analysis adjusted for age. Statistical analyses were performed using SPSS version 22.0 (IBM Corp, 2013). Probability values (p-values) of less than 0.05 defined statistical significance.

3. RESULTS

The total number of participants in this study was 534, with a mean age of 31 years (standard deviation SD=7). Of these, 9.2% (n=49) reported being smokers, while 46.8% (n=250) were exposed to nicotine products during their pregnancies. Table 1 shows the distribution of sample size within different demographic and health factors.

Table 1 Distribution of study sample by demographics and other health-related factors

Variables	Non-Smokers	Active Smokers	Passive Smokers	Total
No. (%)	235 (44.0%)	49 (9.2%)	250 (46.8%)	534 (100.0%)
Age Mean (SD[a])	30 (6)	28 (5)	32 (7)	31 (7)
(Range)	(18-44)	(19-41)	(18-48)	(18-48)
Before Pregnancy BMI				
Mean (SD[a])-	23.7 (4.3)	23.1 (3.6)	24.7 (4.1)	24.2 (4.1)
(Range)	(11.5-37.7)	(16.6-35.2)	(15.6-43.3)	(11.5-43.3)
Pregnancy Trimester				
1st Trimester	36(45.0%)	9(11.2%)	35(43.7%)	80(100.0%)
2ed Trimester	57(33.0%)	22(12.7%)	94(54.3%)	173(100.0%)
3rd Trimester	84(37.7%)	18(8.0%)	121(54.2%)	223(100.0%)
Education status				
Elementary/or less	9(75.0%)	0(0.00%)	3(25.0%)	12(100.0%)
Middle School	4(40.0%)	2(20%)	4(40.0%)	10(100.0%)
Secondary School	40(25.0%)	17(10.6%)	103(64.3%)	160(100.0%)
Bachelor's degree	111(41.5%)	24(9.0%)	132(49.4%)	267(100.0%)
Higher Education	10(43.4%)	6(26.0%)	7(30.0%)	23(100.0%)
Employment status (%)				
Unemployed	110(37.4%)	16(54%)	170(57.4%)	296(100.0%)
Employed	45(36.9%)	24(20%)	53(43.4%)	122(100.0%)
Retired	1(50.0%)	0(0.00%)	1(50.0%)	2(100.0%)
Student	20(47.0%)	9(21.0%)	23(53.4%)	43(100.0%)

History of Chronic Dx (%)	15(23.0%)	5(7.69%)	45(69.2%)	65(100.0%)

[a]Standard deviation.

As in Table 2 the 49 active smokers used multiple methods. The water-pipe was the most frequently used method (Figure 1). Thirty-six of the pregnant women reported using water-pipes, 17 reported using cigarettes and 11 used vapes (e-cigarettes). The younger age group (18-25 years) had the highest prevalence among the active smokers. Around 56.2% attempted to quit over the preceding 12 months, particularly the pregnant women who smoked water-pipes (52.7%). Of the active smokers, 21.8% were smoking in the first trimester, 43.8% in the second trimester and 34.4% in the third.

