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Long term and transitional intermittent smokers: a longitudinal study

M Lindström, S-O Isacsson, and The Malmö Shoulder-Neck Study Group

Objective: To investigate differences in snuff consumption, sociodemographic and psychosocial characteristics between baseline intermittent smokers that had become daily smokers, stopped smoking or remained intermittent smokers at the one year follow up.

Design/setting/participants/measurements: A population of 12 507 individuals interviewed at baseline in 1992-94 and at a one year follow up, aged 45–69 years, was investigated in a longitudinal study. The three groups of baseline intermittent smokers were compared to the reference population (all others) according to sociodemographic, psychosocial, and snuff consumption characteristics. A multivariate logistic regression model was used to assess differences in psychosocial conditions, adjusting for age, sex, country of origin, marital status, education, and snuff consumption.

Results: 60% of all baseline intermittent smokers had remained intermittent smokers, 16% had become daily smokers, and 24% had stopped smoking at the one year follow up. The long term intermittent smokers and those who had stopped smoking were young, unmarried, highly educated, and snuff consumers to a higher extent than the reference population. They also had more psychosocial resources than the reference population, while the psychosocial resources of those who had become daily smokers were poorer.

Conclusions: The majority of intermittent smokers are long term intermittent smokers. The results suggest that long term intermittent smokers have other psychosocial characteristics than daily smokers.

A substantial fraction of all smokers are intermittent, non-daily smokers. In southern Sweden approximately 20% of all smokers in the age groups 45–69 years are intermittent smokers, and the proportion is even higher (25%) when the younger adult age brackets are included. The proportion of intermittent smokers may even be rising in many western countries. Intermittent smokers are younger, and have a comparatively higher educational level and a higher occupational status than daily smokers. Country of origin does not seem to be a determinant of intermittent smoking in southern Sweden. Intermittent or occasional smoking seems to be a transitional stage for many smokers. Some intermittent smokers seem to be in the uptake phase of smoking. Others appear to be preparing for smoking cessation. Intermittent smoking is also related to a stronger intention to quit and a greater likelihood of having recently attempted to quit. However, there is also evidence that intermittent smoking can be a long term behaviour. These findings suggest that some intermittent smokers are long term intermittent smokers who are less susceptible to nicotine addiction, since nicotine addicted smokers mostly require a daily cigarette consumption.

Smoking cessation is a dynamic process that begins with a decision to stop smoking and ends with abstinence maintained over a long period. Smoking cessation is thus not a single event, but rather a process influenced by social, psychological, and biological factors. A strong biological mechanism can account for the fact that smokers experience stress in connection with acute nicotine withdrawal, and that nicotine re-instatement leads to an immediate improvement in the depleted mood state of the smoker. Intermittent smokers are more likely than daily smokers to have a strong intention to quit smoking, and are more likely to attempt to quit. Chippers—persons that smoke less than five cigarettes per day at least four days a week—have no withdrawal symptoms when abstaining from smoking and they score lower on tests of dependence than regular smokers. Chippers and intermittent smokers may thus have less susceptibility for nicotine addiction. Intermittent smokers probably also suffer less severe withdrawal symptoms during cessation attempts than daily smokers and have greater potential for success. However, these biological characteristics of intermittent smokers are most likely affected by other factors in the social environment of the individual, since some intermittent smokers become daily smokers, while other intermittent smokers remain long term intermittent smokers, and some stop smoking.

Health related behaviours such as intermittent smoking are a result of the interaction between a person and his or her environment. The relationship with the environment can be viewed as a dynamic process, since environmental changes require continuous adaptation by the individual. The successful adaptation to changes in the environment requires both individual resources and social relations—for example, social network and social support. According to the part of the psychosocial stress theory tested in this study, resources are individual ones, but there are also resources that the individual has access to through his or her social network.

The hypotheses derived from the psychosocial stress theory and tested in this study are that intermittent smokers with low levels of social networks (social participation and social anchorage) and/or low levels of social support factors (emotional support and instrumental support) might be in the uptake phase of smoking, and might have become daily smokers at the one year follow up, while especially baseline intermittent smokers with high psychosocial resources might be long term intermittent smokers or former daily smokers on their way to smoking cessation.

The aim of this longitudinal study is to assess the proportion of all baseline intermittent smokers that have remained...
intermittent smokers at the one year follow up, the proportion that have become daily smokers, and the proportion that have stopped smoking. The aim is also to compare these three groups of baseline intermittent smokers according to sociodemographic, psychosocial, and snuff consumption characteristics with a reference population (all others).

