

ACTIVE SMOKING AND EXPOSURE TO PASSIVE SMOKING AMONG PREGNANT WOMEN ATTENDING A PRIMARY HEALTH CENTRE IN TEMANGGUNG, INDONESIA

Herlina Mayangsari^{1,2}, Mohammad Afzal Mahmood^{1,2}

¹School of Public Health, the University of Adelaide, Adelaide SA, Australia.

²Primary Health Centre of Temanggung, Department of Health, Temanggung Regency, Indonesia.

Correspondence address: Herlina Mayangsari

E-mail: herlinamayangsari@gmail.com

ABSTRACT

Smoking during pregnancy threatens the health of mothers and their fetus. There are limited data in Indonesia about risk factors associated with smoking during pregnancy. This study aimed to explore levels of smoking, exposure to second-hand smoke (SHS), and related risk factors among pregnant women. Pregnant women who received antenatal care at the Temanggung Primary Health Centre in Central Java, Indonesia were interviewed face-to-face. They were asked about their smoking status, socio-economic status, pregnancy characteristics, and knowledge about health risks associated with smoking. A total of 80 participants were interviewed, and none of whom reported smoking, but the majority of whom (91.3%) reported exposure to SHS. This is a significant proportion when compared to rates of exposure to SHS recorded in other countries. The age of the mother affected the likelihood of exposure to SHS, with older mothers having a reduced likelihood of SHS exposure ($p = 0.013$; $OR = 0.8$; $95\% CI = 0.74-0.96$). However, the number of pregnancies, ANC visits, level of education, income, and awareness of the health risks associated with smoking were not found to be statistically significant. Although women appeared to be relatively aware of the negative effects associated with smoking and SHS exposure, the high incidence of passive smoking illustrated the challenges encountered by women in avoiding SHS. ANC programme should place greater stress on the dangers of SHS exposure, and also involve the whole family. Additionally, laws should be enacted to restrict or prohibit smoking in public places.

Keywords: pregnant women, second-hand smoke, smoking

ABSTRAK

Merokok selama kehamilan dapat mengancam kesehatan ibu dan bayi dalam kandungan. Di Indonesia, data tentang prevalensi dan faktor-faktor yang berhubungan dengan merokok masih terbatas. Tujuan penelitian ini adalah menyelidiki prevalensi merokok dan paparan asap rokok, dan faktor-faktor yang berhubungan dengan merokok pada wanita hamil. Wawancara tatap muka dilakukan terhadap wanita hamil yang melakukan pemeriksaan kehamilan di Puskesmas Temanggung, Jawa Tengah, Indonesia. Status merokok, status sosial ekonomi, karakteristik kehamilan, dan pengetahuan tentang risiko kesehatan akibat merokok diteliti. Terdapat 80 perempuan berpartisipasi. Tidak ada wanita hamil yang merokok saat penelitian. Sebagian besar wanita hamil (91,3%) terpapar oleh asap rokok. Angka ini tercatat paling tinggi dibandingkan laporan paparan asap rokok dari banyak negara. Menjadi ibu dengan umur lebih tua ditemukan menjadi faktor yang signifikan untuk melindungi dari paparan asap rokok ($OR\ 0,8$, $95\%\ CI: 0,74-0,96$, $p = 0,013$); Namun, tidak dengan banyaknya paritas, kunjungan ANC, pendidikan, pendapatan dan pengetahuan tentang risiko kesehatan terkait merokok. Meskipun wanita memiliki pengetahuan yang baik tentang dampak buruk merokok, tingginya prevalensi perokok pasif mencerminkan tantangan yang dihadapi perempuan dalam menghindari paparan asap rokok. Diperlukan adanya penekanan dalam pelayanan ANC, pelibatan keluarga, dan penerapan peraturan dalam upaya pencegahan merokok di tempat umum.

Kata kunci: Wanita hamil, Perokok pasif, Merokok

INTRODUCTION

Smoking is seen as an increasingly significant issue for public health in Indonesia. According to recent statistics, smoking is the fourth most frequent

contributor to disability and early death in Indonesia (Mboi *et al.*, 2018). In fact, just over half (53%) of 1,863,000 deaths recorded in Indonesia in 2016 were due to diseases related to smoking (World Health Organization (WHO), 2018). Research has

also shown that the proportion of the population using tobacco in Indonesia has been growing (Mboi *et al.*, 2018). Indonesia has the third largest proportion of tobacco users per head of population in Asia and the seventh largest globally (WHO, 2015), and 64.3% of men and 2.7% of women aged 15 years or more reported smoking (WHO, 2017). While Indonesia has reported a relatively small proportion of female smokers (2.7%), a much larger proportion of women are at risk of exposure to second-hand smoke (SHS) due to the large proportion of male smokers (64.3%) (Mboi *et al.*, 2018).

Smoking and exposure to SHS during pregnancy can pose long term health issues; furthermore, children whose mothers smoke or are exposed to SHS are more likely to be born prematurely or have a low birth weight (LBW), experience sudden infant death syndrome (SIDS), and suffer from childhood asthma (Deming, 2012; Abraham *et al.*, 2017; Cui *et al.*, 2016; Dietz *et al.*, 2010; Norsa'Adah and Salinah, 2014; Qiu *et al.*, 2014; Zhang and Wang, 2012; Simons *et al.*, 2014). Smoking and exposure to SHS both act through similar biological mechanisms to affect health (Cui *et al.*, 2016), and both increase the risk of a variety of negative health outcomes for both mothers and children (Mitchell *et al.*, 2017).