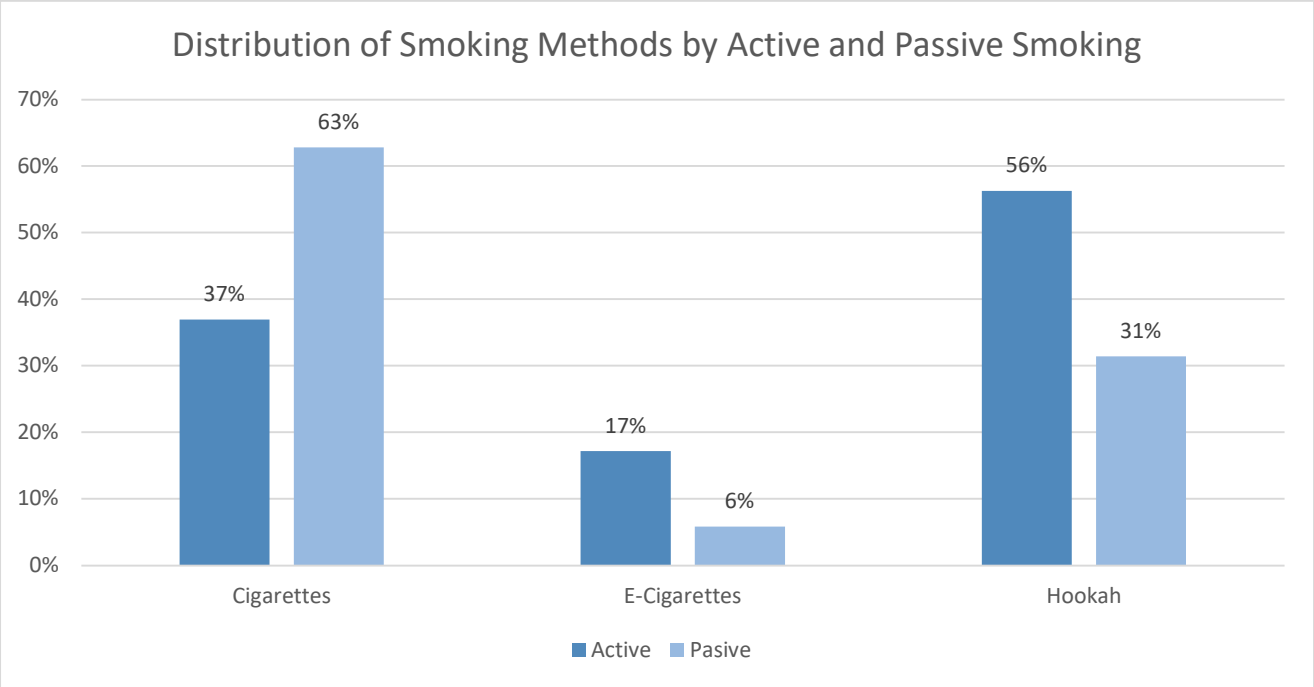

Figure 1 Distribution of Smoking Methods by Active and Passive Smoking

Table 2 Distribution characteristics of active smokers

Smoking Method[a]		E-cigarettes		Waterpipe		Cigarettes		Total	
		No	%	No	%	No	%	No	%
No		11	17.1%	36	56.3%	17	26.5%	64	100.0%
Age Groups	18 -25	6	22.0%	16	59.2%	5	18.5%	27	100.0%
	26-30	3	12.5%	13	54.1%	8	33.3%	24	100.0%
	31-35	2	25.0%	4	50.0%	2	25.0%	8	100.0%
	>35	0	0.00%	3	60.0%	2	40.0%	5	100.0%
Educational Status	Elementary or less	0	0.00%	0	0.00%	0	0.00%	0	100.0%
	Middle	0	0.00%	1	50.0%	1	50.0%	2	100.0%
	Secondary	6	25.0%	12	50.0%	6	25.0%	24	100.0%
	Bachelor	5	15.6%	20	62.5%	7	21.8%	32	100.0%
	Higher Education	0	0.00%	3	50.0%	3	50.0%	6	100.0%
Employment status	Unemployed	6	26.0%	11	47.8%	6	26.0%	23	100.0%
	Employed	4	13.3%	17	56.6%	9	30.0%	30	100.0%
	Retired	0	0.00%	0	0.00%	0	0.00%	0	100.0%
	Student	1	9.0%	8	72.0%	2	18.0%	11	100.0%
Did you attempt to quit smoking in the last 12 months?	No	1	5.8%	9	52.0%	7	41.1%	17	100.0%
	Yes	9	25.0%	19	52.7%	8	22.2%	36	100.0%
Pregnancy Trimesters	First	3	21.4%	8	57.1%	3	21.4%	14	100.0%

	Second	6	21.1%	14	50.0%	8	28.6%	28	100.0%
	Third	2	9.1%	14	63.6%	6	27.3%	22	100.0%

[a]Some of the users used more than one type of smoking method.