**MATERIAL AND METHODS**

**Study population**

This study is based on the Malmö shoulder-neck study (MSNS), which is a subcohort of the Malmö diet and cancer study (MDCS). Malmö is a city in southern Sweden with about 250 000 inhabitants. In 1990 all subjects born in 1926 to 1945 and living in Malmö were defined as a cohort (n = 53 325) for the MDGS. The recruitment to the MDGS took place from March 1991 until September 1996. The MSNS took place between February 1992 and December 1994, and included 14 555 subjects (6489 men and 8066 women) from this cohort. Detailed information concerning the MSNS and the MDGS is given in two other studies.22 23 The study cohort was approached in two ways, by postal invitation (with respondents randomly selected from the 45–69 year age brackets) or by direct contact taken by the proband after a media campaign. The focus in the information given in the invitation was on the relation between diet and cancer and not on smoking or musculoskeletal problems.

All who participated in the MSNS baseline study were also invited to participate in a second examination one year later (median 12.6 months, interquartiles 12.3–13.3 months). A questionnaire was sent to all participants in the baseline study still registered in the municipality of Malmö. Information letters introduced the questionnaire and two written reminders, and finally a telephone call followed, if needed. In total 12 507 participated in the second examination, giving a response rate of 86%. On their return, the questionnaires were immediately checked for missing values and completed by telephone, if necessary.

**Definitions**

**Outcome variable**

The smoking item (“Do you smoke?”) in both the baseline and the one year follow up questionnaires contained four alternatives: daily smoker, intermittent (non-daily) smoker, stopped smoking, and never smoked. The baseline intermittent smokers had at the one year follow up either become daily smokers (intermittent/daily), remained intermittent smokers (intermittent/intermittent), or had stopped smoking (intermittent/ stopped). The three groups of baseline intermittent smokers are separately compared to the aggregate sum (reference population) of daily smokers, former smokers (stopped), and respondents who had never smoked in the univariate and multivariate analyses.

The smoking item includes cigarette, cigar, and pipe smoking, but the vast majority (80.9% of all men and 97.3% of all women) were cigarette smokers.

The reliability of the smoking item was assessed by investigating the test-retest stability of 200 respondents within two weeks after the baseline examination. The test-retest stability was very high. The \( \kappa \) coefficient was 0.96 for all 200 respondents, 0.99 for the men, and 0.94 for the women. No age differences in reliability were observed, since the \( \kappa \) coefficients for the smoking item was 0.97 for the < 58.1 year group and 0.96 for the > 58.1 year group.

**Independent variables**

The age of the participants was computed from birth to the first visit to the MDGS centre and categorised into five groups. For country of origin, all participants born in countries other than Sweden were merged into a single category. Four categories were used for marital status: married, never married, divorced, and widow/widower. In the final analyses, the married category was compared to all unmarried.

**Statistics**

Three groups of baseline intermittent smokers that either had remained intermittent smokers, had become daily smokers, or had stopped smoking at the one year follow up were compared to the reference population in a logistic regression model according to sociodemographic, psychosocial, and snuff consumption characteristics. A multivariate logistic regression model was used to assess differences in psychosocial conditions, adjusting for age, sex, country of origin, marital status, education, and snuff consumption. The statistical analysis was performed using the SPSS software package.28

**RESULTS**

Table 1 shows that the proportions of daily and intermittent smokers at baseline were very similar among men and women. The proportion of never smokers was much higher among women (44.6%) than among men (28.1%). On the
other hand, the proportion of individuals that had stopped smoking was much higher among men (42.0%) than among women (26.8%). The distribution according to age, country of origin, social participation, and social anchorage did not differ between men and women. Men were married to a somewhat higher extent than women, and women were divorced and widows to a higher extent than men. A higher proportion of women had high emotional support and high instrumental support. On the other hand, a higher proportion of women also had only a basal level of education. Only 0.4% of all women were snuff consumers, compared to 7.0% of all men.

The prevalence of daily smoking decreased from 23.8% to 21.7% (p < 0.001) at the one year follow up among the 86% that participated at both the baseline and the one year follow up, while the prevalence of intermittent smoking increased from 4.8% to 5.4% (p < 0.001). The proportion that had stopped smoking increased from 33.7% to 35.1% (p < 0.001), while the proportion of never smokers remained at 37.7% (not shown in tables).