A considerable body of research exists regarding the proportions of women in different countries around the world who smoke while pregnant (Al-Sahab *et al.*, 2010; Chomba *et al.*, 2010; Krstev *et al.*, 2012; Singh *et al.*, 2015; Torres *et al.*, 2011; Vardavas *et al.*, 2010a). The proportion of women who smoke while pregnant recorded in these studies varies from country to country, ranging from 3% in the Dominican Republic to 37.2% in Serbia. In addition to this, the rates of passive smoking reported by the studies varied from 8.3% in the Democratic Republic of the Congo to 94% in Greece (Al-Sahab *et al.*, 2010; Chomba *et al.*, 2010; Krstev *et al.*, 2012; Torres *et al.*, 2011; Vardavas *et al.*, 2010a).

The proportion of premature births in Indonesia was the fifth largest globally in 2010 at 15% of all live births across the country. Furthermore, in 2013, the proportion of infant deaths in Indonesia was among the ten largest in the world (Lawn and Kinney, 2014). In the Temanggung region, the proportion of babies born with LBW was relatively consistent with the national proportion (10.13% and 10.2%, respectively) (Indonesian Ministry of Health, 2013), which further emphasises the potential negative side effects of smoking, especially among pregnant women.

While passive smokers (i.e., those exposed to SHS) are less likely than active smokers to experience health issues related to smoking, the large proportion of the population exposed to SHS in Indonesia illustrates the considerable risk of SHS to the population (Norsa'Adah and Salinah, 2014). The Temanggung region is Indonesia's third largest tobacco producer, with almost 13% of the total tobacco production in Indonesia in 2012 (Tobacco Control Support Center - IAKMI, 2014). The proportion of the population actively smoking is relatively large due to tobacco being easy to access in the area. This is especially true for tobacco farmers and workers employed in the production and processing of tobacco. A relatively large proportion of male tobacco plantation workers (approximately 68%) were still smoking ten years ago (Ahsan *et al.*, 2008). Although the proportion of female workers in the Temanggung region is relatively small (1.1%), exposure to SHS could be much higher. Almost 53.1% of the male population in Temanggung smoked in 2017 (Central Bureau of Statistics, 2018). It remains unclear if the people living in the Temanggung region have an adequate understanding of the harmful effects of tobacco use and exposure to SHS. A sufficient understanding of the negative health effects of smoking is critical for pregnant women to avoid active smoking and being exposed to SHS.

Only a limited number of studies regarding the proportions of pregnant smokers have been conducted and published in Indonesia. Therefore, this study is designed to investigate the rates of active smoking and exposure to SHS among pregnant women, and explore potential influential factors associated with smoking rates.

METHODS

A cross-sectional study was conducted in the Temanggung Primary Healthcare Centre (TPHC) between February 25th and March 12th, 2019, which used a face-to-face survey interview methodology with a structured questionnaire which explored smoking behaviour, risk factors associated with exposure to SHS, access to maternal health services, and demographic factors. The questionnaire was administered to pregnant women who received antenatal care (ANC) in the TPHC. Women receiving ANC during the research period were approached and invited by the clinicians to participate in this study. Eligibility criteria specified that the women should be aged 18 years or older and be in the second or third trimester of pregnancy.

A total of 634 women visited the TPHC during 2018. From this population, a sample of 80 women were selected using simple random sampling. These randomly selected women were approached by the clinicians providing ANC and invited to participate. Out of 80 who were approached, all of them agreed to participate in the study and gave their informed consent to do so via a signed consent form. The questionnaire, which was in Indonesian, consisted of questions about the pregnant women's smoking behaviour, knowledge of the health risks associated with smoking, exposure to passive smoking, and demographic information.

The study utilised smoking status as the dependent variable, which was comprised of active smokers (ex-smokers

and current smokers) and passive smokers. The ex-smokers group was defined as those who had quit smoking at least 30 days prior to the research period. Passive smokers were defined as those who resided with someone who smoked inside while they were present in the same area of the house and/or were exposed to SHS at the workplace, on public transportation, or in a public place (Global Adult Tobacco Survey Collaborative Group, 2011). Independent variables included age, education level, household income, pregnancy characteristics (gestational age, ANC visit, and gravida), working status, and knowledge of smoking-related health risks. The respondent's knowledge was assessed by including questions about four different adverse pregnancy outcomes related to smoking, namely premature delivery, LBW, SIDS, and childhood asthma.

STATA 14 was used to analyse the data. Respondent characteristics, including age, income, education, pregnancy stage, gravida, and number of ANC visits, were identified using descriptive analysis.

The study adopted the passive smoking classification from Torres et al. (2011) to determine current SHS exposure in respondents' homes based on the exposure frequency: rarely or never, sometimes, frequently, and always. A response of "frequently" or "always" getting exposed to SHS at home and/or a response of "yes" in any of the questions regarding current SHS exposure in public facilities classified respondents as being exposed to SHS. Moreover, since there were six questions assessing the knowledge of the health risks associated with the smoking variable, the maximum score for that variable was six, with one point for each correct answer. To determine the knowledge levels, the scores were classified into three categories: (1) poor (a score of less than 3), (2) fair (score of 3 to 4), and (3) good (score of over 4).

