Family-Based Smoking Cessation Intervention for Smoking Fathers and Nonsmoking Mothers with a Child: A Randomized Controlled Trial

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Objective To examine whether a family-based intervention targeting both smoking fathers and nonsmoking mothers in well-child health clinics is effective in increasing fathers' abstinence from cigarette smoking.

Study design This parallel 2-arm randomized controlled trial recruited a total of 1158 families with a daily-smoking father, a nonsmoking mother, and a child aged 0-18 months from the 22 maternal and child health centers in Hong Kong. The intervention group received the family-based intervention, including 6 nurse-led individual face-to-face and telephone counseling sessions within 1 month after recruitment and a voluntary face-to-face family counseling session (FCS). The control group received a leaflet, a self-help booklet, and brief quitting advice only. Father-reported 7-day and 6-month abstinence, smoking reduction, quit attempts, mother-reported help and support, and child salivary cotinine level were assessed at 12 months. Generalized estimating equation models were used to compare these outcomes between the 2 study groups.

Results Compared with the control group, the intervention group reported a greater prevalence of 7-day (13.7% vs 8.0%; OR, 1.92; 95% CI, 1.16-3.17; $P < .01$) and 6-month self-reported abstinence (13.4% vs. 7.5%; OR, 2.10; 95% CI, 1.30-3.40; $P < .01$). Within the intervention group, compared with receipt of individual counseling only, participation in the FCS was associated with increases in fathers' self-reported abstinence (20.2% vs 12.3%; $P = .02$), mothers' help (66.1% vs 43.8%; $P < .01$), and support to the fathers (55.0% vs 45.4%; $P < .01$).

Conclusions The family-based smoking cessation intervention for the families in the well-child healthcare setting was effective in increasing the fathers' self-reported abstinence. Additional participation in the FCS increased mothers' help and support to the fathers. *(J Pediatr 2017;182:260-6).*

Trial registration Controlled-trials.com: ISRCTN99111655; Hkuctr.com: HKUCTR-465.

Infants are particularly vulnerable to secondhand smoke (SHS) exposure as they have smaller and less-developed lungs.[1,2] Worldwide, approximately 40% of children are exposed to SHS, and 165 000 children aged <5 years die every year from lower respiratory infections due to SHS.[3] Parental smoking cessation is the most effective way to eliminate the harm to young children from SHS exposure at home. Smoking cessation interventions for smoking parents in teachable moments, including pregnancy,[4-6] postpartum period,[7] and child's clinical visit for acute illness,[8-10] have been proven effective in randomized controlled trials (RCTs) and systematic reviews.[11] These interventions likely are more well accepted by smoking parents who are concerned about the effects of their smoking on the health of their young child.

In Chinese society, most smokers are male.[12,13] Hong Kong is a Chinese urban city with large disparities in male and female smoking prevalence (18.6% vs 3.2% in 2015).[14] Paternal smoking is the major source of SHS at home.[15] Chinese wives, mostly nonsmokers, generally do not challenge their husbands' smoking habit, to avoid violating traditional family hierarchy and relationships.[1,16] Interventions involving the couple without confronting the Confucian gender norms, which emphasize male dominance in a family, might be more acceptable by Chinese families.[16]

Thus, instead of simply guiding nonsmoking mothers to help smoking fathers, engaging both the mothers and fathers in individual and group counseling sessions may reduce the mothers' pressure and encourage the fathers' smoking cessation. Numerous previous smoking cessation intervention studies have targeted either the smoking or nonsmoking parent, but only 2 studies to date have tested the effectiveness of counseling sessions for both caregivers.[17,18] Therefore, we proposed a family-based intervention in a Chinese context, which includes both the smoking father and the nonsmoking mother in separate and group counseling and emphasizes the mother's role in supporting and helping the father.

In this study, we aimed to test the long-term effectiveness of a family-based intervention that includes nurse-led individual telephone counseling for the smoking

FCS	Family counseling session	PP	Point prevalence
GEE	Generalized estimating equation	RCT	Randomized controlled trial
MCHC	Maternal and child health center	SHS	Secondhand smoke

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father and nonsmoking mother, along with a family counseling session (FCS) involving them together to discuss the SHS exposure of their child and the father's smoking cessation. The primary research question was whether the family-based intervention was effective in helping fathers of infants quit smoking. Cessation outcomes were compared in the fathers who participated in the FCS and those who did not participate. In addition, father-reported smoking at home, mother-reported help and support, and child salivary cotinine level were assessed at 12 months.

