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Smoking Habits, Signs of Chronic Diseases and Survival in Inland and Coastal Regions of Croatia: a Follow-up Study

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ABSTRACT

Aim of the study was to estimate, the relationship between survival, smoking habits, and the results of medical examinations in inland and coastal regions of Croatia. Age and sex stratified sample of general population (1,571 men and 1,793 women, 37–56 years old in 1972; followed in 1982: N= 1,090 men; 1,325 women and/or 1972–1999 controlling vital status). Relative risks and 95% confidence limits were estimated using Cox regression in the model with time dependent covariates, separately by sex. In all regions, the proportion of male smokers decreased between 1972 and 1982. The proportion of female smokers increased, differently in urban and rural regions. During the follow-up between 1972 and 1999, 568 deaths were recorded among men and 382 among women. In men, in addition to age, significant hazards of death were the number of smoked cigarettes per day, body mass index, sedative intake, vital lung capacity (FVC), 100FEV₁/VC, systolic blood pressure, electrocardiogram, history of heart attack, and region. In women, in addition to age, significant predictors were the number of smoked cigarettes per day, systolic blood pressure, electrocardiogram, history of heart disease (excluding coronary diseases), and region. Survival relative risk increased with each additional smoked pack of cigarettes by 2.4% in women and 1.3% in men. Regional differences vs. smoking habit were observed. These data emphasize the need for prevention of smoking.

Key words: prospective studies, population survival, smoking habit

Introduction

Morbidity and mortality risks including cardiovascular diseases and impact of smoking in transitional countries such as Croatia were verified in the world health statistics¹. There has been a series of studies on the influence of smoking on health in the second half of 20 century^{2–6}. Besides, prospective studies indicate that smoking habit affects survival as well as general and specific mortality^{7,8}. Several papers published earlier in Croatia analyzed the influence of smoking on health⁹. They did not focus on survival, including regional differences and/or results of prospective check up^{10–12}. Our earlier results corroborate the findings on the variability of survival in different regions and/or urban vs. rural areas in Croatia¹³. It is well known that long-term smoking is related to long-term consequences on various indicators of health. The epidemiological model presented in this paper included some health indicators (qualitative or quantitative variables) and regional characteristics associated with smoking habits.

This part of the prospective study in adult and/or aged population is focused on the estimation of cigarette smoking in the past, including findings from past medical checks (a questionnaire on chronic bronchitis, chronic cardiovascular diseases, sedative intake, electrocardiogram findings (ECG), respiratory function tests, forced expiratory time, auscultation of concomitant adventitious lung sounds (râles), suffering pneumonia, systolic and diastolic blood pressure, nutrition habits, anthropometrics etc.) on all-cause mortality and survival rate. Potential differences regarding characteristics of the coastal and the inland features in past medical check up as well as vital data including general mortality were multivariate taken into account. Genders were analyzed separately in the model.

Subjects and Methods

Sampling involved two stages. The first stage was a judgment sample of six regions (out of 104 in 1969) covering rural and urban, inland (region: Zagreb /two urban areas/ and Virovitica /rural/) and coastal regions of Croatia (region: Split /urban/, Omiš, region, island Vis /rural/). The second stage was gender stratified with the sampling frame taken from voter's registry (Figure 1).

Survey and Interview Data

This study on age and sex stratified general population sample (aged between 38 and 57) started in 1972. Medical examinations and interviews, aimed at negative effects of certain habits, were conducted in 1972 and 1982. After exclusion of subjects unwilling to undergo medical measurements such as respiratory function tests and ECG the final sample in 1972 included 1,571 men and 1,793 women. Results and data of the check-up and interviews were coded. Smoking habits were registered as a number of cigarettes/day. Body mass index (BMI) was derived as weight (kg)/height² (m). The history of past illnesses was coded according to ICD IX code. Electrocardiogram was coded according to Rose and Blackburn¹⁴. Findings were sorted in four groups: normal, conditionally normal or bordering, mainly pathological, and pathological. Signs of right heart disease and ischemic heart diseases were noted separately. Forced vital capacity (FVC in L.), and 100 FEV₁/FVC were used as survival-known explanatory variables. Forced expiratory time in sec. was determined above trachea using a stopwatch. Auscultation of continuous adventitious lung sounds (râles); histories of pneumonia and chronic heart diseases were included in the check-up form for chronic obstructive pulmonary diseases, and tuberculosis¹⁵.

