

# Knowledge of general medicine students from the medical faculties in Tuzla and Zenica about lung cancer prevention

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## ABSTRACT

**Aim** To assess the level of knowledge about risk factors and prevention of lung cancer among medical students, and to identify differences in knowledge based on the year of study and previous secondary education background.

**Methods** The study was conducted among 223 students of School of Medicine, University of Zenica, and School of Medicine, University Clinical Centre Tuzla using an anonymous online survey via the Google Forms platform. The collected data were analysed using descriptive statistics and the  $\chi^2$  test to assess statistical significance.

**Results** The majority of students identified smoking as the main risk factor for lung cancer, while air pollution was rated as the most overlooked risk factor. There were significant differences in the perception of neglected risk factors between years of study ( $p < 0.05$ ). Most students from Zenica acquire their knowledge through formal education, while students from Tuzla more often rely on the internet and media ( $p < 0.05$ ). Additionally, 82.5% of students believe that passive smoking is equally harmful as active smoking, with no significant differences between the groups.

**Conclusion** Medical students demonstrate a good level of awareness regarding risk factors and prevention of lung cancer; however, there is a need for greater emphasis on environmental risks and passive smoking in their education. The results highlight the importance of continuous education to ensure that future healthcare professionals are equipped to effectively promote health and prevent this disease.

**Keywords:** air pollution, health knowledge, attitudes, practice, lung neoplasms / prevention & control, medical students, smoking

## INTRODUCTION

Insufficient prevention, increasingly widespread air pollution, and smoking as the main cause of lung cancer are the reasons for the rising incidence of lung cancer. An estimated 2.48 million new cases of lung cancer occurred worldwide in 2022 (1). Prevention and early detection of lung cancer remain challenging (2).

Smoking is the leading risk factor for lung cancer, accounting for approximately 90% of all cases. A person who smokes one pack of cigarettes per day has a 20 times higher risk of developing lung cancer compared to a non-smoker (3). Age, sex, and heredity also play a major role in the development of this disease (4). It is estimated that quitting smoking after a lung cancer diagnosis improves 5-year survival by approximately 35%. Passive smoking causes preventable mortality and morbidity (3). Prevention strategies to reduce cigarette smoking in public places should be part of public health policy (5).

Approximately 10-15% of lung cancers in Western countries occur in people who have never smoked (6). These cancers are explained by other occupational and environmental risk factors, such as passive smoking, radon exposure, air pollution, and genetic factors (7).

Between 9% and 15% of diagnosed lung cancers in men and about 5% in females can be attributed to inhalation of carcinogenic agents at work. According to the Francis Crick Institute and University College London, funded by Cancer Research UK, particles commonly found in vehicle exhaust and fossil fuel smoke are associated with the risk of non-small cell lung cancer (NSCLC), which accounts for over 250,000 lung cancer deaths globally each year (8).

Lung cancer incidence is stagnating or slightly decreasing in men, but increasing in women, which is linked to higher smoking prevalence among women (9). Higher cancer mortality is linked to higher smoking prevalence, as well as better or worse access to health insurance, possibilities for early diagnosis, and therapeutic options (10).

According to the British Thoracic Society (BTS) smoking cessation report, only 28% of smokers wanted to quit, and only 6% of them received advice on how to do so (11). Almost 90% of smokers aged 15 or older registered with general practitioners had records of offered support or treatment (1).

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Education on lung cancer prevention and early detection is of great importance, especially among medical students. Through education and future professional work, they can raise public awareness about the importance of lung cancer prevention, thus enabling earlier diagnosis (4).

Despite the growing burden of this disease (9), there is a noticeable lack of studies examining the level of knowledge and awareness about lung cancer prevention among future healthcare professionals in Bosnia and Herzegovina (B&H). To the best of our knowledge, no previous research of this kind has been conducted in B&H. The decision to focus on medical students stems from their dual role – as individuals who must adopt healthy lifestyle habits themselves and as future physicians responsible for educating patients and promoting preventive health behaviours. By identifying knowledge gaps and attitudes toward lung cancer prevention, the findings of this research can serve as a foundation for improving the medical curriculum, designing targeted educational interventions, and strengthening public health strategies aimed at reducing the burden of lung cancer in the population.

The aim of this study was to investigate the level of awareness about risk factors and lung cancer prevention among medical students of two medical faculties to determine possible differences in knowledge about lung cancer prevention among students who completed medical high school, general high school (gymnasium), or other types of secondary education, and to assess medical awareness of the importance of eliminating risk factors and preventing lung cancer in relation to their lifestyle.

## MATERIALS AND METHODS

### Participants and study design

This prospective, descriptive, and epidemiological investigation aimed at assessing the level of knowledge and awareness about lung cancer prevention among medical students.

