RESEARCH ARTICLE

Parental risk perceptions of child exposure to thirdhand smoke and related factors [version 1; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: Thirdhand smoke (THS) exposure is linked to lung cancer, asthma, and chronic diseases, especially in children. The parental risk perception of THS exposure in children has rarely been reported. The objective of this study was to test the association between sociodemographic factors and parental risk perceptions of child exposure to thirdhand smoke (PRPCETS) in residential homes with a child or children aged from one to five years old.

Methods: This study used secondary data from the Smoke Free Home intervention trial. 336 participants were included and analyzed. PRPCETS was assessed by self-administered questionnaire. Multiple logistic regression was used to test the factors related to parental risk perception to the harm of thirdhand smoke.

Results: The overall prevalence of disagreement that THS might be harmful to children was 22.02% (95% CI: 17.59%, 26.45%). Factors associated with PRPCETS were being over 50-years-old (OR: 2.15; 95%CI: 1.05, 4.41); attending school for more than six years (OR: 2.08; 95%CI: 1.07, 4.08); being unemployed (OR: 6.98; 95% CI, 1.41, 34.71); and the number of smokers in the home ≥ 2 persons (OR: 2.48; 95%CI: 1.41, 4.36).

Conclusions: Our findings show the factors related to PRPCETS as follows; aged over 50, duration of school attendance less than six years, no job status, and having ≥ 2 smokers in the home. Further studies should investigate parental knowledge of and attitude towards thirdhand smoke exposure.

Keywords

thirdhand smoke exposure, parental risk perception, risk factors, child health

Open Peer Review**Approval Status**

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version 1		
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Any reports and responses or comments on the article can be found at the end of the article.

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Introduction

Third hand smoke (THS) means residual smoke emitted from tobacco products that is inhaled by a third party¹. Smoke from tobacco products, secondhand smoke, will become embedded on the surface of walls, carpets, furniture, clothing, flooring, vehicles or toys². Exposure to THS induces health problems such as lung cancer development^{3,4} and asthma⁵. Exposure to THS happens in a place that a smoker has previously smoked, such as in houses or cars. A study reported that the home is one of places that THS can occur if there is smoking in the home. Evidence shows that some homes remain contaminated with THS for six months⁶. The results show that infants or children stay, play and climb in the home, and they have a chance to be exposed to THS.

Reviews show few studies have been conducted to test factors related to parental risk perception concerning the harm to the child of THS exposure. Therefore, this study tested factors related to parental risk perceptions of child exposure to thirdhand smoke (PRPCETS).

Methods

Ethical approval and informed consent

The Mahasarakham University Institutional Review Board (IRB) approved the study. The study identification number is 113/2561. Written consent forms were distributed and provided to all participants, and they signed these consent forms.

Design and data collection

This study used secondary data from the Smoke Free Home study project. This project aimed to give smoke-free home information to parents of children aged 1–5 years that reside in the home. A cluster randomized controlled trial was carried out from February 2019 to October 2019 in Roi-Et province, Thailand. The trial was registered at the Thai Clinical Trials Registry (TCTR) with the code [TCTR20190213001](#). Briefly, four primary health care facilities were randomly recruited. Of those, all 47 villages within each of the four health care facilities were selected to be part of the study setting. The targeted settings were screened using the Health Data Center (HDC), the health information database that collects data from the community and hospitals in Thailand. In the HDC, we recruited families according to the following criteria; families with a child aged 1–5 years, where the parent does not smoke, with a smoker in their home. The baseline characteristics and smoking behavior was collected by trained research teams using self-administered questionnaire at participant's home. The trained research teams interviewed a parent of children or a child about their smoke-free home status, exposure to secondhand smoke, THS risk perception, and smoking behavior in the home. If the eligibility criteria (healthy child aged 1–5 years, the parent is a non-smoker, and a smoker smoked in their home) were met, they were invited to the intervention study. In total, we screened 336 households. Of those, 305 were included in the intervention study. In this cross-sectional study, we use the screening data of 336 participants to explore the parental risk perceptions of child exposure to thirdhand smoke.

Measurements

The outcome, PRPCETS, was assessed by asking the parent of children the question “Are you aware that breathing in a room that has had someone smoking in it previously, can affect the health of babies and children?” The response to the question was ranked from 1 to 4 (1: absolutely disagree, 2: disagree, 3: agree, 4: absolutely agree). We divided the answers into ‘Agree’ (which included; 3: agree and 4: absolutely agree) and ‘Disagree’ (which included 1: absolutely disagree, 2: disagree).