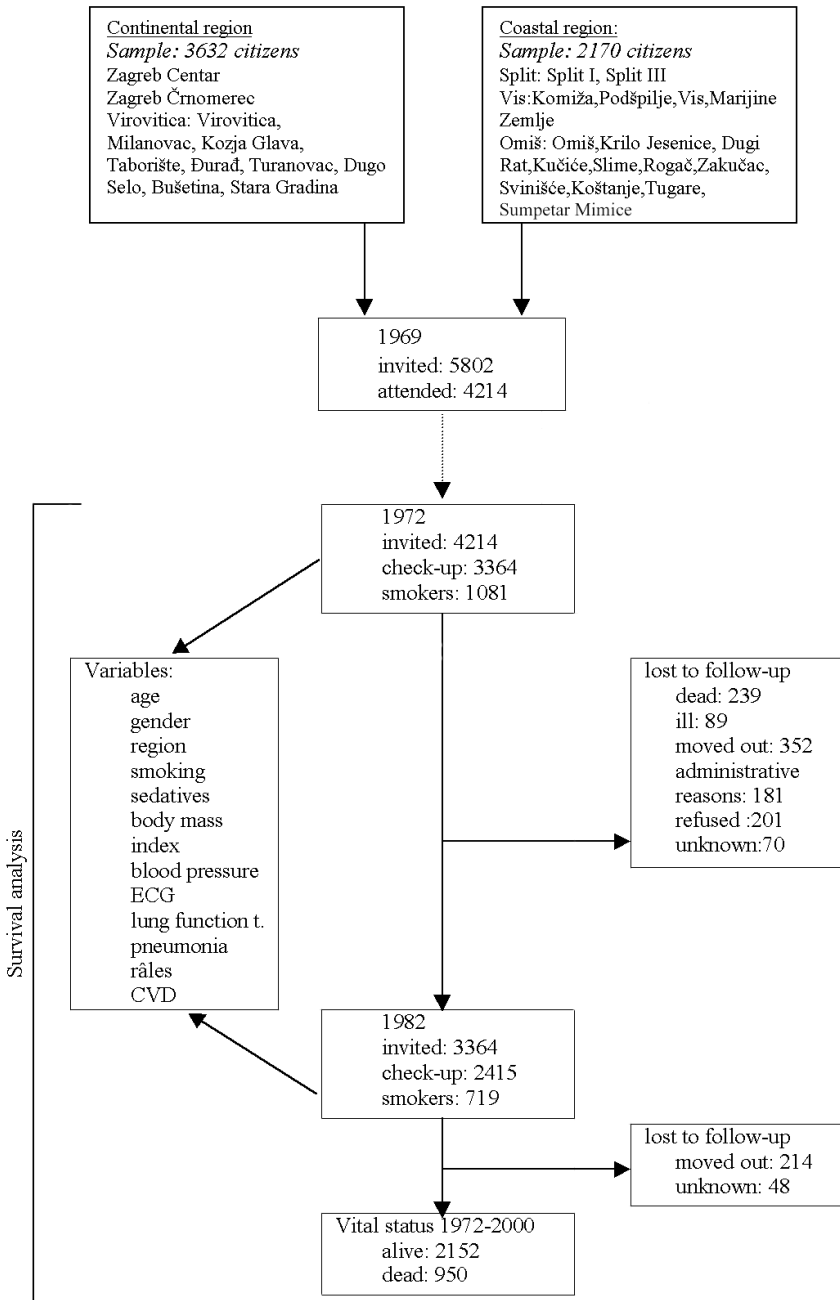


Fig. 1. Flow chart of prospective study.

Vital Data

Vital status data (alive-dead, cause of death, moved out from county or country) were collected between 1 January 1973 – 31 December 1999 (Table 1). Files with the lists of voters and files from birth register offices, diocese offices, mortuaries and cemeteries were searched through. Official forms of the Central Bureau of Statistics in Croatia were also checked. Subjects and/or their families were also contacted by phone. A small number of participants were hospitalized during examinations. 239 subjects died between 1973 and 1982. A total of 568 men and

382 women died between 1972 and 1999. Subjects who died from external causes and 48 subjects whose status could not be verified were excluded from analysis.