Among those who smoked cigarettes, almost half reported being daily smokers. The usual time for their first daily cigarette was 60 minutes after waking up (58%). The rest were split evenly between smoking within the first 30 minutes or between 30 and 60 minutes.

As in Table 3, with reference to the location of SHS exposure, of the total sample 475 were pregnant and 250 were exposed to smoking. Some of them were exposed to more than one type of product. Among the exposed group, the majority (62%) reported being exposed to cigarettes, 31.3% to water-pipes and 5.8% to e-cigarettes. Of the pregnant women, 216 reported their husbands as the major source of exposure to smoke at home. About 21.5% of the respondents were employed and of these only 35% were exposed at work, which meant it was less likely for them to be exposed at work, compared to at home. Regarding the policy rules at home, 31.3% of the secondhand smokers reported not having any rules banning smoking at home, while 10.7% allowed smoking at home.

Table 3 Distribution of characteristics of those exposed to second-hand smoking

Second-hand smokers[a]		Cigarettes		E-cigarettes		Waterpipe		Total	
		No	%	No	%	No	%	No	%
Age group	18-25	54	52.0%	14	13.0%	36	35.0%	104	100.0%
	26-30	49	63.0%	3	4.0%	26	33.0%	78	100.0%
	31-35	49	69.0%	0	0.00%	22	31.0%	71	100.0%
	>35	64	70.0%	3	3.0%	24	26.0%	91	100.0%
Current Job	Unemployed	135	67.0%	10	5.0%	58	29.0%	203	100.0%
	Employed	43	73.0%	1	2.0%	15	25.0%	59	100.0%
	Retired	1	100.0%	0	0.00%	0	0.00%	1	100.0%
	Student	19	58.0%	3	9.0%	11	33.0%	33	100.0%
Educational Status	Elementary/ or less	2	67.0%	0	0.00%	1	33.0%	3	100.0%
	Middle	4	100.0%	0	0.00%	0	0.00%	4	100.0%
	Secondary	89	68.0%	9	7.0%	33	25.0%	131	100.0%
	Bachelor's	99	64.0%	5	3.0%	50	32.0%	154	100.0%
	Higher Education	6	86.0%	0	0.00%	1	14.0%	7	100.0%
Your practiced home smoking rules	Never allowed	36	78.0%	0	0.00%	10	22.0%	46	100.0%
	Allowed within exceptions	33	65.0%	4	8.0%	14	27.0%	51	100.0%
	Allowed	21	57.0%	3	8.0%	13	35.0%	37	100.0%
	No rules	72	67.0%	4	4.0%	32	30.0%	108	100.0%
During the last 30 days has anyone smoked indoor in your workplace?	No	18	69.0%	0	0.00%	8	31.0%	26	100.0%
	Yes	6	43.0%	2	14.0%	6	43.0%	14	100.0%
Pregnancy Trimesters	First Trimester	31	66.0%	3	6.0%	13	28.0%	47	100.0%
	Second Trimester	80	71.0%	5	4.0%	28	25.0%	113	100.0%
	Third Trimester	90	64.0%	6	4.0%	44	31.0%	140	100.0%
Can inhaling smoke adversely affect the health of non-smokers?	No	7	70.0%	0	0.00%	3	30.0%	10	100.0%
	Yes	178	67.0%	12	4.0%	77	29.0%	267	100.0%

[a]Some of the second-hand smokers were exposed to more than one type of smoking product.

While studying the association between being either a smoker or a passive smoker and various demographic factors, multiple associations were found to be significant (Table 4). Having an elementary level of education or less was associated with lowers odds of being a passive smoker (OR=0.21; CI= 0.06-0.83). There was also a significant association between being a passive smoker and having a higher level of education at a secondary school (OR=2.36; CI=1.53-3.66) when adjusted for age.

