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Secondhand smoke exposure of children at home and prevalence of parental smoking following implementation of the new tobacco control law in Macao

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ABSTRACT

Objective: To investigate secondhand smoke exposure (SHS) of children at home and the prevalence of parental smoking after implementation of the new tobacco control law in Macao. This study explored whether the smoking ban in public places in Macao has decreased the prevalence of smoking or led to increased SHS exposure of children at home. As smokers cannot smoke in public places any more, they may smoke at home more frequently; a displacement effect of smoke-free legislation.

Study design: Cross-sectional survey.

Methods: This study surveyed 337 fathers and 538 mothers. Questions from a subset of key questions from the Global Adult Tobacco Survey (2nd edition) were applied to assess the SHS exposure of children and the prevalence of parental smoking since the smoking ban. A classification tree analysis was used to analyse the factors increasing SHS exposure of children.

Results: The prevalence of SHS exposure in children at home was 41.3%. The prevalence rates of paternal and maternal smoking were 43.7% and 3.8%, respectively. Compared with data reported by the Health Bureau of Macao SAR in 2011, the prevalence of parental smoking and the prevalence of SHS exposure of children at home have not decreased since the smoking ban. Analysis of the factors increasing the prevalence of SHS exposure of children indicated that fathers with an education level below high school were more likely to contribute to this increase, compared with fathers with a high school education or more (48.2% vs 32.4%, respectively). In addition, fathers represented the majority of smokers at home, accounting for 92.0% of 415 smoking parents. The prevalence of paternal smoking (82.0%) in the group of children with SHS exposure was much higher than that in the unexposed group (16.7%, Chi-squared test = 367.199, $P = 0.000$). The SHS exposure of children increased consistently with the decrease in paternal education level. This was consistent with the increasing prevalence of paternal smoking as paternal education level

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decreased. SHS exposure was most common among children whose fathers had an education level below high school and whose mothers were aged ≤29 years (75.0%).
Conclusions: This study did not find any decline in the prevalence of parental smoking after the smoking ban. These parents were more likely to smoke at home after the ban, leading to more frequent SHS exposure for their children.

Introduction

Exposure to environmental tobacco smoke, also called 'secondhand smoke' (SHS) exposure, is associated with cardiovascular disease, cancer, pulmonary diseases and many other health problems.[1] The risk of lung cancer is increased if exposure to SHS occurs before 25 years of age.[2] Children born to women exposed to SHS during pregnancy have a higher prevalence of physician-diagnosed childhood asthma.[3] Additionally, children may be at greater risk from SHS than adults as they have a higher breath frequency, inhale more air per body weight, and are less able to handle serious adverse health effects due to immature liver metabolism and other clearing mechanisms.[4] As early as 2009, the World Health Organization (WHO) estimated that there were approximately 186,000 premature deaths in children due to SHS exposure every year.[5] As the application of the WHO Framework Convention on Tobacco Control extended to Macao,[6] the Government of Macao SAR put the 'Regime of Tobacco Prevention and Control' (or the so-called 'new tobacco control law') into practice on 1 January 2012, following Hong Kong and many other countries or areas where smoke-free legislation had been established.[7] The smoking ban covers public places with fuel production and suppliers, government institutions, indoor areas of restaurants and workplaces, hotels, shopping halls, consumer casinos (including karaoke clubs and saunas), public entertainment places (including parks and swimming pools), markets, museums, cultural exhibition centres, airports and ports among others.[8]

Campaigns against smoking in public places have reduced the prevalence of smoking in some parts of the world. The prevalence of smoking decreased approximately 8 months after the smoking ban was introduced in the state of Washington, USA.[7] In the Republic of Ireland and Italy, the prevalence of smoking decreased by 2% and 2.9%, respectively, 1 year after implementing comprehensive smoke-free legislation.[9] In Macao, however, the overall prevalence of smoking had not decreased 6 months after implementation of the new tobacco control law.[10] As Lin and Bian reported, the prevalence of smoking of 16.8%, after adjusting the sex ratio, was close to the prevalence of 16.9% reported by the Health Bureau of Macao SAR in 2011.[11] In addition, in Hong Kong, SHS exposure of primary students grade 2 to 4 at home was reported to be higher after implementation of the public smoking ban, and the prevalence of parental smoking remained at the same level as before the ban.[12] Chan et al.[13] declared that smoke-free legislation in public places may lead to more smoking at home, increasing SHS exposure of other family members, especially children. This phenomenon is called the 'displacement effect of smoke-free legislation'.[12–14]

In 2010, before the new tobacco control law was implemented in Macao, 40% of surveyed adolescents (aged 13–15 years) were reported to be exposed to SHS at home.[11] The daily smoking prevalence rates of males and females aged >14 years were 31.4% and 3.8%, respectively. The highest prevalence of smoking occurred in males aged 35–44 years and females aged 25–34 years, with rates of 40.7% and 5.2%, respectively.[11] To the authors' knowledge, no study to date has evaluated SHS exposure of children or the prevalence of parental smoking since implementation of the new tobacco control law. As such, the authors designed a questionnaire to investigate the prevalence of SHS exposure of children at home and the prevalence of parental smoking from October 2013 to March 2014 in Macao. Furthermore, a classification tree analysis (CTA) was undertaken in an attempt to determine the factors that increase SHS exposure.[15]

CTA is a non-parametric statistical method typically used to identify high-risk populations. Unlike parametric multivariate regression which lacks the ability to capture unspecified, complex inter-relationships across factors,[16] CTA can address these limitations by revealing unspecified interrelationships through an easily interpreted tree diagram.[17] It is data adaptive and can provide insight into the predictive structure of data.[18] In this study, CTA was used to unravel the risk factors contributing to SHS exposure of children at home, as well as the interactions potentially overlooked in logistic regression.

Methods

Sampling method

Fathers or mothers whose children were in the first, third or fifth grade at four primary schools in Our Lady of Fatima Parish, Macao, were surveyed. All of the children were aged between 6 and 14 years. Macao has a total of seven parishes, of which Our Lady of Fatima Parish is the most densely populated, accounting for 40% of the total population.[19] The questionnaire used for the study was self-administered. It included demographic information and information about SHS exposure of children at home, as well as parental smoking habits. The questions to demarcate SHS exposure and smokers were cited from a subset of key questions from the Global Adult Tobacco Survey (2nd edition)[20] in order to better compare the data with related information reported by the Health Bureau of Macao SAR. Exposure of children to SHS at home was defined by the question, 'How often does anyone smoke inside your home?', with the options of daily,