Epidemiological Modeling

The composition of analyzed variables in multi-variable model was created empirically after processing univariate analysis as statistically significant, separately by sex^{16–23}. Cigarette smoking was analyzed incorporating explicatory variables (multivariate approach). Apart from cigarette smoking data, the model included quality and quantity explicatory variables. Quality components included body

TABLE 1
PARTICIPANTS IN FOLLOW-UP STUDY INCLUDED IN THE MODEL BY REGIONS AND SEX

| REGION | Total | Deaths N (%) | Censored | |
|------------|-------|-----------------|-------------|-----------------|
| | | | Alive N (%) | The rest* N (%) |
| Črnomerec | 651 | 182 (28.0) | 413 (63.4) | 56 (8.6) |
| Men | 292 | 111 (38.0) | 153 (52.4) | 28 (9.6) |
| Women | 359 | 71 (19.8) | 260 (72.4) | 28 (7.8) |
| Centar | 549 | 144 (26.2) | 363 (66.1) | 42 (7.7) |
| Men | 273 | 88 (32.2) | 165 (60.4) | 20 (7.4) |
| Women | 276 | 56 (20.3) | 198 (71.7) | 22 (8.0) |
| Virovitica | 769 | 276 (35.8) | 413 (53.7) | 80 (10.5) |
| Men | 338 | 169 (50.0) | 141 (41.7) | 28 (8.3) |
| Women | 431 | 107 (24.8) | 272 (63.1) | 52 (12.1) |
| Omiš | 745 | 204 (27.4) | 498 (66.8) | 43 (5.8) |
| Men | 365 | 119 (32.6) | 225 (61.6) | 21 (5.8) |
| Women | 380 | 85 (22.4) | 273 (71.8) | 22 (5.8) |
| Split | 371 | 76 (20.5) | 261 (70.4) | 34 (9.1) |
| Men | 182 | 49 (26.9) | 119 (65.4) | 14 (7.7) |
| Women | 189 | 27 (14.3) | 142 (75.1) | 20 (10.6) |
| Vis | 279 | 68 (24.4) | 204 (73.1) | 7 (2.5) |
| Men | 121 | 32 (26.5) | 83 (68.6) | 6 (4.9) |
| Women | 158 | 36 (22.8) | 121 (76.6) | 1 (0.6) |
| Total | 3364 | 950 (28.2) | 2152 (64.0) | 262 (7.8) |
| Men | 1571 | 568 (36.2) | 886 (56.4) | 117 (7.4) |
| Women | 1793 | 382 (21.3) | 1266 (70.6) | 145 (8.1) |

* Rest = external causes of death + unknown residence status+ lost to follow-up

TABLE 2
FOLLOW-UP OF SMOKERS (1972 AND 1982) BY REGIONS AND SEX

| REGION | 1972 | | 1982 | |
|------------|------|-------------|------|-------------|
| | N | Smokers (%) | N | Smokers (%) |
| Črnomerec | 651 | 254 (39.0) | 435 | 164 (37.7) |
| Men | 292 | 164 (56.4) | 191 | 90 (47.1) |
| Women | 359 | 90 (25.5) | 244 | 74 (30.3) |
| Centar | 549 | 217 (39.5) | 382 | 137 (35.9) |
| Men | 273 | 141 (51.6) | 183 | 81 (44.3) |
| Women | 276 | 76 (27.7) | 199 | 56 (28.1) |
| Virovitica | 769 | 224 (29.1) | 557 | 142 (25.5) |
| Men | 338 | 207 (61.8) | 230 | 123 (53.5) |
| Women | 431 | 17 (3.9) | 327 | 19 (5.8) |
| Omiš | 745 | 160 (21.5) | 595 | 121 (20.3) |
| Men | 365 | 143 (39.9) | 282 | 103 (36.5) |
| Women | 380 | 17 (4.5) | 313 | 18 (5.8) |
| Split | 371 | 149 (40.2) | 214 | 86 (40.2) |
| Men | 182 | 102 (56.0) | 101 | 45 (44.6) |
| Women | 189 | 47 (25.0) | 113 | 41 (36.3) |
| Vis | 279 | 77 (27.6) | 232 | 69 (29.7) |
| Men | 121 | 65 (54.6) | 103 | 48 (46.6) |
| Women | 158 | 12 (7.8) | 129 | 21 (16.3) |
| Total | 3364 | 1081 (32.1) | 2415 | 719 (29.8) |
| Men | 1571 | 822 (52.8) | 1090 | 490 (45.0) |
| Women | 1793 | 259 (14.6) | 1325 | 229 (17.3) |

mass index, sedative intake (4 categories), adventitious lung sounds (râles), pneumonia in the past, forced expiratory time, electrocardiogram findings, previously suffered myocardial heart attack, ischemic heart disease, other heart diseases, and residence status (Figure 1; Table 3a, Table 4a). Quantity components included age, number of smoked cigarettes per day, forced vital capacity, 100FEV₁/VC, systolic, and diastolic blood pressure (Figure 1; Table 3b; Table 4b). Body mass index (18.5–25), ECG, mortality in Virovitica region, and negative results of described variables was used as baseline values.

