Gender and educational differences in the association between smoking and health-related quality of life in Belgium

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ABSTRACT

Previous studies have shown that smoking has a significant and negative association with health-related quality of life (HRQOL). A question remains, however, as to whether this association between smoking and HRQOL differs by gender or educational level. To examine this question, we extracted data from the 2013 Belgian Health Interview Survey ($n = 5668$). HRQOL was assessed using the descriptive system of the EuroQol 5D-5L that consists of 5 dimensions and the resulting index score. Linear and logistic multivariable regression models were fitted to estimate the association between HRQOL and smoking for each educational level and gender. Also, interaction terms were introduced in the full regression models and the Wald test was used to assess model fit. Our findings show that among men, there is no significant association between smoking and HRQOL, and no effect modification by educational level. Among women, however, daily smokers have shown significantly lower HRQOL scores compared with never smokers, but only among females with a low and intermediate educational level. The lower EQ-5D index scores among female daily smokers with lower education was due to higher odds of reporting problems in anxiety/depression, mobility, pain, and usual activities. To conclude, information on the association between HRQOL and smoking is useful for the development of smoking cessation interventions. Our findings suggest the importance of tailoring these interventions to the needs of the women with lower education.

1. Introduction

It is widely documented that tobacco smoking is associated with various chronic diseases, disability and mortality (CDC, 2017; Van Oyen et al., 2014). Smoking has also been associated with other measures of general health and well-being including health-related quality of life (HRQOL) (Maheswaran et al., 2013; Vogl et al., 2012). Indeed, a number of studies have examined the association between smoking and HRQOL in diverse settings and populations and using different ways to measure HRQOL. Based on a recent review of these studies, it could be concluded that smokers have worse HRQOL than non-smokers and that the strength of the association increases with the number of cigarettes smoked (Goldenberg et al., 2014).

Assessing the association between smoking and HRQOL is important as HRQOL generates a holistic multidimensional measure of well-being that encompasses people's evaluation of their physical, mental, emotional and social functioning. It is a measure that goes beyond direct measures of health and focuses on the impact health status has on

quality of life (Hennessy et al., 1994). Therefore, HRQOL allows a better understanding of the impact of smoking on well-being, thereby supplementing the well-known impact of smoking on mortality and morbidity. HRQOL also allows to provide a positive context for encouraging smoking cessation by focusing on the positive gains in quality of life (Wilson et al., 1999).

HRQOL has also gained significant importance on the policy level as it is often used to inform public health and health care policy. HRQOL can indeed be used as an input to calculate quality-adjusted life years (QALYs), one of the most commonly reported measures of benefit in health economic evaluations (McCaffrey et al., 2016). Therefore, HRQOL can be instrumental in informing economic evaluations of interventions related to tobacco smoking, be it prevention, cessation or treatment interventions.

The association between smoking and HRQOL has already been well established. A question still remains however as to whether this association varies by sex and socioeconomic status (SES). This is an important question since studies have indicated lower HRQOL among

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women and among people with lower SES (Mielck et al., 2013), and have found important variations by sex and SES in the patterns of smoking and the health impacts of smoking (Graham et al., 2006; Pampel and Rogers, 2004; Peters et al., 2015).Such information on a differential association between smoking and HRQOL may further refine targeting strategies for smoking cessation interventions (Wilson et al., 2004), yet few studies have examined this issue. For instance, some studies analysed whether the association between HRQOL and smoking differ by gender, but reached inconsistent conclusions (Coste et al., 2014; Laaksonen et al., 2006; Wilson et al., 2004). No study has however assessed whether the association between HRQOL and smoking varies by SES. Nonetheless, a number of studies have shown that the negative association between HRQOL and chronic diseases such as hypertension, diabetes and obesity is greater among people with a lower SES (Kinge and Morris, 2010; Mielck et al., 2014; Stafford et al., 2012).

In this context, the purpose of the current study is to use Belgian data to explore whether the association between HRQOL and smoking differs by gender and SES.

2. Methods

2.1. Study population

The Belgian Health Interview Survey (BHIS) is a cross-sectional household survey that has been periodically organized since 1997. The participants are selected from the national register through a multistage stratified sample of the population. For this study we used data from the BHIS 2013 and included only participants aged 15 years and older. The participation rate in the survey was 57% at the household level. The detailed methodology of the survey is described elsewhere (Demarest et al., 2013). The final sample had a population of 5668 individuals. Data on demographic information and SES were collected through face-to-face interviews, whereas HRQOL and smoking were assessed via self-administered written questionnaires.

