Preventive Medicine 83 (2016) 70–76

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Associations between behavioural risk factors and smoking, heavy smoking and future smoking among an Australian population-based sample

Jaimi M. Iredale [a,*], Philip J. Clare [a], Ryan J. Courtney [a], Kristy A. Martire [b], Billie Bonevski [c], Ron Borland [d], Mohammad Siahpush [e], Richard P. Mattick [a]

[a] National Drug and Alcohol Research Centre (NDARC), University of NSW, Sydney, NSW 2052, Australia
[b] School of Psychology, University of NSW, Sydney, NSW 2052, Australia
[c] School of Medicine & Public Health, University of Newcastle, University Dr, Callaghan, NSW 2308, Australia
[d] Centre for Behavioural Research in Cancer, Cancer Council Victoria, 615 St Kilda Rd, Melbourne, VIC 3004, Australia
[e] College of Public Health, University of Nebraska Medical Centre, 42nd and Emile, Omaha, NE 68198, USA

ARTICLE INFO

Available online 2 December 2015

Keywords:
Tobacco
Diet
Alcohol
Obesity
Risk

ABSTRACT

Introduction. Tobacco smoking co-occurs with behavioural risk factors including diet, alcohol use and obesity. However, the association between behavioural risk factors and heavy smoking (>20 cig/day) compared to light–moderate smoking is unknown. The link between behavioural risk factors and future smoking for both ex and current smokers is also unknown. This study sought to examine these relationships. It is hypothesised that behavioural risk factors will be more strongly associated with heavy smoking.

Method. Data from Wave 7 (2007) of the Household and Labour Dynamics in Australia (HILDA) survey was analysed using logistic regression to determine relationships between diet (fruit and vegetable consumption, and unhealthy diet choices), alcohol consumption, obesity and physical activity with light–moderate smoking and heavy smoking. The association between these risk factors and future smoking (2008) was assessed for current and ex-smokers (2007).

Results. Obese respondents were less likely to be light/moderate smokers (RRR: 0.53; 95% CI: 0.43, 0.66) but not heavy smokers. Those who consume confectionary weekly were less likely to be light/moderate smokers (RRR: 0.73; 95% CI: 0.61, 0.87), but not heavy smokers. Smokers in 2007 were more likely to continue smoking in 2008 if they consumed 1–4 drinks per occasion (OR: 2.52; 95% CI: 1.13, 5.62). Ex-smokers in 2007 were less likely to relapse in 2008 if they consumed recommended levels of both fruit and vegetables (OR: 0.31; CI: 0.10, 0.91).

Conclusion. The relationships between heavy smoking and behavioural risk factors differ from moderate–light smoking. Future primary care interventions would benefit from targeting multiple risk factors, particularly for heavy smokers.

Introduction

Behavioural risk factors often present in combinations, leading to synergistic health effects associated with decreased longevity (Woodward et al., 1994; Breslow and Enstrom, 1980; Poortinga, 2007; Bryant et al., 2013). In particular, tobacco smoking is the leading risk factor responsible for health and disease globally and occurs concurrently with other behavioural risk factors including diet, alcohol use and obesity (Poortinga, 2007). Poor diet and physical inactivity contribute towards obesity; the leading cause of death in Australia that is predicted to follow a similar pattern in the United States (Mokdad et al., 2004; Lim et al., 2012). Obesity is defined as having a body mass index (BMI) of 30 or more (World Health Organisation, 1995).