Statistical analysis

Data processing included descriptive statistics and survival analysis by Cox regression method with changeable predictors explaining the relative risk of death and 95% confidence limits separately for men and women²⁴. The analyses were performed using SAS 8.0 software (SAS Institute Inc. 2003).

Results

The lowest mortality among women was observed in Split and among men in Split and Vis the highest in Virovitica

TABLE 3
MODEL WITH UNIVARIATE AND MULTIVARIATE RELATIVE RISKS WITH CONFIDENCE LIMITS (BY YEAR OF EXAMINATION) – MEN

| Variable | Men | | Multivariate analysis | | | | Univariate analysis | | | |
|------------------------------------|-------------|------------|-----------------------|---------------|--------|-------|---------------------|---------|---|---|
| | 1972. | 1982. | RR | 95 % CI | P | RR | 95 % CI | P | | |
| | N (%) | N (%) | | | | | | | | |
| a) qualitative variables | | | | | | | | | | |
| Sedatives: | 0.0279 | | | | | | | | | |
| Never | 1321 (84.0) | 572 (52.7) | 1.000 | – | – | – | – | – | – | – |
| Sometimes | 185 (11.9) | 309 (28.5) | 0.869 | (0.687–1.097) | 0.2378 | 1.044 | (0.847–1.286) | 0.6873 | | |
| Regularly a little | 54 (3.5) | 133 (12.3) | 1.397 | (1.041–1.874) | 0.0260 | 1.686 | (1.305–2.178) | <0.0001 | | |
| Regularly a lot | 10 (0.6) | 70 (6.5) | 1.219 | (0.801–1.855) | 0.3542 | 2.004 | (1.422–2.824) | <0.0001 | | |
| Râles | 270 (17.3) | 500 (45.9) | 1.271 | (0.993–1.492) | 0.0579 | 1.747 | (1.476–2.067) | <0.0001 | | |
| Forced expiratory time > 5 seconds | 462 (32.0) | 74 (36.3) | 1.240 | (0.919–1.374) | 0.2557 | 1.748 | (1.468–2.082) | <0.0001 | | |
| Pneumonia | 33 (2.1) | 363 (33.3) | 0.873 | (0.698–1.092) | 0.2336 | 1.186 | (0.972–1.448) | 0.0924 | | |
| Electrocardiogram findings: | 0.0012 | | | | | | | | | |
| o.k. | 1074 (68.9) | 618 (56.8) | 1.000 | – | – | – | – | – | – | – |
| Mainly o.k. | 113 (7.2) | 87 (8.0) | 0.558 | (0.368–0.848) | 0.0062 | 0.643 | (0.431–0.959) | 0.0303 | | |
| Mainly pathologic findings | 233 (15.0) | 160 (14.7) | 1.173 | (0.917–1.501) | 0.2034 | 1.326 | (1.053–1.670) | 0.0165 | | |
| Pathologic findings | 139 (8.9) | 223 (20.5) | 1.327 | (1.047–1.681) | 0.0191 | 1.791 | (1.460–2.196) | <0.0001 | | |
| Right heart ECG signs | 3 (0.3) | 3 (0.3) | 0.399 | (0.917–1.713) | 0.1575 | 2.851 | (1.860–4.372) | <0.0001 | | |
| Chronic ischemic heart disease | 113 (7.2) | 73 (6.7) | 1.253 | (0.918–1.715) | 0.1577 | 1.969 | (1.515–2.559) | <0.0001 | | |
| Others heart diseases | 31 (2.0) | 33 (3.0) | 0.940 | (0.557–1.586) | 0.8172 | 1.372 | (0.878–2.144) | 0.1644 | | |
| Region: | <0.0001 | | | | | | | | | |
| Zagreb Črnomerec | 292 (18.6) | 191 (17.5) | 0.729 | (0.549–0.970) | 0.0299 | 0.673 | (0.529–0.855) | 0.0012 | | |
| Zagreb Centar | 273 (17.4) | 183 (16.8) | 0.598 | (0.435–0.823) | 0.0016 | 0.538 | (0.415–0.696) | <0.0001 | | |