Smoking status and responses to all the independent variables were displayed using frequency distributions. Logistic

regression analysis was performed using a two-tailed T-test of logistic regression with a threshold of 0.05 for statistical significance to determine the association between the outcome and the predictors (Hilbe, 2016). Bivariate and multivariable logistic regression models were used to analyse the data. All variables with a p-value of less than 0.25 from the bivariate analysis were selected for the initial multivariable model. Variables with a p-value of less than 0.05 were included in the next stage of model fitting. The process of backwards elimination continued until only significant covariates were retained in the model (Hosmer *et al.*, 2013).

The study was approved by the Human Research Ethics Committee of the University of Adelaide Number H-2019-12 and by the Indonesian authorities Number 070/343/2018. Since data about pregnant smokers in the Temanggung region were not available, smoking status data were provided through consent forms collected by the clinicians in the TPHC.

RESULTS

A total of 80 pregnant women were surveyed. No participants withdrew from the survey once the study had commenced. The mean age of the pregnant women surveyed was 27 years. Close to half of the participants (48.75%) had completed 12 years of formal education, and more than half (53.7%) were from low-income households.

Prevalence of active smoking

None of the participants reported active smoking (Table 1). Four participants identified themselves as ex-smokers (95% CI = 1.9%-12.8%). Of these, two participants reported that they had been daily smokers, while the remaining two had smoked at least once a week. Two ex-smokers were from low income families, in the second trimester, and were

primigravida, while the other two were from middle income families, in the third trimester, and were multigravida. All four ex-smokers had completed senior high school.

Table 1. Demographic, Pregnancy Characteristics, and Smoking Status

Variable	Ex-smoker	
	Yes (%)	No (i.e. never smoked) (%)
All	4 (5.0)	76 (95.0)
Age		
<30	3 (3.8)	53 (66.3)
≥30	1 (1.3)	23 (28.8)
Education		
No school	0 (0.0)	0 (0.0)
Very low	0 (0.0)	8 (10.0)
Low	0 (0.0)	19 (23.8)
Middle	4 (5.0)	35 (43.8)
High	0 (0.0)	14 (17.5)
Household income		
Low	2 (2.5)	41 (51.3)
Modest	2 (2.5)	25 (31.3)
High	0 (0.0)	10 (12.5)
Pregnancy stage		
Second trimester	2 (2.5)	42 (52.5)
Third trimester	2 (2.5)	34 (42.5)
Gravida		
Primigravida	2 (2.5)	34 (42.5)
Multigravida	2 (2.5)	42 (52.5)

Prevalence of passive smoking during pregnancy

The overwhelming majority of participants (91.3%) (95% CI = 82.5-95.8) reported being exposed to SHS (Table 2). Of these, 80.0% (95% CI = 69.6-87.5) reported being exposed in their homes, followed by 55.8% (95% CI = 40.3-70.3) being exposed to SHS in public facilities, 47.1% (95% CI = 30.4-64.4) in the workplace, and 25.5% (95% CI = 8.1-51.8) while using public transportation.

Approximately, 15% of the participants were exposed to SHS in two locations, namely at home and at work. Women who were in the second trimester of pregnancy and multigravida were the most likely to report current exposure to SHS (27%).

Table 2. Passive smoking status according to demographic and pregnancy characteristics

Variable	Passive smoker					
	Home	Workplace	Public facilities	Public transportation	Total Exposed	Total not exposed
	Yes (%)	Yes (%)	Yes (%)	Yes (%)	(%)	(%)
All	64 (80.0)	16 (47.1%)	24 (55.8)	4 (23.5)	73 (91.3)	7 (8.7)
Age						
<30	48 (60.0)	12 (35.3)	20 (46.5)	2 (11.8)	54 (67.5)	2 (2.5)
≥30	16 (20.0)	4 (11.8)	4 (9.3)	2 (11.8)	19 (23.8)	5 (6.2)
Education						
No school	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Very low	7 (8.8)	1 (2.9)	1 (2.3)	1 (5.9)	8 (10.0)	0 (0.0)
Low	15 (18.8)	5 (14.7)	6 (13.9)	3 (17.7)	17 (21.3)	2 (2.5)
Middle	31 (38.8)	8 (23.5)	10 (23.3)	0 (0.0)	34 (42.5)	5 (6.2)
High	11 (13.8)	2 (5.9)	7 (16.3)	0 (0.0)	14 (17.5)	0 (0.0)
Household income						
Low	37 (46.3)	6 (17.7)	10 (23.3)	3 (17.7)	39 (48.7)	4 (5.0)
Modest	20 (25.0)	6 (17.7)	8 (18.6)	1 (5.9)	25 (31.3)	2 (2.5)
High	7 (8.8)	4 (11.8)	6 (13.9)	0 (0.0)	9 (11.3)	1 (1.2)
Pregnancy stage						
Second trimester	35 (43.8)	7 (20.6)	13 (30.2)	0 (0.0)	38 (47.5)	6 (7.5)
Third trimester	29 (36.3)	9 (26.5)	11 (25.6)	4 (23.5)	35 (43.8)	1 (1.2)
Gravida						
Primigravida	31 (38.8)	7 (20.6)	12 (27.9)	0 (0.0)	36 (45.0)	0 (0.0)
Multigravida	33 (41.3)	9 (26.5)	12 (27.9)	4 (23.5)	37 (46.3)	7 (8.7)