A 59.9% majority of all baseline intermittent smokers remained intermittent smokers at the one year follow up, while 15.9% had become daily smokers and 19.2% had

### Table 1 Prevalence (%) of smoking, sociodemographic, and psychosocial variables. The Malmö shoulder-neck study

<table>
<thead>
<tr>
<th>Smoking status</th>
<th>Men</th>
<th>%</th>
<th>Women</th>
<th>%</th>
<th>Total</th>
<th>%</th>
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<td>5.1</td>
<td>365</td>
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<td>Stopped smoking</td>
<td>2725</td>
<td>42.0</td>
<td>2160</td>
<td>26.8</td>
<td>4885</td>
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<td>Never smoked</td>
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<td>28.1</td>
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<td>1024</td>
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<td>1850</td>
<td>12.7</td>
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<td>Married</td>
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<td>5537</td>
<td>68.6</td>
<td>10029</td>
<td>68.9</td>
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<td>0.4</td>
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<td>93.0</td>
<td>8007</td>
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<td>Total</td>
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<td>8066</td>
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<td>14555</td>
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stopped smoking. An interesting 5.0% of all baseline intermittent smokers stated that they had never smoked at the one year follow up. This group was regarded in the following analyses as baseline intermittent smokers that had stopped smoking (not shown in tables).

Tables 2 and 3 show that the long term intermittent smokers (intermittent/intermittent) were significantly younger and had a significantly higher level of social participation than the reference population. The transitional intermittent smokers that had become daily smokers (intermittent/daily) had lower social participation to a significantly higher extent (odds ratio (OR) 1.79, 95% confidence interval (CI) 1.19 to 2.69) than the reference population. The transitional intermittent smokers that had stopped smoking (intermittent/stopped) were younger and unmarried to a significantly higher extent than the reference population. They also had a significantly lower proportion of persons with basal level education (OR 0.69, 95% CI 0.49 to 0.97) than the reference population. The odds ratios of being a snuff user were higher in all the three baseline intermittent smoker groups compared to the reference population.

Table 4 shows that the long term intermittent (intermittent/intermittent) smokers still had a significantly lower proportion of persons with low social participation compared to the reference population after adjustment for age, sex, country

| Table 2 | Distribution of sociodemographic and psychosocial characteristics according to smoking status of baseline intermittent smokers at one year follow up. The Malmö shoulder-neck study |
|---|---|---|---|---|
| | Intermittent/daily (n=95) (%) | Intermittent/intermittent (n=358) (%) | Intermittent/stopped (n=145) (%) | Reference population (n=11909) (%) |
| Age | | | | |
| 45–49 years | 12.6 | 15.6 | 20.0 | 12.3 |
| 50–54 years | 23.2 | 31.8 | 30.3 | 24.2 |
| 55–59 years | 26.6 | 23.2 | 15.9 | 22.9 |
| 60–64 years | 31.6 | 17.9 | 20.7 | 25.0 |
| 65–69 years | 6.3 | 11.5 | 13.1 | 15.6 |
| (Missing) | (n=0) | (n=0) | (n=0) | (n=0) |
| Sex | | | | |
| Men | 47.4 | 48.6 | 46.9 | 44.0 |
| Women | 52.6 | 51.4 | 53.1 | 56.0 |
| (Missing) | (n=0) | (n=0) | (n=0) | (n=0) |
| Country of origin | | | | |
| Sweden | 88.3 | 87.2 | 85.4 | 88.4 |
| Other country | 11.6 | 12.8 | 14.6 | 11.6 |
| (Missing) | (n=0) | (n=0) | (n=0) | (n=5) |
| Marital status | | | | |
| Married | 60.0 | 63.7 | 59.3 | 67.8 |
| Unmarried | 15.8 | 8.4 | 12.4 | 9.0 |
| Divorced | 18.9 | 23.5 | 23.4 | 16.6 |
| Widow/widower | 5.3 | 4.5 | 4.8 | 6.6 |
| (Missing) | (n=0) | (n=0) | (n=0) | (n=7) |
| Education | | | | |
| University degree | 15.8 | 14.0 | 17.4 | 12.6 |
| Medium | 16.8 | 19.3 | 20.8 | 17.4 |
| Basal level | 67.4 | 66.7 | 61.8 | 70.0 |
| (Missing) | (n=0) | (n=1) | (n=1) | (n=20) |
| Social participation | | | | |
| High | 56.8 | 76.5 | 76.6 | 70.2 |
| Low | 43.2 | 23.5 | 23.4 | 29.8 |
| (Missing) | (n=0) | (n=1) | (n=1) | (n=0) |
| Social anchorage | | | | |
| High | 78.0 | 74.5 | 76.1 | 75.4 |
| Low | 22.0 | 25.5 | 23.9 | 24.6 |
| (Missing) | (n=4) | (n=9) | (n=3) | (n=269) |
| Emotional support | | | | |
| High | 63.2 | 64.6 | 69.2 | 70.2 |
| Low | 36.8 | 35.4 | 30.8 | 29.8 |
| (Missing) | (n=0) | (n=2) | (n=2) | (n=53) |
| Instrumental support | | | | |
| High | 63.2 | 69.7 | 75.0 | 69.1 |
| Low | 36.8 | 30.3 | 25.0 | 30.9 |
| (Missing) | (n=0) | (n=1) | (n=1) | (n=24) |
| Snuff consumption | | | | |
| Yes | 9.5 | 11.5 | 9.0 | 3.0 |
| No | 90.5 | 88.5 | 91.0 | 97.0 |
| (Missing) | (n=0) | (n=1) | (n=0) | (n=17) |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |
of origin, marital status, education, and snuff consumption in the multivariate logistic regression analysis. In contrast, the odds ratio of low social participation among transitional intermittent/daily smokers was 1.79 (95% CI 1.17 to 2.75) compared to the reference population in the multivariate analysis.

