Original Article

Paternal smoking is associated with greater food insecurity among poor families in rural Indonesia

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Food insecurity is common in developing countries and related to the physical well being of families. Household food insecurity is intended to reflect a household's access, availability, and utilization of food. The relationship between paternal smoking and household food insecurity has not been well characterized. The objective of this study was to examine the relationship of paternal smoking with household food insecurity among poor families in rural Indonesia. In a cross-sectional study of 26,380 rural households in the Indonesian Nutrition Surveillance System in 2003, we examined the relationship between paternal smoking and household food insecurity score, as measured using a 9-item food security questionnaire. The prevalence of paternal smoking was 72.9%. In families with and without a father who smoked, the mean (standard error) household food insecurity score was 1.83 (0.01) and 1.48 (0.02), respectively ($p<0.0001$). Paternal smoking was associated with greater household food insecurity score ($p<0.0001$) in a multivariable linear regression model, adjusting for maternal age, maternal education, weekly household expenditure per capita, and province. Among poor families in rural Indonesia, households with a father who smokes are at greater risk of household food insecurity.

Key Words: food insecurity, Indonesia, poverty, smoking, tobacco

INTRODUCTION

Of the estimated 1.8 billion smokers in the world, more than 80% are living in low income countries.[1] Smoking exacerbates the effects of poverty, as expenditures for tobacco may divert household income from food, clothing, housing, health, and education.[2,3] Parental tobacco use has been associated with child malnutrition[3] and greater infant and under-five child mortality.[4] Environmental tobacco smoke also increases respiratory disease in children.[5,6] The prevalence of smoking remains high in many developing countries, especially among men in southeast Asia.[7] Indonesia is a major market for the tobacco industry and is the only member country of the Association of Southeast Asian Nations (ASEAN) that is not a signatory to the World Health Organization Framework Convention on Tobacco Control.[7,8]

There is an estimated 900 million people worldwide who are affected by food insecurity, and a large majority of them are found in developing countries.[9] Food insecurity is a multi-dimensional term that describes lack of the physical and economic access to sufficient and nutritious food for the entire household. Food insecurity can be measured in a variety of ways, and recent approaches have emphasized measuring inadequate access to food.[10] Greater food insecurity is associated with a poor quality and quantity of diet[11] and increased neonatal, infant, and under-five child mortality.[12]

We hypothesized that paternal smoking increases household food insecurity in rural families in Indonesia. In order to address this hypothesis, we characterized the relationship between paternal smoking and household food insecurity among families in a population-based sample in rural Indonesia.

MATERIALS AND METHODS

The study subjects consisted of children from families that participated in a major nutritional surveillance system (NSS) in Indonesia that was established by the Ministry of Health, Government of Indonesia and Helen Keller International in 1995.[13] The NSS was conducted in the provinces of Lampung, Banten, West Java, Central Java, East Java, Lombok, South Sulawesi, and West Sumatra.

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The subjects included in this analysis were surveyed between June 26 and September 27, 2003. The NSS was based upon the conceptual framework of the United Nations Children's Fund (UNICEF) on the causes of malnutrition[14] with the underlying principle to monitor public health problems and guide policy decisions.[15] The NSS was based upon stratified multistage cluster sampling of households in ecological zones within provinces of the country.[13] In each zone, villages were selected by probability-proportional-to-size sampling. Data were collected by two-person field teams. A structured coded questionnaire was used to collect data from the mother, father, or guardian regarding information on the household's composition, maternal age, parental education, and weekly household expenditures, along with other socioeconomic, environmental sanitation, and health indicators. The participation rate of families in the surveillance system was >97%, and the main reason for non-response was that the family had moved out of the area or was absent at the time the interviews were conducted. Non-response because of refusal to participate in the surveillance system was very low (<1%).

The NSS included questions on paternal and maternal smoking. In each household, data were gathered regarding weekly expenditures on cigarettes and on total weekly expenditures. Expenditure and price variables were collected in Indonesian rupiah. For this analysis, expenditures are presented in US dollars to control for the fluctuation of the rupiah. Monthly exchange rates from 2003 were established using historic data publicly available through the Bank of Canada.[12]

The NSS included questions relating to household food security that have previously been used to assess food insecurity in Indonesia.[12] The survey instrument included nine questions or statements relating to household food insecurity: 1) We worried whether our food would run out before we got money to buy more; 2) The food that we bought just did not last, and we did not have enough money to get more; 3) Our children were not eating enough because we just could not afford enough food; 4) In the last 12 months, did you or other adults in your household ever cut the size of meals or skip meals because there was not enough money for food? 5) In the last 12 months, did your children ever skip meals because there was not enough money for food? 6) In the last 12 months, did you ever eat less than you felt you should because there was not enough money for food? 7) In the last 12 months, were you ever hungry but did not eat because you could not afford enough food? 8) In the last 12 months, did you lose weight because you did not have money for food? 9) In the last 12 months, did you or other adults in your household ever not eat for a whole day because there was not enough money for food? The nine questions were related closely to the 9-item adapted U.S. Household Food Security Survey Module.[16] These nine items were used to comprise a possible household food insecurity score from 0-9, with a higher score signifying greater food insecurity.[12]

The study protocol complied with the principles enunciated in the Helsinki Declaration.[17] The field teams were instructed to explain the purpose of the NSS and data collection to each child's mother or caretaker, and, if present, the father and/or household head; data collection proceeded only after written informed consent. Participation was voluntary and all subjects were free to withdraw at any stage of the interview. The protocol was approved by the Medical Ethical Committee of the Ministry of Health, Government of Indonesia, and the plan for secondary data analysis was approved by the Institutional Review Board of the Johns Hopkins School of Medicine.