Passive smoking during pregnancy and its associated factors

Table 3 presents the results of the association test between smoking and associated health and demographic factors. There was a statistically measurable relationship between SHS exposure and age ($p = 0.013$; OR = 0.8; 95% CI = 0.74-0.96). Generally, participants came from a low socio-economic status (SES) background. More than half of the participants (53.7%) reported a household income that was below the region's minimum wage. Nearly half of the participants (48.7%) had finished senior high school. Participants from a low-SES background were most likely to report SHS exposure while pregnant (Table 2). Nevertheless, the study found no significant relationships between passive smoking status and household income ($p = 0.95$; OR = 1.04; 95% CI = 0.34-3.16) or education level ($p = 0.94$; OR = 1.03; 95% CI = 0.42-2.53). Furthermore, the likelihood of a woman being exposed to SHS did not vary statistically when examined by the

participants' working status ($p = 0.960$; OR = 1.0; 95% CI = 0.2-5.0).

The study also found no statistically significant relationship between later pregnancy stages and exposure to SHS ($p = 0.122$; OR = 5.5; 95% CI = 0.63-48.2). However, there was a statistically significant relationship between gravida and SHS exposure ($p = 0.011$; OR 0.5; 95% CI = 0.27-0.84). As discussed previously, participants, who were aged 30 years or older and were classed as multigravida, were at a higher risk of being exposed to SHS.

As shown in Table 3, 44 participants had more than 4 ANC visits, of whom 42 (95%) reported exposure to SHS. This was a larger proportion than that observed among the 36 women who had less than 4 ANC visits, of whom 31 reported being exposed to SHS (86%). However, the study observed no significant correlation between exposure to SHS and number of ANC visits ($p = 0.071$; OR = 1.4; 95% CI = 0.97-2.05).

Participants' understanding of the negative health issues associated with smoking and SHS exposure while pregnant varied (Table 3). Just over one-fifth of the

participants (22.5%) recognised all six of the surveyed health risks associated with smoking while pregnant.

Table 3. Passive smoking and associated factors

Variable	N (%)	Passive smoker		OR (95% CI)	P-value*
		Yes (%)	No (%)		
Age	80 (100.0)	73 (91.3)	7 (8.7)	0.8 (0.7-0.9)	0.013
<30	56 (70.0)	54 (67.5)	2 (2.5)		
≥30	24 (30.0)	19 (23.8)	5 (6.2)		
Education	80 (100.0)	73 (91.3)	7 (8.7)	1.0 (0.4-2.5)	0.941
No school	0 (0.0)	0 (0.0)	0 (0.0)		
Very low	8 (10.0)	8 (10.0)	0 (0.0)		
Low	19 (23.8)	17 (21.3)	2 (2.5)		
Middle	39 (48.7)	34 (42.5)	5 (6.2)		
High	14 (17.5)	14 (17.5)	0 (0.0)		
Household income	80 (100.0)	73 (91.3)	7 (8.7)	1.0 (0.3-3.2)	0.949
Low	43 (53.7)	39 (48.7)	4 (5.0)		
Modest	27 (33.8)	25 (31.3)	2 (2.5)		
High	10 (12.5)	9 (11.3)	1 (1.2)		
Pregnancy stage	80 (100.0)	73 (91.3)	7 (8.7)	5.5 (0.6-48.2)	0.122
Second trimester	44 (55.0)	38 (47.5)	6 (7.5)		
Third trimester	36 (45.0)	35 (43.8)	1 (1.2)		
Gravida	80 (100.0)	73 (91.3)	7 (8.7)	0.5 (0.3-0.8)	0.011
Primigravida	36 (45.0)	36 (45.0)	0 (0.0)		
Multigravida	44 (55.0)	37 (46.3)	7 (8.7)		
ANC visits	80 (100.0)	73 (91.3)	7 (8.7)	1.4 (0.9-2.1)	0.071
Poor	3 (3.8)	2 (2.5)	1 (1.3)		
Good	33 (41.2)	29 (36.2)	4 (5.0)		
Very good	44 (55.0)	42 (52.5)	2 (2.5)		
Knowledge of smoking health-related risks	80 (100.0)	73 (91.3)	7 (8.7)	0.6 (0.2-1.6)	0.294
Poor	30 (37.5)	28 (35.0)	2 (2.5)		
Fair	32 (40.0)	30 (37.5)	2 (2.5)		
Good	18 (22.5)	15 (18.7)	3 (3.8)		
Working situation	80 (100.0)	73 (91.3)	7 (8.7)	1.0 (0.2-5.0)	0.96
Unemployed	45 (56.2)	41 (51.3)	4 (5.0)		
Employed	35 (43.8)	32 (40)	3 (3.7)		

*Logistic regression, two-sided p-value <0.05

Two-fifths of the participants (40.0%) were aware of up to four health risks attributable to smoking during pregnancy, while nearly two-fifths of participants (37.5%) were only able to identify one or two of the surveyed negative health outcomes. This means that almost all women were aware of at least one or more negative health issues related to smoking

and SHS exposure during pregnancy. No measurable statistical relationship was found between the level of understanding of negative health issues and SHS exposure while pregnant ($p = 0.294$; $OR = 0.6$; $95\% CI = 0.21-1.61$).