Regarding employment status, a significant association was found between being unemployed and having a lower probability of being a smoker (OR=0.3; CI=0.15-0.60), while the employed women had higher chances of being smokers (OR=4.3; CI=2.10-9.02). On examining the association between age and being either a smoker or a passive smoker, there was a weak negative association between age and being a smoker (r=-0.14; p-value=0.03). However, there was a weak positive association between age and being a passive smoker (r=0.14; p-value=0.005).

Table 4 Odds ratios (OR) of being a smoker or a passive smoker according to different demographic factors

	Active Smoker		Passive Smoker	
	Adjusted OR[a]	95% CI[b]	Adjusted OR[a]	95% CI[b]
Education status				
Literate with no education/Elementary	NA[c]	NA[c]	0.21	0.06 – 0.83
Middle School	1.80	0.31 – 10.34	0.62	0.12 – 2.58
Secondary School	1.70	0.83 – 3.40	2.36	1.53 – 3.66
Bachelor's degree	0.94	0.88 – 0.99	0.69	0.47 – 1.03
Higher Education	3.02	0.99 – 0.17	0.45	0.17 – 1.22
Employment status				
Unemployed	0.3	0.15 – 0.60	1.25	0.83 – 1.87
Employed	4.30	2.10 – 9.02	0.70	0.42 – 1.07
Retired	NA[c]	NA[c]	0.50	0.03 – 8.23
Student	1.15	0.43 – 3.10	1.20	0.60 – 2.42

[a]Odd ratio adjusted to age. [b]95% Confidence interval. [c]NA: non-applicable for having non as a smoker within the study sample.

Table 5 Association of age with being a smoker or a passive smoker

	Active Smoker		Passive Smoker	
	r[a]	p-value	r[a]	p-value
Age	-0.14	0.03	0.14	0.005

[a] Correlation coefficient.

4. DISCUSSION

This cross-sectional analytic study investigated the prevalence and the associated factors of tobacco use and second-hand smokers among pregnant women from Madinah City in Saudi Arabia. The overall prevalence of active smoking during pregnancy reached as high as 9.2%, which is higher compared to studies carried out in other countries. A study in the Emirates found that the frequency of maternal smoking was as low as 0.7% (Taha et al., 2022). According to a study in Costa Rica, the rate of smoking among pregnant women was 2.7% (Quiñones et al., 2022).

Consistent with other studies, the prevalence of exposure to second-hand smoke was noticed to be much higher than the prevalence of active smoking among pregnant women. A total of 46.8% of pregnant women were exposed to SHS, including cigarettes and other types of tobacco products. Of these, 40% were exposed to cigarettes. These estimates are higher compared to two previous Saudi studies carried out in Riyadh, which reported that 31% and 24% (respectively) of pregnant women were exposed to cigarettes (Alghamdi et al., 2016; Wahabi et al., 2013).

Recently, water-pipe use has spread worldwide among young adults. According to our study, out of 470 (n=49) women who reported smoking during pregnancy, the water-pipe was the most frequently used product among 56.3%, followed by cigarettes among 26.5% and finally e-cigarettes among 17.1%. This high prevalence of water-pipe smoking during pregnancy could be due to the misconception that the water-pipe is less harmful (Daniels, 2012). Most previous studies on the subject have measured tobacco use as a broad concept, regardless of the type of tobacco product that had been used or that subjects had been exposed to.

A recent study in the United States, aimed mainly at water-pipe smokers, reported the water-pipe as being the most frequently used smoking method among pregnant women, with a prevalence of up to 81% (47 out of 58 pregnant women) (Stroud et al., 2020).

The water-pipe has been found to contain the same addictive drug, nicotine that causes dependency in cigarettes (Jukema et al., 2014). Therefore, the water-pipe has similar harmful consequences for both the mother and the fetus (Nematollahi et al., 2020).