| Variable | Men | | Multivariate analysis | | | | Univariate analysis | | | | | |
|-----------------------------|------------|------------|-----------------------|---------------|---------------|---------|---------------------|---------------|---------|---------------|---------------|---------|
| | 1972. | 1982. | RR | 95 % CI | P | RR | 95 % CI | P | RR | 95 % CI | P | |
| | N (%) | N (%) | | | | | | | | | | |
| Virovitica | 338 (21.5) | 230 (21.1) | 1.000 | – | – | – | – | – | – | – | – | |
| Omiš | 365 (23.2) | 282 (25.9) | 0.640 | (0.491–0.835) | 0.0010 | 0.528 | (0.418–0.668) | <0.0001 | 0.425 | (0.309–0.585) | <0.0001 | |
| Split | 182 (11.6) | 101 (9.3) | 0.462 | (0.330–0.647) | <0.0001 | 0.404 | (0.277–0.590) | <0.0001 | 0.404 | (0.277–0.590) | <0.0001 | |
| Vis | 121 (7.7) | 103 (9.4) | 0.481 | (0.322–0.719) | 0.0004 | 0.404 | (0.277–0.590) | <0.0001 | 0.404 | (0.277–0.590) | <0.0001 | |
| b. Quantitative variables | | | | | | | | | | | | |
| Variables | Men | | Multivariate analysis | | | | Univariate analysis | | | | | |
| | Valid N | X | ± SD | RR | 95 % CI | p | RR | 95 % CI | p | RR | 95 % CI | p |
| Age '72 | 1571 | 47.55 | 5.65 | 1.048 | (1.030–1.066) | <0.0001 | 1.070 | (1.053–1.086) | <0.0001 | 1.070 | (1.053–1.086) | <0.0001 |
| Age '82 | 1571 | 57.55 | 5.65 | | | | | | | | | |
| Body mass index =25 '72 | 1557 | 26.18 | 3.60 | 0.732 | (0.602–0.889) | 0.0031 | 0.695 | (0.583–0.828) | <0.0001 | 0.695 | (0.583–0.828) | <0.0001 |
| Body mass index =25 '82 | 1090 | 27.60 | 3.80 | | | | | | | | | |
| N. Cigarettes/day>0 '72* | 822 | 23.60 | 11.04 | 1.013 | (1.007–1.020) | <0.0001 | 1.014 | (1.009–1.019) | <0.0001 | 1.014 | (1.009–1.019) | <0.0001 |
| N. Cigarettes/day>0 '82* | 490 | 21.83 | 12.16 | | | | | | | | | |
| FVC '72 (dl.) | 1560 | 445.89 | 78.58 | 0.998 | (0.997–0.999) | 0.0002 | 0.996 | (0.995–0.997) | <0.0001 | 0.996 | (0.995–0.997) | <0.0001 |
| FVC '82 (dl.) | 1046 | 365.22 | 85.28 | | | | | | | | | |
| 100FEV ₁ /VC '72 | 1559 | 72.29 | 9.24 | 0.991 | (0.982–0.999) | 0.0349 | 0.978 | (0.971–0.985) | <0.0001 | 0.978 | (0.971–0.985) | <0.0001 |
| 100FEV ₁ /VC '82 | 1046 | 75.85 | 11.09 | | | | | | | | | |
| Systolic BP '72 (mm Hg) | 1561 | 141.11 | 20.29 | 1.009 | (1.004–1.013) | <0.0001 | 1.014 | (1.010–1.017) | <0.0001 | 1.014 | (1.010–1.017) | <0.0001 |
| Systolic BP '82 (mm Hg) | 1090 | 146.56 | 22.11 | | | | | | | | | |