The first model of the multivariate logistic analysis for passive smoking predictors included four covariates with a

bivariate analysis p-value of less than 0.25. At the end, only age was found to be significantly correlated with exposure to SHS.

DISCUSSION

The proportion of females who actively smoke in Indonesia is 0.83% (Central Bureau of Statistics, 2016), while among the participants in the study, there were no active smokers. However, this study found a much larger proportion of participants who reported being exposed to SHS (91.3%) compared to the national figure (67%) (Mboi *et al.*, 2018). This result is indicative of ramifications for Indonesia's maternal health programs as most current maternal health programs seem not to place heavy importance on the issues related to smoking while pregnant.

Other countries around the world, both developed and developing, have recorded higher proportions of women who actively smoke while pregnant, e.g., Serbia (37.2%), Greece (17%), India (14.8%), the Democratic Republic of the Congo (14.1%), Mongolia (11.8%), Canada (10.5%), Japan (9.8%), Zambia (6.6%), and the Dominican Republic (3%) (Al-Sahab *et al.*, 2010; Chomba *et al.*, 2010; Krstev *et al.*, 2012; Singh *et al.*, 2015; Torres *et al.*, 2011; Vardavas *et al.*, 2010a; Hikita *et al.*, 2017). The relatively small proportion of pregnant women in Indonesia who actively smoke may reflect—at least in part—the relatively small proportion of smokers among the general population of Indonesian women.

On the other hand, the proportion of pregnant women in the study who reported being exposed to SHS was larger than that found in China (75.1%), Iran (23.1%), Spain (55.5%), Mongolia (44.8%), India (69.8%), Serbia (57.6%), the Dominican Republic (16%), Zambia (13.6%), and the Democratic Republic of the Congo (8.3%), while being only marginally smaller than that recorded in Greece (94%) (Chomba *et al.*, 2010; Krstev *et al.*, 2012; Aurrekoetxea

et al., 2014; Hikita *et al.*, 2017; Mahmoodabad *et al.*, 2019; Singh *et al.*, 2015; Torres *et al.*, 2011; Yang *et al.*, 2010; Vardavas *et al.*, 2010b). This reflects the fact that a relatively large proportion of men in Indonesia smoke and also the almost complete absence of regulations on smoking in public places in Indonesia. This may also indicate a lack of awareness among Indonesian men of the health issues for pregnant women and babies caused by smoking.

This study found that a larger proportion of participants reported being exposed to SHS in a variety of locations in Indonesia in comparison to results of a study in India (48.5% at home, 16.8% in public places, and 13.3% in the workplace). Although, the proportion in this study was found to be smaller than the proportion recorded in Greece (64% in public places, 49% in the workplace) with the exception of SHS exposure in the home (72%) (Singh *et al.*, 2015; Vardavas *et al.*, 2010a). This rate of exposure to SHS in a variety of locations is likely to be the result of a combination of various environmental influences, such as a large proportion of male smokers, an absence of restrictions on smoking in public, and a lack of understanding of the negative health issues for family members associated with passive smoking.

No statistically measurable relationships were found in the study between passive smoking status and household income or education level. This result is consistent with results found in studies in China and Iran (Mahmoodabad *et al.*, 2019; Yang *et al.*, 2010), but differed from results of studies conducted in Greece, Mongolia, and Spain (Aurrekoetxea *et al.*, 2014; Hikita *et al.*, 2017; Vardavas *et al.*, 2010a). The low SES of women implies that their spouses are likely also from low SES backgrounds. Assuming men of low SES tend to be more likely to smoke, the likelihood of SHS exposure for their family members increases.

A negative association between the age of the mother and smoking while

pregnant was found by Vardavas et al. (Vardavas *et al.*, 2010b). It was found that the older the mother during pregnancy, the less likely it was that she would be exposed to SHS. This finding was confirmed in the present study. It could be argued that younger women might be more likely than older women to interact with more people outside the home while pregnant for work or travel. Thus, they interact more with smokers, leading to an increased chance of SHS exposure. It may also be the case that older women are more likely to have had previous pregnancies entailing previous maternal healthcare interactions, during which they would receive information about the negative health issues related to smoking and SHS exposure. This may lead them to avoid being exposed to SHS.

Research conducted in Greece and Spain found that passive smoking was negatively associated with number of pregnancies (Vardavas *et al.*, 2010b; Aurrekoetxea *et al.*, 2014), and this finding is supported by the results of the present study. Maternal healthcare education accessed during previous pregnancies could function to make mothers more aware of the negative health issues associated with SHS exposure, thus making them more likely to avoid it in future pregnancies. It is also argued that healthy pregnancies in the past can help prevent women from smoking during pregnancy (Vardavas *et al.*, 2010a), and it is reasonable to extend this to avoiding SHS exposure as well. Accessing ANC can offer important opportunities for pregnant women to obtain information about the negative health issues associated with smoking (Al-Sahab *et al.*, 2010). This, however, is predicated on the ANC program providing information about smoking while pregnant and its negative health effects, and this was something which was allegedly lacking in the ANC program in place at many maternal health facilities in the Temanggung region. Accordingly, the present study found that more ANC visits did not serve to prevent or lessen the chance of SHS exposure during pregnancy.