While assessing SHS exposure, 67% of our subjects reported having been exposed to cigarettes. This may be explained by the fact that the majority (86.4%) of secondhand smokers reported that their husbands smoked. Regarding second-hand smoking rules at home, 10.7% allowed smoking at home, 15% allowed it with exceptions and 31.4% had no rules. This may be due to lack of knowledge and awareness among the husbands regarding the effects of smoking on fetal health (Afzal et al., 2022). Thus, only 13.4% never allowed smoking at home, compared to a previous study carried out in Costa Rica which reported that 72.7% of pregnant women never allowed smoking at home (Quiñones et al., 2022).

These results indicate that any intervention to limit second-hand exposure in the house should be directed toward both parents, not just the mother. Knowledge regarding the hazards should be raised among husbands with smoking habits. Among employed pregnant women (n=75), 33.3% were exposed to SHS at the workplace. Similar to previous Saudi studies Alghamdi et al., (2016) and Wahabi et al., (2013), we found that pregnant women were more likely to be exposed to SHS at home than in the workplace. A possible explanation for the low percentage of exposure at work may be strict policies against smoking in the workplace.

Among the cigarette smokers, our study demonstrated that 50% of pregnant women were daily smokers. Most of these reported that they smoked 60 minutes after waking up. A study carried out in the Netherlands reported that 7.8 cigarettes per day was the average for daily smokers during pregnancy (Baron et al., 2013). Approximately 53.4% of the active smokers had attempted to quit smoking during the preceding 12 months. Approximately 25.4% of the total participants were asked about their smoking history during their clinical visits over the preceding 12 months. Among the smokers, 60% had been advised to quit smoking. This emphasizes the need for smoking cessation against maternal tobacco smoking (cigarettes, water-pipes or e-cigarettes).

Our findings also highlighted the associated socio-demographic determinants. Age showed a weak negative association with being a smoker; however, second-hand smoking was high among younger pregnant women. Our results are in line with studies from both the USA and Sri Lanka, where the prevalence of maternal smoking increased as mothers' ages decreased (Perera et al., 2021; Drake et al., 2018). A few studies carried out in Saudi Arabia and Spain also found a significant association between the frequency of second-hand smoking and the ages of pregnant woman (Alghamdi et al., 2016; Wahabi et al., 2013).

The educational level of pregnant women was significantly related to the prevalence of second-hand smoking. Women with secondary school degrees had higher odds of being passive smokers. In the United Arab Emirates, exposure to SHS was significant in pregnant women whose educational levels were high school or lower. Many studies have indicated that lower education levels are predictors for SHS exposure. In our study, we found that having an educational level of elementary school or lower carried lower odds of being exposed to smoke. A possible explanation for this may be that most other studies took into consideration the educational levels of both spouses (Taha et al., 2022).

We did not observe an association between educational level and active smokers in our study, since the majority of the smokers in our sample had secondary and/or bachelor's degrees. In this study, employment status did not show an association with passive smoking. Nevertheless, we found that pregnant women who were employed were more likely to be smokers. The findings of several other studies align with ours (Rocheleau et al., 2017). One reported employment to be independently associated with smoking both before and during pregnancy.

Limitations

One of the limitations of this study was the interviewing method of data collection. This may lead to underreporting of smoking in pregnant women due to a social desirability bias. Another limitation is self-reported data collection, which may lead to difficulties in recalling memories. A further limitation is that the husbands were not assessed for socio-demographic factors including age, employment status and educational level.

In addition, we used a subjective method to measure smoking status among pregnant women. We advise subsequent studies to use a larger sample size and an objective way to detect smoking or exposure status such as nicotine level, in order to confirm the agreement between self-reported and objective measurements of tobacco use and/or exposure.