We also collected demographic data as follows; age in years, gender, duration of school attendance in years, occupation, marital status, income (Thai Baht, THB/month), number of smokers in the home, number of children in the home (under five years), and co-use of smoking and drinking alcohol. The age of the children's parents was categorized as 18–40 years, 40–50 years, and >50 years. Duration of school attendance was categorized as 0–6 years, and >6 years. Occupation was categorized as agricultural, merchant, government officer, and no job. Marital status was categorized as married and divorced/other. Income (THB) was assessed and categorized as <10000THB/month, and ≥10000THB/month. Data on the number of smokers in the home was also collected and categorized as one person and ≥2 persons. Number of children in the home aged one to five years was categorized as one person and ≥2 persons. In addition, co-use of drinking alcohol in the home was assessed by a sequence of two questions; “In the past 1 month, has there been alcohol drinking in the home?” Responses were no or yes. If they answered yes, they were asked “During alcohol drinking, was there smoking?”. The answers were ‘yes, every time’, ‘yes, sometimes’, and ‘no, not at all’. We categorized this variable as alcohol drinking but no smoking (when they answered yes to alcohol drinking but reported no smoking at all), co-use (alcohol drinking and smoking), and no (no alcohol drinking).

Statistical methods

All factors were presented as frequencies and percentages. For univariate analysis, we tested the association between factors and PRPCETS using the chi-square statistic. We also used multiple logistics regression in the multivariate analysis, and the final model was adjusted for candidate confounder factors. All statistics were performed in R version 3.6.1⁷ and epiDisplay version 3.5.0.1 package⁸.

Results

The overall prevalence of ‘Disagree’ answers to the PRPCETS question was 22.02% (95% CI: 17.59%, 26.45%). Of 336 participants included and analyzed in this study, 60.4% were aged 18–40 years, 92.3% were female parents, 77.1% worked in agriculture, 79.2% were married, and 67.3% had one person smoking at home⁹. Regarding the number of children in the home, 82.7% had ≥2 children, and 53.6% reported that tobacco was smoked during alcohol drinking in the home. We compared the distribution of the prevalence of PRPCETS for each factor. There was a statistically significant difference

between factors and PRPCETS as follows; age (p value: 0.012), the number of years of school attendance (p value: 0.009), occupation (p value: 0.002), and the number of smokers in the home (p value: <0.001). **Table 1** shows the results of the univariable analysis and prevalence distribution among factors.

In **Table 2**, results of the multiple logistic regression analysis is shown after adjustment for potential confounders. The group

aged over 50 years had an increased risk of disagreement with the PRPCETS question (OR: 2.15; 95%CI: 1.05,4.41). Parents who had attended a school for more than six years had an increased risk of disagreeing with the PRPCETS question (OR: 2.08; 95%CI: 1.07, 4.08). Being unemployed (OR: 6.98; 95% CI, 1.41,34.71) was positively associated with disagreement with the PRPCETS question. In addition, having ≥ 2 smokers in the home (OR: 2.48; 95%CI: 1.41, 4.36) was positively associated with disagreement with the PRPCETS question.

Table 1. Characteristics of the participants.

Variables	Total (n=336)	Disagree to harms THS exposure (n=74)	Agree to harms THS exposure (n=262)	P value
Age (years)				
18-40	203 (60.4)	36 (48.6)	167 (63.7)	0.012
40-50	78 (23.2)	18 (24.3)	60 (22.9)	
>50	55 (16.4)	20 (27.0)	35 (13.4)	
Gender				
Female	310 (92.3)	244 (93.1)	66 (89.2)	0.263
Male	26 (7.7)	18 (6.9)	8 (10.8)	
Duration of school attendance (years)				
0-6	140 (41.7)	21 (28.4)	119 (45.4)	0.009
>6	196 (58.3)	53 (71.6)	143 (54.6)	
Occupation				
Agricultural	259 (77.1)	62 (83.8)	197 (75.2)	0.002
Merchant	63 (18.8)	6 (8.1)	57 (21.8)	
Government officer	6 (1.8)	1 (1.4)	5 (1.9)	
No job	8 (2.4)	5 (6.8)	3 (1.1)	
Marital status				
Married	266 (79.2)	56 (75.7)	210 (80.2)	0.402
Divorced/Other	70 (20.8)	18 (24.3)	52 (19.8)	
Income (Thai Baht)				
<10000	161 (47.9)	35 (47.3)	126 (48.1)	0.904
≥ 10000	175 (52.1)	39 (52.7)	136 (51.9)	
Number of smokers in the home				
1	226 (67.3)	38 (51.4)	188 (71.8)	< 0.001
≥ 2	110 (32.7)	36 (48.6)	74 (28.2)	
Number of children in the home (under 5 years)				
1	278 (82.7)	61 (82.4)	217 (82.8)	0.937
≥ 2	58 (17.3)	13 (17.6)	45 (17.2)	
Concurrent alcohol and smoking (co-use)				
No	139 (41.4)	23 (31.1)	116 (44.3)	0.122
Alcohol drinking but no smoking	17 (5.1)	4 (5.4)	13 (5)	
Both alcohol drinking and smoking	180 (53.6)	47 (63.5)	133 (50.8)	

Table 2. The multiple logistic regression results of the related factors to parental risk perception to the harms of thirdhand smoke exposure.