Methods

This single-blinded, parallel 2-armed RCT recruited nonsmoking mothers who took their child to any of the 22 of the 31 maternal and child health centers (MCHCs) assigned by the Hong Kong Department of Health (Controlled-trials.com: ISRCTN99111655; Hkuctr.com: HKUCTR-465). MCHCs were selected as the recruitment sites because approximately 75% of neonates born in Hong Kong utilize this public health service, including vaccination and child assessment, until age 18 months.[19] The nurses on duty determined the eligibility of families based on the following inclusion criteria: (1) nonsmoking mother with a neonate or infant aged 0-18 months (definition of neonate and infant from the US Food and Drug Administration[20]); (2) father who smoked 1 or more cigarettes daily in the past 30 days; (3) father, mother, and child living together in the same household in the past 7 days; (4) father not participating in any other smoking cessation program; (5) both father and mother Hong Kong residents and speak Cantonese; and (6) no other smoking cohabitants in the household. Infants who were not accompanied by a mother were excluded.

Eligible mothers were briefed about the project and then referred to an MCHC nurse counselor with extensive training and experience in smoking cessation. Once the mother provided written consent to participate, the nurse counselor administered the baseline survey, collect the infant's saliva, and randomized the family into the intervention group or the control group. The nurse counselor then contacted the father by telephone (number provided by the mother) to provide verbal consent and schedule a baseline interview within 2 days of the mother's enrollment. The timing of each intervention and follow-up component is shown in **Figure 1** (available at www.jpeds.com). The study was approved by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW 07-211).

Infant Saliva Cotinine Level

The half-life of saliva cotinine (a metabolite of nicotine) is 16-20 hours, which allows for the detection of tobacco smoke exposure (cotinine range, 0.1-20 ng/mL) within several days of exposure.[21,22] Infants' saliva, which can be collected easily and noninvasively, is commonly used to measure their SHS exposure.[23,24] For saliva collection, the counselor placed a Sorbette (a wand with a small sponge; Salimetrics, State College, Pennsylvania) in the infant's mouth under the tongue for 15-30 seconds at a time, removing and reintroducing it until it began to expand (at least 1 minute total time). Each infant provided 2 Sorbettes soaked with saliva for analysis. The Sorbettes were labeled, placed in a microcentrifuge tube, and then frozen at −20 °C for transportation. Enzyme-linked immunosorbent assays of the saliva samples were conducted by the Department of Community, Occupational, and Family Medicine of the National University of Singapore.

Intervention

The mothers of the intervention group received an onsite counseling session, 2 self-help booklets on smoking cessation and maintaining a smoke-free home, and a card specifying the follow-up schedule from the nurse counselor. During the first month after enrollment, the mothers received 2 telephone counseling sessions at 1 week and 1 month, and the fathers received 3 telephone counseling sessions at 2 days, 1 week, and 1 month, as suggested by the US Clinical Practice Guideline.[25] Each session lasted approximately 30 minutes. Fathers were advised to quit smoking, and mothers were advised to help the fathers quit and establish a smokefree home to reduce infants' SHS exposure. In addition to the individual counseling, the father and mother voluntarily participated in the FCS, which was aimed at establishing mutual support, encouraging effective discussion, and setting goals for smoking cessation. The fathers were given 1 week of free nicotine replacement therapy and HK$200 (roughly US$26) as incentives for participation. The Transtheoretical Model of Change,[26] the Social Cognitive Theory,[27] and the Social Ecological Theory[28] were referenced to inform the content of the individual counseling and the FCS (**Appendix 1**; available at www.jpeds.com) All the counseling sessions were delivered by the nurse counselors.

In the control group, the mothers received a 2-page leaflet about the importance of establishing a smokefree home, a self-help smoking cessation pamphlet for the smoking fathers, and brief advice (**Appendix 2**; available at www.jpeds.com). The fathers did not receive any advice on cessation at baseline or any follow-up.

Follow-Up

All fathers and mothers were contacted separately via telephone and asked to complete an assessment by trained interviewers, who were blinded to the group allocation and based at the research office, at 6 and 12 months after enrollment. Parents were then invited to provide their infants' saliva samples obtained at their residence. Fathers who reported no smoking in the past 7 days at the 12-month follow-up were invited to participate in biochemical validation, including measurement of exhaled CO and saliva cotinine level using NicAlert strips (Nymox Pharmaceutical Corporation, St. Laurent, QC, Canada; www.nymox.com). Abstinence was validated by an exhaled CO level <4 ppm and saliva cotinine level <10 ng/mL.[29,30]

Outcome Variables

The primary outcome was the point prevalence (PP) of father-reported tobacco abstinence in the past 7 days or 6 months at the 12-month follow-up. The secondary outcomes