* Only for smokers; Bold = statistically significant RR

TABLE 4
MODEL WITH UNIVARIATE AND MULTIVARIATE RELATIVE RISK WITH CONFIDENCE LIMITS (BY YEAR OF EXAMINATION)—WOMEN

| Variable | Women | | Multivariate analysis | | | | Univariate analysis | | | |
|------------------------------------|-------------|------------|-----------------------|----------------|---------|-------|---------------------|---------|---|---|
| | 1972. | 1982. | RR | 95 % CI | P | RR | 95 % CI | P | | |
| | N (%) | N (%) | | | | | | | | |
| a) Qualitative variables | | | | | | | | | | |
| Sedatives: | | | | | 0.0967 | | | | | |
| Never | 1221 (68.8) | 522 (39.8) | 1.000 | — | — | — | — | — | — | — |
| Sometimes | 442 (24.9) | 488 (37.1) | 0.972 | (0.744–1.709) | 0.8360 | 1.057 | (0.834–1.340) | 0.6468 | | |
| Regularly a little | 100 (5.6) | 221 (16.8) | 1.350 | (0.973–1.873) | 0.0728 | 1.722 | (1.299–2.281) | 0.0002 | | |
| Regularly a lot | 13 (0.7) | 83 (6.3) | 1.478 | (0.929–2.352) | 0.0991 | 2.075 | (1.376–3.129) | 0.0005 | | |
| Râles | 106 (6.0) | 407 (30.7) | 0.874 | (0.663–1.152) | 0.3406 | 1.171 | (0.926–1.480) | 0.1887 | | |
| Forced expiratory time > 5 seconds | 186 (11.6) | 38 (17.6) | 1.109 | (0.808–1.522) | 0.5214 | 1.421 | (1.062–1.900) | 0.0180 | | |
| Pneumonia | 36 (2.0) | 337 (25.4) | 1.133 | (0.855–1.501) | 0.3855 | 1.245 | (0.969–1.601) | 0.0865 | | |
| Electrocardiogram findings: | | | | | 0.0012 | | | | | |
| o.k. | 1138 (64.1) | 663 (50.3) | 1.000 | — | — | — | — | — | — | — |
| Mainly o.k. | 101 (5.7) | 49 (3.7) | 0.813 | (0.423–1.562) | 0.5344 | 0.898 | (0.512–1.577) | 0.7086 | | |
| Mainly pathologic findings | 347 (19.5) | 332 (25.2) | 1.015 | (0.769–1.340) | 0.9152 | 1.215 | (0.945–1.563) | 0.1284 | | |
| Pathologic findings | 190 (10.7) | 275 (20.8) | 1.247 | (0.931–1.670) | 0.1395 | 1.793 | (1.399–2.300) | <0.0001 | | |
| Right heart ECG signs | 1 (0.1) | 4 (0.3) | 3.010 | (0.858–10.565) | 0.0853 | 3.313 | (1.567–7.002) | 0.0017 | | |
| Chronic ischemic heart disease | 258 (14.3) | 66 (5.0) | 1.289 | (0.907–1.832) | 0.1564 | 2.000 | (1.493–2.680) | <0.0001 | | |
| Others heart diseases | 49 (2.8) | 37 (2.8) | 2.219 | (1.400–3.518) | 0.0007 | 2.860 | (1.906–4.291) | <0.0001 | | |
| Region: | | | | | <0.0001 | | | | | |
| Zagreb Ŗrnomerec | 359 (20.0) | 244 (18.4) | 0.739 | (0.508–1.075) | 0.1133 | 0.729 | (0.540–0.985) | 0.0393 | | |
| Zagreb Centar | 276 (15.4) | 199 (15.0) | 0.675 | (0.456–1.000) | 0.0500 | 0.752 | (0.544–1.039) | 0.0841 | | |