While there is conflicting evidence for a link between smoking and physical activity, unhealthy nutrient intake has been demonstrated among smokers compared to non-smokers (Mesquita et al., 2014; Dallongeville et al., 1998; Anokye et al., 2012; Vogl et al., 2012; Coste et al., 2014). In their meta-analysis, Dallongeville et al. (1998) concluded that smokers consume 77.5% more alcohol, and 3.5% more fat in their diet than non-smokers. Research shows that 60% of adults who consume alcohol at harmful levels are also self-reported smokers

* Corresponding author.
E-mail addresses: j.iredale@unsw.edu.au (J.M. Iredale), p.clare@unsw.edu.au (P.J. Clare), r.courtney@unsw.edu.au (R.J. Courtney), k.martire@unsw.edu.au (K.A. Martire), Billie.bonevski@newcastle.edu.au (B. Bonevski), Ron.Borland@cancervic.org.au (R. Borland), msiahpush@unmc.edu (M. Siahpush), r.mattick@unsw.edu.au (R.P. Mattick).

http://dx.doi.org/10.1016/j.ypmed.2015.11.020
0091-7435/

(Bonevski et al., 2014; Droomers et al., 1999). Additionally, a French cohort study of middle-aged adults (2011) found current smokers to be moderate to high consumers of fatty-salted foods and were less likely to consume fatty-sweetened foods than never smokers (Méjean et al., 2011). Smokers have fewer and flatter taste buds than non-smokers which affects their taste preferences (Pavlos et al., 2009). Furthermore, the consumption of fruit and vegetables in diet reduces the risk of chronic disease. (World Health Organization, 2003; Joshipura et al., 2001; Riboli and Norat, 2003) The Australian National Health and Medical Research Council (NHMRC) recommend that adults consume five serves of vegetables and two serves of fruit daily (National Health and Medical Research Council, 2003a). An inverse association between smoking and fruit and vegetable consumption is well-founded (Haibach et al., 2013; Nuttens et al., 1992). Explanations suggested for this association similarly include: palatability as well as low socio-economic status (SES), deficient knowledge, and appetite (Woodward et al., 1994; Haibach et al., 2013).

The association between smoking and BMI is complex and inconsistent. Evidence supports an inverse association, where nicotine resulted in lower body weight as smoking suppresses appetite, and alters metabolism (Chajek-Shaul et al., 1990; Grunberg, 1985; Stamford et al., 1986; Wack and Rodin, 1982; Williamson et al., 1991). Alternatively, other research found obesity rates differ depending on level of cigarette consumption (Rásky et al., 1996; Tan et al., 2013; Yang et al., 2014). Yang et al.'s (2014) community based survey of 6432 males showed that light smokers (<10 cig/day) had lower BMI and heavy smokers (>30 cig/day) had higher BMI compared to non-smokers. The researchers attributed this to other risk factors including lower education, and higher alcohol use and fat intake. These results are consistent with genetics research showing that 11 BMI-influencing gene variants are correlated with smoking, as they simultaneously influence habit formation, appetite and reward. (Thorgeirsson et al., 2013) This research suggests that heavy smokers may differ from other smokers, however the difference in behavioural risk factor clustering for heavy smokers at a population level has not been determined.

Therefore, the present analysis aimed to extend research demonstrating differences in heavy smokers by examining the association between heavy smoking and other behavioural risk factors in a population based Australian sample. This data will be informative in shaping the future direction of lifestyle smoking interventions as it will determine which risk factors to target. Furthermore, the existing literature is yet to systematically determine which risk factors influence future smoking at a population level. The current study aimed to fill this gap and determine the association between behavioural risk factors and the continuation of smoking in a longitudinal cohort.

Based on past research, we hypothesised that those who are more likely to smoke: consume alcohol at risky levels and consume higher levels of salty fatty foods (Dallongeville et al., 1998; Bonevski et al., 2014). Those who consume recommended levels of fruits and vegetables (Haibach et al., 2013), and higher levels of sweet fatty foods (Dallongeville et al., 1998) are less likely to smoke. We expect moderate–light smokers but not heavy smokers to have lower BMI (Grunberg, 1985; Yang et al., 2014). Those who engage in a regular physical activity were thought to be neither more or less likely to smoke (Mesquita et al., 2014). We expected that alcohol consumption and dietary factors may be more strongly associated with heavy smoking (Thorgeirsson et al., 2013). We hypothesised that these patterns would remain the same for predicting future smoking.