2.2. Measures

A three-category variable was used to differentiate between never smokers, former smokers and daily smokers. This categorization was based on two questions: 1) Have you smoked at least 100 cigarettes (about 5 packs) or the equivalent amount of tobacco in your entire life (Yes/No)?; 2) Do you smoke at all nowadays (Yes, daily; Yes, occasionally; Not at all)? Only daily smokers were considered as smokers. Occasional smokers were dropped from the analyses as the number of people in this category was too small ($n = 260$) to allow reliable conclusions to be drawn.

Educational level was used as a proxy for SES. Educational level was based on the highest level of education achieved in the household. We recoded this variable into three categories (UNESCO, 2006): low (lower secondary education or less), intermediate (higher secondary education), and high (higher education).

HRQOL was assessed using the EuroQol 5D-5L (EQ-5D-5L) questionnaire. It is a standardized and widely used instrument that has been applied to a broad range of health conditions in different populations. A number of studies have used this instrument to assess the association between HRQOL and smoking and smoking-related diseases (Maheswaran et al., 2013; Vogl et al., 2012). The EQ-5D-5L has two main components: the descriptive system and the visual analogue scale. In this study we used only the descriptive system, which defines HRQOL in terms of five dimensions (5D): 'mobility', 'self-care', 'usual activities', 'pain/discomfort' and 'anxiety/depression'. Each of these dimensions has 5 levels (5L) of perceived problems: (level 1) no problems, (level 2) slight problems, (level 3) moderate problems, (level 4) severe problems, and (level 5) extreme problems. There are 3125 (5^5) possible health states generated by combining one level from each of the dimensions.

For example state 11111 indicates no problems on any of the 5 dimensions, while state 12345 indicates no problems with mobility, slight problems with self-care, moderate problems with doing usual activities, severe pain or discomfort and extreme anxiety or depression.

Each health state is converted into a single EQ-5D index score using an algorithm based on public preferences for different health states. In Belgium, such an algorithm is so far only available for the EQ-5D-3L questionnaire (3 levels of responses instead of 5) (Cleemput, 2010). Therefore, using a cross-walk function, the EuroQoL Group mapped the EQ-5D-5L health states to EQ-5D-3L health states (Van Hout et al., 2012). Applying both algorithms to the EQ-5D-5L health states thus resulted in the calculation of an EQ-5D index score for each respondent, ranging from -0.158 (worst health state) to 1 (most optimal health state). See more details on the calculation of the ED-5D-5L index score in the supplementary files.

2.3. Data analysis

Firstly, descriptive summary statistics by age, sex and educational level were calculated for the EQ-5D index score and for each of the 5 dimensions.

Secondly, multivariable linear regression modelling was used to study the association between the EQ-5D index score and smoking while controlling for a number of covariates. Logistic regression modelling was performed to study the association of each of the dimensions, dichotomized into 'no problems' (level 1) and 'any problem' (levels 2 to 5), with smoking while controlling for the same covariates. The choice of covariates was guided by previous studies in the field. Therefore, in addition to including age, gender and education in these models, we controlled for marital status (married or legally cohabiting, widowed, divorced, never married), country of birth (Belgian, Non-Belgian but citizen of the European Union, non-Belgian and citizen of other countries), region of residence (Brussels, Flemish Region, Walloon Region), obesity (subjects with a Body Mass Index greater than or equal to 30 were considered obese), healthy eating defined as eating at least 5 portions of fruit and vegetables daily (yes/no) and alcohol over-consumption defined as more than 14 drinks a week for women and 21 drinks a week for men (yes/no). We controlled for socio-demographic factors as these have an important impact on HRQOL and on smoking. We controlled for health behaviour factors as unhealthy behaviours tend to cluster. The variance inflation factor for the relationship between smoking and the other included covariates equalled 1.06, indicating no risk of multicollinearity.

Thirdly, to assess effect modification by gender, interaction terms between smoking and gender were introduced in the full regression models and a Wald test was used to evaluate whether the inclusion of the interaction terms would improve the fit of the model. If the Wald test was statistically significant, then we stratified the regression analysis by gender. The same approach was used to assess effect modification by educational level.

All analyses were weighted and have accounted for the complex study design of the BHIS. Confidence intervals were calculated at the 95% level. The analyses were performed in STATA 13 using appropriate svy commands.

3. Results

The mean EQ-5D index score was 0.812, ranging from -0.158 (worst health state) to 1 (most optimal health state). When considering the separate dimensions, the percentage of individuals who reported any problem varied from 7% for self-care to 18% for usual activity, 18% for mobility, 27% for anxiety/depression and 50% for pain/discomfort. As shown in Tables 1 and 2, the EQ-5D score was significantly lower among daily smokers compared with never smokers, even after adjusting for age and for a series of covariates (coefficient of -0.055 with a 95% CI of -0.074; -0.035). As shown in Table 2, for all dimensions except for self-care, the likelihood of reporting any problem was