| Variable | Women | | Multivariate analysis | | | | Univariate analysis | | | |
|-----------------------------|----------------|----------------|-----------------------|---------------|---------|-------|---------------------|---------|--|--|
| | 1972. N (%) | 1982. N (%) | RR | 95 % CI | P | RR | 95 % CI | P | | |
| Virovitica | 431 (24.0) | 327 (24.7) | 1.000 | – | – | – | – | – | | |
| Omiš | 380 (21.2) | 313 (23.6) | 0.739 | (0.537–1.016) | 0.0622 | 0.810 | (0.609–1.077) | 0.1475 | | |
| Split | 189 (10.5) | 113 (8.5) | 0.541 | (0.345–0.849) | 0.0076 | 0.525 | (0.344–0.801) | 0.0028 | | |
| Vis | 158 (8.8) | 129 (9.7) | 0.768 | (0.512–1.152) | 0.2018 | 0.806 | (0.553–1.176) | 0.2640 | | |
| b) Quantitative variables | | | | | | | | | | |
| Variables | Women | | Multivariate analysis | | | | Univariate analysis | | | |
| | Valid N | X ± SD | RR | 95 % CI | p | RR | 95 % CI | P | | |
| Age '72 | 1792 | 47.73 | 1.106 | (1.081–1.133) | <0.0001 | 1.122 | (1.101–1.145) | <0.0001 | | |
| Age '82 | 1792 | 57.73 | 5.72 | | | | | | | |
| Body mass index =25 '72 | 1777 | 27.80 | 4.54 | | | 0.972 | (0.757–1.248) | 0.8230 | | |
| Body mass index =25 '82 | 1325 | 29.50 | 4.82 | | | | | | | |
| N. Cigarettes/day>0 '72* | 259 | 16.96 | 9.20 | | | 1.011 | (1.002–1.020) | 0.0371 | | |
| N. Cigarettes/day>0 '82* | 229 | 13.93 | 9.79 | | | | | | | |
| FVC '72 (dl.) | 1777 | 320.13 | 58.16 | | | 0.994 | (0.992–0.995) | <0.0001 | | |
| FVC '82 (dl.) | 1233 | 270.93 | 65.69 | | | | | | | |
| 100FEV ₁ /VC '72 | 1777 | 75.14 | 7.88 | | | 0.990 | (0.980–1.000) | 0.0567 | | |
| 100FEV ₁ /VC '82 | 1233 | 76.32 | 10.21 | | | | | | | |
| Systolic BP '72 (mm Hg) | 1777 | 144.60 | 22.02 | | | 1.014 | (1.009–1.018) | <0.0001 | | |
| Systolic BP '82 (mm Hg) | 1325 | 154.91 | 23.20 | | | | | | | |

* Only for smokers; Bold = statistically significant RR

(Table 1). Table 2. presents the analysis of smoking habit related to region and sex. In 1972, there were 52.8% men smokers, and 14.6% women smokers. In 1982, the proportion of men smokers decreased significantly to 45.0%, and the proportion of women smokers increased to 17.3%. The proportion of men smokers in 1972 ranged from 40.0% in Omiš to 61.8% in Virovitica. Ten years later (1982), the proportion of men smokers was still the lowest in Omiš (36.5%) and highest in Virovitica (53.5%) region. There is a noticeable difference between women from urban (Centar, Črnomerec, Split) and rural regions (Virovitica, Omiš, Vis). In 1972, there were more than 25% women smokers from urban areas and less than 8% from rural areas. In 1982, the proportion of women smokers increased and was above 20% in urban and below 8% in rural regions. The exception is Vis where the proportion of women smokers increased from 7.8% to 16.3% between 1972 and 1982.

Table 3 A presents, in sample of men the distribution of qualitative variables and RR for survival. Trends of sedative consumption and frequency of health problems were noticed.

Table 3 B (distribution of quantitative variables, RR for survival in men sample) shows a statistically significant increase in BMI >25, systolic pressure, and a decrease in FVC. Apart from age, BMI, sedative consumption, FVC (decline >0.1 L), 100FEV₁/VC (10% decline), systolic blood pressure (inclination >10 mm Hg), adverse ECG findings, past heart attacks, and the region presented a statistically significant RR in men. In women (Table 4A., 4B.), these risks included (apart from age) systolic pressure >10 mm Hg, adverse ECG findings, history of heart diseases (with the exception of coronary syndrome) and the region.

The analysis showed statistical significance of smoking to survival in men and women. The relation was more obvious in

women. In men, each additional cigarette pack smoked per day increased the death risk by 1.3%. In women each additional cigarette pack smoked per day increased the risk by 2.4%.