Method

The analysis used data from Wave 7 (2007) and Wave 8 (2008) of the Household Income and Labour Dynamics Australia (HILDA) survey, a national survey of household labour dynamics conducted in Australia. HILDA is a longitudinal survey conducted annually since 2001, with a sample of approximately 12,000–13,000 participants ranging in age from 18 to 96 years as of June 2007, with retention rates around 90%. Recruitment was based on a multistage, stratified random sample, where a random selection of households was made from a random selection of the Australian Census Collection Districts (CCDs). More detailed descriptions of the HILDA design and methodology for each wave are available elsewhere (Summerfield et al., 2013). Analysis was restricted to those who completed the self-completion questionnaire portion of HILDA (Summerfield et al., 2013), for a total sample of 10,423 for the primary analysis and 5356 for the secondary analysis (3159 ex-smokers and 2197 smokers).

Outcome variables

Participants were asked a number of questions about their smoking status, including whether they were a current or ex-smoker, how often they smoked, and how many cigarettes they smoked on average. From these responses, the participants were coded into a three-level variable (non-smoker/light-moderate smoker/heavy smoker) reflecting their current smoking status (2007), with those who smoked more than 20 cigarettes daily considered heavy smokers. (Qian et al., 2010) A second, binary variable (non-smoker/smoker) was also constructed of future smoking status (2008).

Predictor variables

Nutrition

The participants were asked a number of questions about their diet, including typical consumption of fruits and vegetables, and how often they ate "unhealthy" food in a range of categories: (1) biscuits, cakes, pies, cake-type desserts, pastries, etc.; (2) confectionery (such as lollies, sweets, chocolate bars, and fudge) and ice cream; (3) snack foods (such as potato crisps, pretzels, popcorn, crackers, oriental snack mix, and salted nuts); (4) fried potatoes, french fries, hot chips or wedges.

Fruit and vegetable consumption was coded based on whether respondents regularly consume the Australian recommended daily intake of fruits (2 serves), vegetables (5 serves) or both (National Health and Medical Research Council, 2003a). Frequency of eating unhealthy food categories was coded as 'weekly or daily' and 'less than weekly'. Unhealthy food categories included: cakes, confectionary, snack foods, and potato products.

Physical activity

The participants were asked how often per week they participated in moderate or intense physical activity, with moderate physical activity defined as 30 min of activity at a level that "will cause a slight increase in breathing and heart rate, such as brisk walking". The survey response options were fixed and coded based on whether participation was zero, one to three, or four or more times per week.

Alcohol use

There were four categories: never drinker, ex-drinker, current low-risk drinker (1–4 drinks per occasion), and current risky drinker (more than four drinks per occasion). These categories were based on Australian NHMRC guidelines for alcohol use (National Health and Medical Research Council, 2003b).

Body Mass Index (BMI)

HILDA used the participants' height and weight to calculate BMI [BMI = mass(kg)/(height(m)^2)]. Four BMI categories were included: underweight (BMI < 18.5), healthy (18.5 ≤ BMI < 25), overweight (25 ≤ BMI < 30) and obese (BMI ≥ 30) (World Health Organisation, 2000).

Controlling variables

Other variables were included in the model as previous research shows that they are potential confounders (World Health Organisation, 2000; Ware et al., 1992).

Employment status and occupation

A single employment status and occupation variable was included. There were three employment categories: unemployed but in workforce (i.e. looking for work), unemployed but not in workforce (i.e. retired or unable to work) or employed. If employed, occupation was coded: blue-collar, white-collar or professional. This resulted in a five-level categorical variable.

Relative socio-economic advantage and disadvantage measure

Socio-Economic Indexes for Areas (SEIFA) was developed by the Australian Bureau of Statistics (ABS) to rank areas of Australia based on their relative