Factors	Crude OR (95%CI)	Adjusted OR (95%CI)
Age (years)		
18–40	1	1
40–50	1.39 (0.74, 2.63)	1.04 (0.52, 2.08)
>50	2.65 (1.37, 5.11)	2.15 (1.05, 4.41)
Duration of school attendance (years)		
> 6	1	1
≤ 6	2.10 (1.20, 3.68)	2.08 (1.07, 4.08)
Occupation		
Agricultural	1	1
Merchant	0.33 (0.14, 0.81)	0.50 (0.19, 1.26)
Government officer	0.64 (0.07, 5.54)	1.08 (0.11, 10.44)
No job	5.30 (1.23, 22.79)	6.98 (1.41, 34.71)
Number of smokers in the home		
1	1	1
≥2	2.41 (1.42, 4.09)	2.48 (1.41, 4.36)

Discussion

Our results show the association between age, the number of years school attendance, occupation status, the number of smokers in the home and PRPCETS. However, statistical significance was not observed for gender, marital status, income per month, the number of children in home, and concurrent smoking and drinking in home.

PRPCETS was correlated with the age of parents. Our results show that older parents tended to disagree with the statement that THS might be harmful to children. This effect might be because older parents have received little information on the harms of THS exposure. In addition, the major tobacco control strategies included little information on THS exposure in the promotion of tobacco control¹⁰.

Several studies show that high education level might protect against exposure to second-hand smoking^{11–13}, but there is little evidence to support this. Our results reveal that a high level of education protected against disagreement with the PRPCETS question. Parents who had the opportunity to study at a high level at school who were exposed to tobacco control campaigns at school or on the internet, radio, or television^{14–16} might have increased knowledge of or more positive attitudes towards the risk of THS exposure.

Occupation status is one of socioeconomic factors that is associated with tobacco control research¹⁷. Our analysis showed that parents who have no job tended to disagree with the statement concerning the harms of THS exposure to

their children. The effect described, usually, the parents who stayed at home to look after their child or children and had no job.

In households with smokers, our results show that households with more than one smoker were at greater risk of parents who disagreed with the PRPCETS question. Home is a one place that THS occurs because people have previously smoked inside^{18–20}. Our hypothesis is that in households that have many smokers and have children, there is a chance that a smoker smoked in their home or close to home such as by a wall or door. When this event has occurred frequently, parents might think that THS is not an important matter when they cannot smell tobacco smoke.

Our study has several limitations. Our analysis used the data from a smokefree home intervention project that was carried out in the northeast of Thailand. Therefore, the prevalence observed might not represent parents with a child or children aged under five years in the rest of the country. In addition, our questionnaire did not assess parent's knowledge of and attitude towards the harms of THS exposure. This measurement might impact the risk perception of harms of THS exposure. The strength of the study is that this might be the first study in Thailand to investigate the factors related to parental risk perception concerning the harms of child THS exposure.

Conclusion

Results show the factors related to parental risk perception of child harm from THS exposure as follows; aged more than

50 years, duration of school attendance less than six years, having no job, and having many smokers in the home (≥ 2 persons). Further studies should investigate parents' knowledge of and attitude towards THS exposure.

Data availability

Underlying data

Harvard Dataverse: thirdhand smoke parental risk perception: <https://doi.org/10.7910/DVN/N188CL>⁹

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

Acknowledgements

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Reviewer Report 03 February 2023

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Varduhi Hayrumyan

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Zaruhi Grigoryan

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Comments

Introduction

1. The introduction should include information on the topic of research in the study setting (Thailand): smoking as a public health issue, second-hand smoke exposure in general and particularly in private settings such as homes and cars.
2. Thirdhand smoke (THS) exposure should be described as an issue currently under the focus of international public health research. What is known about perceptions, attitudes, and knowledge of THS? What about any studies on this conducted among parents of young children?
3. Describe the factors associated with the PRPCETS discussed in the literature globally and their importance and implications. It is mentioned that "Reviews show few studies have been conducted to test factors related to parental risk perception concerning the harm to the child of THS exposure." What do those few studies conclude and how this study will fill the gap in the literature?
4. The author included a variable regarding alcohol consumption. How is alcohol consumption connected with the research questions? A justification should be provided for including this in the analysis.
5. The rationale of the study should be strengthened to demonstrate its importance for both the international public health community and Thailand.