5. CONCLUSION

Regarding the findings of the study, we need to raise awareness of the potential harms of any smoking product, including water-pipe, cigarettes and others, particularly during pregnancy. Having a smoke-free environment for a pregnant woman is crucial for her health during pregnancy, for both the mother and the fetus. Thus, developing a strict smoking-free policy at home plays an important role in limiting SHS exposure. Husbands need to be educated about passive smoking and its harmful effects, in order to

cultivate a better home environment. Healthcare providers also have a substantial role to play in detecting smoking during antenatal visits. It is of utmost importance to ask and assess all attending pregnant women about smoking products and encourage smoking cessation by providing appropriate support and strategies.

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Author's Contributions

Maha Almutairi carried out the study design, collecting of data, analysis and writing manuscript; Abdulmohsen Al-Zalabani guided the study design and critically reviewed the paper; Nouf Alkalbi and Zahrah Alsharif analyzed the data and interpretation; Mohamad Almotairy participated in writing the manuscript; Ayman Almotairy collected the data and wrote the first draft. All authors reviewed the article critically and approved the final version of the manuscript.

Ethical approval

The study was approved by the Medical Ethics Committee in Al-Madinah Health Cluster, Saudi Arabia (Ethical approval code: IRB 22-033).

Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

REFERENCES AND NOTES

1. Afzal F, Aalam KP, Mehra S, Joshi S, Ahmad AA. Practice and awareness of migrant pregnant women living in urban slums towards tobacco consumption. Medical Science 2022; 26:ms316e2332. doi: 10.54905/disssi/v26i125/ms316e2332
2. Alghamdi AS, Jokhadar HF, Alghamdi IM, Alsohibani SA, Alqahtani OJ, Wahabi HA. Socioeconomic determinants of exposure to secondhand smoke among pregnant women. Int J Womens Health Reprod Sci 2016; 4(2):59-63.
3. Al-Zalabani AH, Amer SM, Kasim KA, Alqabshawi RI, Abdallah AR. Second-hand smoking among intermediate and secondary school students in Madinah, Saudi Arabia. Biomed Res Int 2015; 2015:672393.
4. Baron R, Manniën J, De-Jonge A, Heymans MW, Klomp T, Hutton EK, Brug J. Socio-demographic and lifestyle-related characteristics associated with self-reported any, daily and occasional smoking during pregnancy. Semple MG (Editor). PLoS One 2013; 8(9):e74197.
5. Daniels KE. Hookah pipe use: Comparing male and female university students' knowledge, risk perceptions and behaviours 2012. https://core.ac.uk/download/pdf/58916152.pdf
6. Drake P, Driscoll AK, Mathews TJ. Cigarette Smoking During Pregnancy: United States, 2016. NCHS Data Brief 2018; 305:1-8.
7. GATS KSA. Global Adult Tobacco Survey 2019.
8. Gupta S, Malhotra AK, Verma SK, Deka M, Yadav R, Singh S. Effects of passive smoking (environmental tobacco smoke) on pregnancy outcome at district hospital, Jhansi, Uttar Pradesh. Int J Med Sci Public Health 2015; 4:1090-4.
9. IBM Corp. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp 2013.
10. Jafari A, Rajabi A, Gholian-Aval M, Peyman N, Mahdizadeh M, Tehrani H. National, regional and global prevalence of cigarette smoking among women/females in the general population: A systematic review and meta-analysis. Environ Health Prev Med 2021; 26(1):1-3.
11. Jukema JB, Bagnasco DE, Jukema RA. Waterpipe smoking: Not necessarily less hazardous than cigarette smoking:

Possible consequences for (cardiovascular) disease. Neth Heart J 2014; 22(3):91–9.
12. Kadhum M, Sweidan A, Jaffery AE, Al-Saadi A, Madden B. A review of the health effects of smoking shisha. Clin Med (Lond) 2015; 15(3):263–6.
13. Krishnamurthy A, Chinnakali P, Dorairajan G, Sundaram SP, Sarveswaran G, Sivakumar M, Krishnamoorthy K, Dayalane H, Sinouvassan V. Tobacco use, exposure to second-hand smoke among pregnant women and their association with birth weight: A retrospective cohort study. J Family Med Prim Care 2018; 7(4):728.
14. Lange S, Probst C, Rehm J, Popova S. National, regional and global prevalence of smoking during pregnancy in the general population: A systematic review and meta-analysis. Lancet Glob Health 2018; 6(7):e769–76.
15. Mahmoodabad SS, Karimiankakolaki Z, Kazemi A, Mohammadi NK, Fallahzadeh H. Exposure to secondhand smoke in Iranian pregnant women at home and the related factors. Tob Prev Cessat 2019; 5:7.
16. Nematollahi S, Holakouie-Naieni K, Madani A, Shabkhiz H, Torabi E, Lotfi S. The effect of quitting water pipe during pregnancy on anthropometric measurements at birth: A population-based prospective cohort study in the south of Iran. BMC Pregnancy Childbirth 2020; 20(1):241.
17. Perera AS, Jayasinghe RM, Rajapakse A, Ratnayake RM, Jayasinghe RD. Second hand smoking and tobacco use among pregnant women in Yatinuwara Medical Officer of Health (MOH) area in Sri Lanka. J Oral Biol Craniofac Res 2021; 11(3):442–6.
18. Quiñones Z, Li D, McIntosh S, Avendaño E, Sánchez JJ, Dimare-Hering C, Flores-Golfin D, Wang S, Pérez-Ramos JG, Dye TD, Ossip DJ. Predictors of Secondhand Smoke Exposure During Pregnancy in Costa Rica, the Dominican Republic and Honduras. Nicotine Tob Res 2022; 24(6):909–13.
19. Qutob RA, Habib SK, Al-Faisal AA, Al-Sugayer MK, Alghamdi AH, Alaryni AA, Alammari YM, Al-Harbi KM, Bukhari AI, Hakami OA. Knowledge and perception of risks and use of e-cigarettes among adults in Saudi Arabia: A cross sectional study. Medical Science 2022; 26:ms479e2562. doi: 10.54905/dissi/v26i129/ms479e2562
20. Rocheleau CM, Bertke SJ, Lawson CC, Romitti PA, Desrosiers TA, Agopian AJ, Bell E, Gilboa SM. National Birth Defects Prevention Study. Factors associated with employment status before and during pregnancy: Implications for studies of pregnancy outcomes: Employment Status and Pregnancy. Am J Ind Med 2017; 60(4):329–41.
21. Sharma T, Khapre M. Exposure of second-hand smoke in women and children: A narrative review. J Family Med Prim Care 2021; 10(5):1804.
22. Stroud L, Werner E, Matteson K, Carey M, St Helen G, Eissenberg T, Scott-Sheldon LA. Waterpipe (hookah) tobacco use in pregnancy: Use, preferences and perceptions of flavours. Tob Control 2020; 29(Suppl 2):s62–71.
23. Taha MN, Al-Ghumgham Z, Ali N, Al-Rifai RH, Elbarazi I, Al-Maskari F, El-Shahawy O, Ahmed LA, Loney T. Tobacco Use and Exposure to Environmental Tobacco Smoke amongst Pregnant Women in the United Arab Emirates: The Mutaba'ah Study. Int J Environ Res Public Health 2022; 19(12):7498.
24. US Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health 2014.
25. Wahabi HA, Alzeidan RA, Fayed AA, Mandil A, Al-Shaikh G, Esmaeil SA. Effects of secondhand smoke on the birth weight of term infants and the demographic profile of Saudi exposed women. BMC Public Health 2013; 13(1):341.
26. World Health Organization. WHO global report on trends in prevalence of tobacco use 2000-2025, 3rd edition. World Health Organization 2019.
27. World Health Organization. WHO report on the global tobacco epidemic, 2017: Monitoring tobacco use and prevention policies. World Health Organization 2017.
28. World Health Organization. WHO Report on the Global Tobacco Epidemic 2021: Addressing new and emerging products. World Health Organization 2021.