The exclusion of the baseline intermittent smokers that reported that they had never smoked at the one year follow up from the intermittent/stopped group yielded the same results as those presented in tables 3 and 4 for the intermittent/stopped group.

**DISCUSSION**

A 60% majority of all baseline intermittent smokers had remained intermittent smokers, 16% had become daily smokers, and 24% had stopped smoking at the one year follow up. The long term intermittent smokers and the transitional smokers who had stopped smoking were young, unmarried, highly educated, and snuff consumers to a higher extent than the reference population. They also seem to have more psychosocial resources, especially social participation, than the total population. In contrast, the social participation of the baseline intermittent smokers that had become daily smokers was poorer than in the reference population.

The present results could be biased by selection bias, misclassification, and confounding.

A comparison with another investigation conducted in the city of Malmö during the same time period with a higher participation rate (71%) showed a good correspondence in the same age groups concerning socioeconomic status, smoking, and social participation. Some studies have shown that non-participants differ from study participants in terms of...
Intermittent (non-daily) smokers differ from daily smokers because they are younger, more highly educated, have higher socioeconomic position, and are less nicotine addicted. They also have better social networks and higher social participation than daily smokers. Intermittent smokers are either in the uptake phase of smoking, long term intermittent smokers, or former daily smokers in the process of smoking cessation. Most previous studies concerning intermittent smokers are cross sectional studies. This longitudinal study in southern Sweden shows that 60% of all baseline intermittent smokers had remained intermittent smokers at the one year follow up, while 16% had become daily smokers, and 24% had stopped smoking. The baseline intermittent smokers that had become daily smokers at the one year follow up had significantly higher risks of low social participation at baseline than the reference population, while the baseline intermittent smoker group that had remained intermittent smokers after a year had significantly lower risks of having low social participation than the reference population.

What this paper adds

The finding that all the groups of intermittent smokers have much higher proportions of individuals with snuff consumption partly contradicts the notion that intermittent smokers may be less nicotine addicted than daily smokers. Snuff consumption is a specifically Swedish phenomenon. This may to some extent affect the estimations of the proportion of all intermittent smokers that are long term intermittent smokers compared to other western countries. Snuff consumption is comparatively high in Sweden compared to many other western countries, and the use of oral snuff is a very particular trait
that characterises sniff consumption in Sweden. However, the vast majority (approximately 90%) of the intermittent smokers in all the three long term and transitional intermittent smoker groups do not use sniff, a fact that indicates that no far reaching inferences should be drawn from these findings.

CONCLUSION

The majority of intermittent smokers are long term intermittent smokers. The study results indicate that long term intermittent smokers have both sociodemographic and psychosocial characteristics—that is, high levels of social participation—that significantly differ from both transitional intermittent smokers that initiate daily smoking and the reference population. The results further support the notion that long term intermittent smokers are a specific group of smokers with other characteristics than daily smokers.

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