Methods

1. It is mentioned that the study used secondary data from a project. However, in the "Ethical approval and informed consent" paragraph it is mentioned that "Written consent forms

were distributed and provided to all participants, and they signed these consent forms." In case of studies using secondary data, consent requirements are exempt as the studies usually pose no risk to study participants. It is possible the author described the ethical considerations of the parent study (trial) instead of describing the current study.

2. Is the parent study published or described elsewhere? If yes, it would be helpful to include an appropriate citation.
3. It is written, "In the HDC, we recruited families according to the following criteria; families with a child aged 1–5 years, where the parent does not smoke, with a smoker in their home." The author should clarify whether both parents were non-smokers or only one parent and if the "smoker in the home" is another family member living in the home or others (e.g. guests). How "a smoker smoked in their home" eligibility criteria was defined? How it was decided whether the mother or the father should participate in the interview?
4. It is not clear why families with smoker parents were excluded from the study. Justification is needed.
5. The categorization of educational status (0-6 years and >6 years) in the measurements section is not clear to someone outside of the local context.
6. How multiple logistic regression models were constructed? What strategies were used?

Results

1. Consistency while reporting decimal points should be maintained throughout the paper. A suggestion would be to keep one decimal point in the text.
2. The confidence intervals of the outcome variable are presented with percentages ("95% CI: 17.59%, 26.45%") others without.
3. Overwhelming majority of interviewed parents were females (92.3%). This is a limitation of the study given that male parents' perceptions could be different. Also needs to be discussed in the discussion section.
4. Table 1 needs to be checked for typos.
5. The potential confounders mentioned in the following sentence could be specified: "In Table 2, results of the multiple logistic regression analysis is shown after adjustment for potential confounders."
6. Table 2 does not include p values. Should be added.
7. Regression analysis could be better interpreted.
8. This sentence in the Results section "Parents who had attended a school for more than six years had an increased risk of disagreeing with the PRPCETS question (OR: 2.08; 95%CI: 1.07, 4.08)." contradicts the table. Maybe you meant "Parents who had attended a school **less** than six years" ...

Discussion

1. The explanation of why older parents tended to disagree with the PRPCETS question is poor. Needs more discussion.
2. The explanation of occupation status as a significant factor associated with PRPCETS is not clear.
3. Smoker in the home factor is not well explained as well. The discussion section overall needs revisions for language clarity.
4. Any evidence/discussion on why other hypothesized factors such as gender, marital status, income per month, the number of children in the home, and concurrent smoking and drinking in the home were not revealed as factors in this study? Is there any literature on these things?
5. No implication of the study findings was made. What is the value of the current study? What gaps in the literature if fills? What are the conclusions and lessons learned?
6. The study identified groups that are risky in terms of disagreeing that THS is dangerous. What could be done with this information? This should be discussed.
7. The Conclusion section needs to be rewritten. It is just briefly repeating the study findings now.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: We are public health researchers. One of our main areas of research is Tobacco Control.

We confirm that we have read this submission and believe that we have an appropriate level

of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

Reviewer Report 01 September 2020

<https://doi.org/10.5256/f1000research.28165.r70190>

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Supot Kamsa-ard

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Entitled: Parental risk perceptions of child exposure to thirdhand smoke and related factors

Reviewer comments:

Minor comments:

1. Measurement section
Paragraph 2: Please give more information for a variable as Duration of school attendance. What does it mean?
2. Result section
Paragraph 2: There is number of decimals, 1 or 2. It should be consistency in the hole full text.
3. Table 1
 1. Is it importance for report the p-value for comparison between disagree to harms THS exposure and agree to harms THS exposure? Because of the table 1 for baseline characteristics. Do not need for hypothesis testing.
 2. For continuous variable such as Age, Income should report mean (standard deviation), and median (minimal and maximal) as well.
 3. Heading title, please insert n (%) in each column.
4. Table 2
Statistics methods, it should describe model fitting strategies such what type of method for fitting model, for example forward or backward method. In additional, the table for demonstrate on Crude analysis still for important that we explore for multiple analysis. Why not report the crude analysis table?
5. Conclusion section
Please concise conclusion, it is not repeat the result. For instance, which is factor that the most important for PRPCETS.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: I am a instructor in university, which included more than 10 years experiences in public health research and cancer epidemiology.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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