Participants of the current study who were in the third trimester of their pregnancy were less likely to report being exposed to SHS, which may be due to relatives avoiding smoking near the participants due to their advanced condition. The present study also did not find unemployment to be a significant predictor of exposure to SHS. Unemployment can partly function as a proxy measure of lower SES, lower levels of education of both the mother and her spouse, and poverty. All of these factors are linked to increased likelihood of men smoking and consequently to increased risk of expecting mothers being exposed to SHS at home. On the other hand, unemployment could function as a preventative factor as employment usually entails a greater likelihood of being in public places and thus a greater risk of exposure to SHS from people smoking there.

Participants in the current study had a reasonable understanding of the negative health issues associated with smoking and exposure to SHS during pregnancy; however, only 22.5% had a high level of awareness of how smoking and SHS exposure can adversely impact pregnancy. This is a smaller proportion than those found in studies conducted in India (53.3%) and the Dominican Republic (98%) (Singh *et al.*, 2015; Torres *et al.*, 2011). It is crucial for pregnant women in particular to have accurate understandings of the negative health issues associated with smoking and SHS exposure in order to implement strategies to decrease their chance of being exposed to SHS (Lai *et al.*, 2013). However, it is apparent from the results of the present study that, on its own, understanding of potential health risks associated with smoking cannot prevent women from being exposed to SHS. This is due to many environmental influences, including a large proportion of Indonesian men who smoke and a high likelihood smoking at home. Regardless of their understanding of health risks, a woman may not have complete control over the behaviour of those around

her and also lack opportunities to negotiate with people whose behaviour causes them to become exposed to SHS.

The present study did not find a statistically significant association between SHS exposure and actively smoking during pregnancy, which did not cohere with the findings of research conducted in Greece and Canada. That research indicated that pregnant women were likely to smoke during pregnancy if their partners did so (Vivilaki *et al.*, 2016; Al-Sahab *et al.*, 2010). A potential explanation for this is that smoking while pregnant is negatively thought of by Indonesians (Nichter *et al.*, 2010). This emphasises the need for preventing pregnant women from being exposed to SHS. This can be achieved by implementing stronger restrictions on tobacco, increasing the level of understanding of the negative effects of smoking among men, and empowering women receiving ANC via educational initiatives.

The scope of the present study was restricted by a number of factors. Constraints of time and logistics meant that the study contained a single setting with a relatively small sample size, which limited the generalisability of the results to the wider population in other parts of Indonesia. Additionally, the findings may not be generalised to all pregnant women in the general population due to the fact that it took place in a public health facility; many women access maternal healthcare from private health facilities. Furthermore, comparisons of the results of the present study with those obtained in other studies should be undertaken with caution. This is due to the fact that this study was only undertaken amongst participants living in an urban area, with its associated characteristics. Furthermore, additional information such as the number of cigarettes smoked by male partners of the participants was not collected in the present study. Further research needs to consider additional factors that influence smoking habits among pregnant women, including

paternal education, paternal age, and support during their pregnancy period. In spite of these restrictions, the present study illustrates a considerable public health issue, potentially impacting a large group of women, and reveals the inadequacy of current ANC programs in enabling women to avoid exposure to SHS, particularly in multiple places across home, work, and travel.

CONCLUSION

The current study aimed to explore levels of smoking, exposure to SHS, and related risk factors among pregnant women in an Indonesian context. While relatively few women smoke in Indonesia, and fewer still smoke during pregnancy. It is evident from the results of this study that they still face considerable health risks related to exposure to SHS. This risk is greater if the expecting mother is younger and primigravida. Furthermore, increased attendance at ANC or a simple increase of access to health services did not significantly reduce the risk of exposure. It is, therefore, of considerable importance that the effectiveness of ANC visits is optimised, and this is further supported by the finding of this study that only a relatively small proportion of participants had a deep understanding of the risks associated with SHS.

The results of the present study suggest that local public health departments should scale up their strategies to address the issue of lack of education on SHS exposure risks. Local health agencies still need to put programs in place to effectively educate and empower women through ANC. They also need to advocate for stronger laws restricting smoking to reduce SHS exposure on pregnant women.

REFERENCES

- Abraham, M., Alramadhan, S., Iñiguez, A., Duijts, L., Jaddoe, V., Dekker, H. T. D., Crozier, S., Godfrey, N.,