Categorical variables were compared using chi-square tests. A multivariable linear regression model was used to examine the relationship between paternal smoking and household food insecurity score. Maternal age was included in the analyses rather than paternal age, because maternal age is more closely related to child health. Variables that were significantly associated with paternal smoking in univariate analyses were included in the final multivariable models. Population-based weighting was used to account for differences in population size of the various provinces. All analyses were performed using SAS Survey (v. 9.1.3, SAS Institute, Inc, Cary, NC) to account for the cluster design. A type I error of 0.05 was used in the analyses.

RESULTS

The prevalence of paternal smoking was 72.9%, and the prevalence of maternal smoking was 0.5%. Due to the low prevalence of maternal smoking, these analyses are limited to paternal smoking only. In families with and without a father who smoked, the mean (standard error) household food insecurity score was 1.83 (0.01) and 1.48 (0.02), respectively ($p<0.0001$). The prevalence of paternal smoking by province was 79.4% for Lampung, 76.8% for Banten, 77.4% for West Java, 68.3% for Central Java, 69.9% for East Java, 79.1% for Lombok, and 66.3% for South Sulawesi. The characteristics of households in which the father was a smoker were compared with households in which the father was not a smoker (Table 1). In households where the father was a smoker, maternal age was lower, the level of both paternal education and maternal education were lower, and the weekly per capita household expenditure was higher. There were no significant differences between the groups in the proportion of households with >4 individuals eating from the same kitchen.

We examined the relationship between paternal smoking and household food insecurity score in a multivariable linear regression model that adjusted for maternal age, maternal education, weekly per capita household expenditure, and province (Table 2). Both maternal education and paternal education were not included together in the model because of collinearity between these two variables. Paternal smoking was associated with household food insecurity score ($p<0.0001$) after adjusting for maternal age, maternal education, and per capita household expenditure. Maternal education and weekly per capita household expenditure had higher betas than paternal smoking in relation to household food insecurity score.

DISCUSSION

The present study shows that paternal smoking is independently associated with greater food insecurity in rural families in Indonesia. To our knowledge, this is the first

Table 1. Demographic factors in families with and without a father who smoked in rural Indonesia

Characteristics[†]		Paternal smoking		No paternal smoking		*p*
		N	%	N	%	
Maternal age, y	≤24	5939	31.5	2076	29.5	0.004
	25-28	4401	23.3	1704	24.3	
	29-32	3780	20.1	1504	21.4	
	33+	4730	25.1	1744	24.8	
Maternal education, y	0	1037	5.5	250	3.6	<0.0001
	1-6	10156	54.1	3263	46.5	
	7-9	4160	22.1	1653	23.6	
	10+	3434	18.3	1844	26.3	
Paternal education, y	0	858	4.7	195	2.9	<0.0001
	1-6	8869	48.9	2711	39.9	
	7-9	3785	20.9	1356	19.9	
	10+	4635	25.5	2534	37.3	
Number of individuals eating from the same kitchen	0-4	8570	45.5	3278	46.6	0.1
	>4	10282	54.5	3750	53.4	
Weekly household expenditure per capita, quintile[‡]	1	3540	18.8	1549	22.0	<0.0001
	2	3763	20.0	1385	19.7	
	3	3794	20.1	1402	20.0	
	4	3841	20.9	1279	18.2	
	5	3814	20.2	1414	20.1	

[†]There were missing data for the following variables: maternal age (478), maternal education (583), paternal education (1437), individuals eating from same kitchen (500), weekly household expenditure per capita (499).
[‡]Quintile 1 is the lowest and quintile 5 is the highest expenditure per capita.