Discussion

Results on cigarette smoking habit were described by multivariate Cox regression. Apart from smoking, the model included a set of concomitants explicatory variable. The study points out that the relative risk of death related to smoking habit is more obvious in women, which is in line with the results of similar studies^{25,26}. Study results confirmed that tobacco smoking independently represents one of statistically significant survival risks, as well as included confounders^{27,28}. The relative risk of some confounders resulted insignificantly in the model. We speculate that the reasons for that may be in a relatively low mortality rate, especially in women. We could not analyze specific mortality (e.g. cardiovascular, neoplasm). In the Republic of Croatia, apart from the known tobacco production size (Virovitica region: possible occupational exposure to nicotine = green tobacco sickness), there has been no analysis conducted so far, which would be comprehensible, epidemiological, prospective and age-based cohorts. Neither has been conducted an analysis regarding sex, urban/rural population, and regarding macro-regional or regional location^{29,30}. Mortality in Croatia is higher than in the neighboring western countries^{13,30,31}. Moreover, our multivariable model indicates mortality dissimilarities between urban and rural areas of the country. In rural areas, unfit life and work conditions, diet structure, and incomplete health insurance that had been in function until 1976, could explain these results to some extent. This mostly relates to the survival results in the population of Virovitica and Vis. Besides, population

sample from Virovitica as an inland rural area has the worst morbidity indicators^{11,13}. Higher death risk in women from the region of Vis (in comparison with Split region) is statistically significant. It might be possibly derived that biologically common difference in survival between men and women was missing. We have tried to apply a limited model to imitate actual life conditions. Smoking in our study does not include smoking index, passive smoking or separate data on former smokers in both check-ups and specific mortality rates. The study is limited by incomplete data on specific mortality (e.g. lung neoplasm). They were not included in the multivariate epidemiological model because of small frequencies with specific cause of death in the sample in this follow-up. That type of data analysis could not esti-

mate differences in survival between women and men. The inconvenience of the method is that the model could not solve the relation between statistical interactions and biologic synergism for health indicators. Our results confirm the susceptibility of men and especially women smokers, indicating a necessity to improve prevention of smoking in order to increase a survival. Our report justifies the extension of a prospective study of long-term effects of smoking, and widens compound of explicatory variables on life span, survival and mortality.

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PUŠENJE, SIMPTOMI KRONIČNIH BOLESTI I PREŽIVLJENJE U KONTINENTALNOJ I OBALNOJ POPULACIJI U HRVATSKOJ: DALJNJE ISTRAŽIVANJE

S A Ž E T A K

Cilj istraživanja bio je procijeniti povezanost životnih navika, a posebno navike pušenja cigareta te sklopa pojedinih rezultata jednostavnih liječničkih pregleda s trajanjem dužine životnog vijeka – preživljenjem vodeći računa o kontinentalnoj i primorskoj regiji zemlje ali i različitostima urbanog i ruralnog načina življenja. Istraživanje se temeljilo na podacima dobnog i spolno stratificiranog uzorka opće populacije Hrvatske u dobi od 38–57 g. (1571 muškarac i 1793 žene iz 1972 g., te ponovljenog pregleda 1982 g na ispitanicima koji su se odazvali na ponovni pregled (N= 1090 M; 1325 Ž) /općine: Zagreb – četvrti: Centar i Črnomerec; Split, Omiš, Vis, Virovitica). Od 1985–1999 g. praćen je vitalni status sudionika studije. U razdoblju između pregleda 1972–1982 g. registriran je pad broja pušača cigareta u cjelokupnom uzorku. Uočljiva je razlika u broju žena pušača u urbanim i ruralnim sredinama, te porast navike pušenja u žena. U gradskim sredinama broj pušača cigareta bio je više od 28%, a u ruralnim 6%. U uzorku stanovništva otoka Visa navika pušenja se u tom razdoblju u pučanstvu uvećala sa 7.8 na 16.3%. Nakon univarijatne analize koja je arbitrarno uključila varijable potencijalno povezane s navikom pušenja urađena je multivarijatna analiza postupkom Coxove regresije. U populaciji muškaraca uz dob kao značajni prediktor hazarda preživljenja te dnevne potrošnje cigareta bile su kao eksplikatorne varijable zabilježene BMI, liječenje sedativima, vitalni kapacitet, 100FEV₁/VC, sistolički krvni tlak, elektrokardiografski nalaz, preboljeli srčani infarkt i regija, a najviše pušača zabilježeno je u općini Virovitica. U žena su značajni predkatori rizik preživljenja uz životnu dob i pušenje cigareta bili sistolički krvni tlak, nalaz elektrokardiograma, zabilježene preboljele bolesti srca izuzev infarkta miokrada te regionalna pripadnost. Svaka pupušena kutija cigareta više od one koju su ispitanici iznijeli prilikom medicinskog pregleda uvećava rizik smrti za 2.4% u žena, a 1.3% u muškaraca. U radu se potvrđuje utjecaj navike pušenja cigareta na rizik preživljenja.