- Hindmarsh, P., Vik, T., Jacobsen, G. W., Hanke, W., Sobala, W., Devereux, M. & Turner, S. 2017. A Systematic Review Of Maternal Smoking During Pregnancy And Fetal Measurements With Meta-Analysis. *In: Department Of, E. (Ed.)*.
<https://doi.org/10.1371/journal.pone.0170946>
- Ahsan, A., Fajri, P. A., Nuzul, B., Wiyono, N. H. & Widodo, P. T. 2008. *Kondisi Petani Tembakau Di Indonesia: Studi Kasus Di Tiga Wilayah Penghasil Tembakau* [Online].
- Al-Sahab, B., Saqib, M., Hauser, G. & Tamim, H. 2010. Prevalence Of Smoking During Pregnancy And Associated Risk Factors Among Canadian Women: A National Survey. *Bmc Pregnancy And Childbirth*, 10, 24-24.
<https://doi.org/10.1186/1471-2393-10-24>
- Aurrekoetxea, J. J., Murcia, M., Rebagliato, M., Fernández-Somoano, A., Castilla, A. M., Guxens, M., López, M. J., Lertxundi, A., Espada, M., Tardón, A., Ballester, F. & Santa-Marina, L. 2014. Factors Associated With Second-Hand Smoke Exposure In Non-Smoking Pregnant Women In Spain: Self-Reported Exposure And Urinary Cotinine Levels. *Science Of The Total Environment*, 470-471, 1189-1196.
<https://doi.org/10.1016/j.scitotenv.2013.10.110>
- Central Bureau of Statistics. 2016. *Profil Statistik Kesehatan 2016* [Online].
- Central Bureau of Statistics. 2018. *Profil Kesehatan Provinsi Jawa Tengah 2017* [Online].
- Chomba, E., Tshetu, A., Onyamboko, M., Kaseba-Sata, C., Moore, J., McClure, E. M., Moss, N., Goco, N., Bloch, M. & Goldenberg, R. L. 2010. Tobacco Use And Secondhand Smoke Exposure During Pregnancy In Two African Countries: Zambia And The Democratic Republic Of The Congo. *Acta Obstetrica Et Gynecologica Scandinavica*, 89, 531-539.
<https://doi.org/10.3109/00016341003605693>
- Cui, H., Gong, T.-T., Liu, C.-X. & Wu, Q.-J. 2016. Associations Between Passive Maternal Smoking During Pregnancy And Preterm Birth: Evidence From A Meta-Analysis Of Observational Studies.(Report). 11.
<https://doi.org/10.1371/journal.pone.0147848>
- Deming, D. 2012. The Impact Of Second-Hand Tobacco Smoke Exposure On Pregnancy Outcomes, Infant Health, And The Threat Of Third-Hand Smoke Exposure To Our Environment And To Our Children.
- Dietz, P. M., England, L. J., Shapiro-Mendoza, C. K., Tong, V. T., Farr, S. L. & Callaghan, W. M. 2010. Infant Morbidity And Mortality Attributable To Prenatal Smoking In The U.S. *American Journal Of Preventive Medicine*, 39, 45-52.
<https://doi.org/10.1016/j.amepre.2010.03.009>
- Global Adult Tobacco Survey Collaborative Group 2011. Tobacco Questions For Survey: A Subset Of Key Questions From The Global Adult Tobacco Survey (Gats)
- Hikita, N., Haruna, M., Matsuzaki, M., Sasagawa, E., Murata, M., Oidovsuren, O. & Yura, A. 2017. Prevalence And Risk Factors Of Secondhand Smoke (Shs) Exposure Among Pregnant Women In Mongolia. *Scientific Reports*, 7, 16426.
<https://doi.org/10.1038/s41598-017-16643-4>
- Hilbe, J. M. 2016. *Practical Guide To Logistic Regression*, Philadelphia, Pa, United States, Chapman And

- Hall/Crc.
<https://doi.org/10.1201/b18678>
- Hosmer, D. W., Lemeshow, S. & Sturdivant, R. X. 2013. *Applied Logistic Regression*, New York, United States, John Wiley & Sons, Incorporated.
<https://doi.org/10.1002/9781118548387>
- Indonesian Ministry of Health. 2013. *Riset Kesehatan Dasar (Riskesdas) 2013* [Online].
- Krstev, S., Marinković, J., Simić, S., Kocev, N. & Bondy, S. 2012. Prevalence And Predictors Of Smoking And Quitting During Pregnancy In Serbia: Results Of A Nationally Representative Survey. *International Journal Of Public Health*, 57, 875-883.
<https://doi.org/10.1007/s00038-011-0301-5>
- Lai, M. C., Chou, F. S., Yang, Y. J., Wang, C. C. & Lee, M. C. 2013. Tobacco Use And Environmental Smoke Exposure Among Taiwanese Pregnant Smokers And Recent Quitters: Risk Perception, Attitude, And Avoidance Behavior. *International Journal Of Environmental Research And Public Health*, 10, 4104-4116.
<https://doi.org/10.3390/ijerph10094104>
- Lawn, J. E. & Kinney, M. 2014. Preterm Birth: Now The Leading Cause Of Child Death Worldwide. American Association For The Advancement Of Science.
- Mahmoodabad, S. S. M., Karimiankakolaki, Z., Kazemi, A., Mohammadi, N. K. & Fallahzadeh, H. 2019. Exposure To Secondhand Smoke In Iranian Pregnant Women At Home And The Related Factors.
- Mboi, N., Murty Surbakti, I., Trihandini, I., Elyazar, I., Houston Smith, K., Bahjuri Ali, P., Kosen, S., Flemons, K., Ray, S. E., Cao, J., Glenn, S. D., Miller-Petrie, M. K., Mooney, M. D., Ried, J. L., Nur Anggraini Ningrum, D., Idris, F., Siregar, K. N., Harimurti, P., Bernstein, R. S., Pangestu, T., Sidharta, Y., Naghavi, M., Murray, C. J. L. & Hay, S. I. 2018. On The Road To Universal Health Care In Indonesia, 1990–2016: A Systematic Analysis For The Global Burden Of Disease Study 2016. *The Lancet*, 392, 581-591. [https://doi.org/10.1016/S0140-6736\(18\)30595-6](https://doi.org/10.1016/S0140-6736(18)30595-6)
- Mitchell, E. A., Thompson, J. M., Zuccollo, J., Macfarlane, M., Taylor, B., Elder, D., Stewart, A. W., Percival, T., Baker, N. & McDonald, G. 2017. The Combination Of Bed Sharing And Maternal Smoking Leads To A Greatly Increased Risk Of Sudden Unexpected Death In Infancy: The New Zealand Sudi Nationwide Case Control Study. *The New Zealand Medical Journal (Online)*, 130, 52.
- Nichter, M., Greaves, L., Bloch, M., Paglia, M., Scarinci, I., Tolosa, J. E. & Novotny, T. E. 2010. Tobacco Use And Secondhand Smoke Exposure During Pregnancy In Low-And Middle-Income Countries: The Need For Social And Cultural Research. *Acta Obstetricia Et Gynecologica Scandinavica*, 89, 465-477.
<https://doi.org/10.3109/00016341003592552>
- Norsa'adah, B. & Salinah, O. 2014. The Effect Of Second-Hand Smoke Exposure During Pregnancy On The Newborn Weight In Malaysia. *The Malaysian Journal Of Medical Sciences : Mjms*, 21, 44.
- Qiu, J., He, X., Cui, H., Zhang, C., Zhang, H., Dang, Y., Han, X., Chen, Y., Tang, Z., Zhang, H., Bai, H., Xu, R., Zhu, D., Lin, X., Lv, L., Xu, X., Lin, R., Yao, T., Su, J., Liu, X., Wang, W., Wang, Y., Ma, B., Liu, S., Huang, H., Lerro, C., Zhao, N., Liang, J., Ma, S., Ehrenkranz, R. A., Liu, Q. & Zhang, Y. 2014. Passive