Table 2. Multivariable linear regression models of paternal smoking and other covariates with food insecurity score[†]

Characteristic		Beta	S.E.	*p*
Paternal smoking		0.21	0.03	<0.0001
Maternal age, y	≤24	---	---	---
	25-28	0.06	0.02	0.03
	29-32	0.08	0.04	0.06
	33+	0.16	0.04	0.0001
Maternal education, y	0	---	---	---
	1-6	-0.64	0.08	<0.0001
	7-9	-1.04	0.09	<0.0001
	10+	-1.42	0.09	<0.0001
Weekly household expenditure per capita, quintile[‡]	1	---	---	---
	2	-0.31	0.05	<0.0001
	3	-0.48	0.06	<0.0001
	4	-0.57	0.06	<0.0001
	5	-0.89	0.06	<0.0001

[†]Model is adjusted for province. References for categorical variables are maternal age (≤24 y), maternal education (0 y), weekly household expenditure per capita (quintile 1).
[‡]Quintile 1 is the lowest and quintile 5 is the highest expenditure per capita.

study from southeast Asia to demonstrate a relationship between paternal smoking and greater household food insecurity. These findings are consistent with previous studies that suggest smoking diverts precious household resources from food to tobacco.[2,3] Our previous studies in Indonesia show that in households where the father is a smoker, tobacco accounted for 22% of weekly per capita household expenditures.[18] The present study extends the idea further to show paternal smoking makes poor households less food secure. The findings of the present study are consistent with results from the U.S. National Health and Nutrition Examination Survey (1999-2002) in which food insecurity was more severe in households were the adults were smokers.[19] In another study from the U.S. involving low-income families, smoking prevalence was higher among families that were food insecure compared with families that were food secure.[20]

Food insecurity has negative effects upon the health and wellbeing of children. In the U.S., children from food insecure households were more likely to have "fair or poor" health and to be hospitalized.[21] Children from food-insecure households in urban slums of Pakistan were more likely to be stunted than those from food secure

households.[22] Food insecurity is linked with greater developmental risk in infants and toddlers.[23]

The limitations of the present study are the cross-sectional design, which limits the ability to draw causal inferences. There may be unmeasured confounders that may influence the relationship between paternal smoking and household food insecurity. The field workers who administered the surveys did not directly observe whether the fathers were smoking or not, however the prevalence of paternal smoking reported in this study is consistent with other surveys in Indonesia. The magnitude of the difference in household food security score between families with fathers who smoked or did not smoke was smaller than the difference in score found between families with and without under-five child mortality in Indonesia.[14]

Indonesia is the fifth largest market for tobacco in the world, with 182 billion cigarettes consumed per year.[24] *Kretek* (tobacco mixed with cloves and various additives) cigarettes account for nearly 90% of the cigarettes consumed in Indonesia[25] and are accessible to the poor as single cigarettes or small, less expensive packs.[26] Tobacco advertising is ranked among the largest advertising spending categories in Indonesia,[27] where there are few restrictions on tobacco industry conduct, advertising, and promotion.[24] Indonesia is still the only country in southeast Asia that has not signed the World Health Organization Framework Convention on Tobacco Control which would require implementation of advertising limitations and the banning of tobacco sales to youths.[7,8] Relatively weak tobacco control legislation was passed in 1999 and then further weakened in 2003 with an amendment to drop sanctions against the tobacco industry for violation of tobacco control regulations, such as not including health warnings.[24] Indonesia has the highest prevalence of smoking in the southeast Asian region.[25] The heavy advertising and marketing of cigarettes in Indonesia may be a contributing factor to the high prevalence of smoking among Indonesian men, and cigarette smoking is considered a mark of masculinity among teenage boys.[28]

The present study adds to the growing evidence that paternal smoking is associated with adverse consequences for the health of children in the family, as smoking diverts money from food to tobacco,[2,3] and increases food insecurity.

AUTHOR DISCLOSURES

The authors have no conflict of interest. This work was supported in part by a Lew R. Wasserman Award from Research to Prevent Blindness to Dr. Semba. The data analysis and paper writing were conducted during a workshop held in Kappel-am-Albis, Switzerland, November 23-27, 2009 that was supported by Sight & Life, the non-profit humanitarian initiative of DSM, Basel, Switzerland.

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印尼鄉村貧窮家戶其家中父親抽菸狀態與糧食不安全有關

糧食不安全的現象常見於發展中國家，同時也與家族身體安適有關。家戶糧食不安全正是反映該家戶的食物可近性、可獲性及利用。家中父親抽菸狀態與家戶糧食不足之間的關係仍然不清楚。因此本篇研究目的為探討印尼鄉村中較貧窮的家戶，其家中父親抽菸狀態與家戶糧食不安全之相關性。本篇為一橫斷性研究，使用 2003 年印尼營養監測系統資料，共 26380 鄉村家戶，同時利用一份 9 題的糧食安全問卷，評估家戶糧食不安全程度，探討與家中父親抽菸狀態之相關性。結果發現，家中父親抽菸盛行率為 72.9%。另外，若家中父親有否抽菸者，其家戶糧食不安全分數的平均數(標準誤)為 1.83 (0.01)與 1.48 (0.02) (p<0.0001)。最後結果也發現，在調整了母親年齡、母親教育程度、家戶每人每週消費及地區等變項後，發現家中父親抽菸狀態與家戶糧食不安全分數具有顯著的相關性(p<0.0001)。結論：在印尼鄉村地區貧窮家戶，家中父親是否抽菸，為家戶糧食不安全之危險因子。

關鍵字：糧食不足、印尼、貧窮、抽菸、菸草製品