- Smoking And Preterm Birth In Urban China. *American Journal Of Epidemiology*, 180, 94-102. <https://doi.org/10.1093/aje/kwu092>
- Simons, E., To, T., Moineddin, R., Stieb, D. & Dell, S. D. 2014. Maternal Second-Hand Smoke Exposure In Pregnancy Is Associated With Childhood Asthma Development. *The Journal Of Allergy And Clinical Immunology: In Practice*, 2, 201-207.E3. <https://doi.org/10.1016/j.jaip.2013.11.014>
- Singh, S., Mini, G. K. & Thankappan, K. R. 2015. Tobacco Use During Pregnancy In Rural Jharkhand, India. *International Journal Of Gynecology And Obstetrics*, 131, 170-173. <https://doi.org/10.1016/j.ijgo.2015.05.021>
- Tobacco Control Support Center - Iakmi. 2014. *Buku Bunga Rampai - Fakta Tembakau Dan Permasalahannya* [Online].
- Torres, E., Quinones De Monegro, Z., French, L., Swanson, D. P., Guido, J. & Ossip, D. J. 2011. Tobacco Use And Exposure To Secondhand Smoke Among Pregnant Women In The Dominican Republic: An Exploratory Look Into Attitudes, Beliefs, Perceptions, And Practices. *Nicotine Tob Res*, 13, 1220-7. <https://doi.org/10.1093/ntr/ntr193>
- Vardavas, C. I., Chatzi, L., Patelarou, E., Plana, E., Sarri, K., Kafatos, A., Koutis, A. D. & Kogevinas, M. 2010a. Smoking And Smoking Cessation During Early Pregnancy And Its Effect On Adverse Pregnancy Outcomes And Fetal Growth. *European Journal Of Pediatrics*, 169, 741-748. <https://doi.org/10.1007/s00431-009-1107-9>
- Vardavas, C. I., Patelarou, E., Chatzi, L., Roumeliotaki, T., Sarri, K., Murphy, S., Koutis, A., Kafatos, A. G. & Kogevinas, M. 2010b. Factors Associated With Active Smoking, Quitting, And Secondhand Smoke Exposure Among Pregnant Women In Greece. *Journal Of Epidemiology*, 20, 355-362. <https://doi.org/10.2188/jea.JE20090156>
- Vivilaki, V. G., Diamanti, A., Tzeli, M., Patelarou, E., Bick, D., Papadakis, S., Lykeridou, K. & Katsaounou, P. 2016. Exposure To Active And Passive Smoking Among Greek Pregnant Women.(Survey). *Tobacco Induced Diseases*, 14. <https://doi.org/10.1186/s12971-016-0077-8>
- WHO. 2015. Who Report On The Global Tobacco Epidemic, 2015, Appendix X: Comparable Prevalence Estimates For Tobacco Smoking 2013.
- WHO. 2017. Who Report On The Global Tobacco Epidemic, 2017: Country Profile, Indonesia.
- WHO. 2018. Noncommunicable Diseases (Ncd) Country Profile 2016.
- Yang, L., Tong, E. K., Mao, Z. & Hu, T. W. 2010. Exposure To Secondhand Smoke And Associated Factors Among Non-Smoking Pregnant Women With Smoking Husbands In Sichuan Province, China. *Acta Obstetrica Et Gynecologica Scandinavica*, 89, 549-557. <https://doi.org/10.3109/00016341003713851>
- Zhang, K. & Wang, X. 2012. Maternal Smoking And Increased Risk Of Sudden Infant Death Syndrome: A Meta-Analysis. *Legal Medicine*, 15. <https://doi.org/10.1016/j.legalmed.2012.10.007>