The inclusion criterion for participants was enrolment in the general medicine study program at School of Medicine, University of Zenica, and School of Medicine at the University Clinical Centre in Tuzla (B&H). All students were invited to participate voluntarily. The exclusion criterion was refusal to participate in the study. In total, 223 students from the two faculties participated in the study. The sample included students born between 1994 and 2004, representing different academic years of the study. Participation was entirely voluntary and anonymous, and each respondent was informed about the purpose of the research before completing the questionnaire.

### Methods

Data collection was carried out using a structured questionnaire distributed through the Google Forms platform. The online survey was available for completion in the areas of Zenica and Tuzla from 31 March 2023 to 7 April 2023.

The questionnaire consisted of two main sections: sociodemographic data including variables such as age, sex, faculty, and year of study, and knowledge and awareness of lung cancer prevention, with questions designed to assess students' understanding of risk factors, prevention strategies, and early detection methods.

The instrument was self-administered and designed to ensure confidentiality and ease access for participants. Data were au-

tomatically collected through an online form and exported for statistical analysis.

### Statistical analysis

Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize sociodemographic characteristics and knowledge levels. Crosstabulation analyses were conducted to examine potential associations between variables such as sex, year of study, and knowledge scores. For data visualization, graphs and tables were generated using Microsoft Excel to facilitate the interpretation of findings and to illustrate trends within the dataset. Value of  $p < 0.05$  was considered statistically significant.

## RESULTS

A total of 223 students were surveyed: 126 (56.5%) from School of Medicine in Zenica and 97 (43.5%) from School of Medicine in Tuzla; 151 (67.7%) were females and 72 (32.3%) were males. The distribution by year of study was as follows: 36 (16.1%) first-year students, 55 (24.7%) second-year students, 28 (12.6%) third-year, 26 (11.7%) fourth-year, 46 (20.6%) fifth-year, and 32 (14.3%) sixth-year students.

The largest percentage of respondents had previously completed medical high school 125 (56.1%), followed by those who attended a general high school 85 (38.1%), and those who completed another type of secondary school 13 (5.8%).

The highest percentage of medical students in Zenica and Tuzla who felt they had received adequate education on lung cancer prevention through their current studies was among students in higher years, particularly the fifth and sixth years. This trend was more pronounced among students from Tuzla. In total, 29.1% of respondents indicated the fifth year as the period in which they received sufficient education, while the lowest percentage of such responses came from first-year students (8.2%) ( $p > 0.05$ ). Additionally, a higher prevalence of students from Zenica (53.2%) reported feeling adequately educated than those from Tuzla (44.3%) ( $p > 0.05$ ).

The highest number of students came from medical high schools (56.1%), followed by general high schools (38%), while 13 students (5.8%) came from other types of secondary schools. The highest perceived level of education was among students from general high schools (51.8%), and the lowest among those from other secondary schools (46.2%), without statistical significance ( $p > 0.05$ ) (Table 1).

**Table 1. Perception of the level of education in relation to the previously completed secondary school**

| Previously completed secondary school | No (%) of students with self-assessed adequacy of education on lung cancer prevention |              | Total |
|---------------------------------------|---------------------------------------------------------------------------------------|--------------|-------|
|                                       | Adequate                                                                              | Not adequate |       |
| Medical high school                   | 61 (48.8)                                                                             | 64 (51.2)    | 125   |
| General high schools                  | 44 (51.8)                                                                             | 41 (48.2)    | 85    |
| Other types of secondary schools      | 6 (46.2)                                                                              | 7 (53.8)     | 13    |
| <b>Total</b>                          | 111 (49.8)                                                                            | 112 (50.2)   | 223   |

Out of the 223 students, a higher prevalence of male (54.2%) than female (47.7%) students felt they were adequately educated, with no statistically significant difference ( $p > 0.05$ ) (Table 2).

**Table 2. Perception of the level of education in relation to sex**

| Sex          | No (%) of students with self-assessed adequacy of education on lung cancer prevention |              | Total |
|--------------|---------------------------------------------------------------------------------------|--------------|-------|
|              | Adequate                                                                              | Not adequate |       |
|              | Female                                                                                | 72 (47.7)    |       |
| Male         | 39 (54.2)                                                                             | 33 (45.8)    | 72    |
| <b>Total</b> | 111 (49.8)                                                                            | 112 (50.2)   | 223   |

The proportion of students who stated that they “do not consider themselves smokers but occasionally smoke” was highest in the second and third years (21.8% and 21.4%, respectively), which may indicate transitional phases in smoking behaviour ( $p < 0.01$ ) (Table 3).

**Table 3. Smoking status of students in relation to the year of study**

| Year of study | No (%) of students with smoking status |            |               |                                    | Total |
|---------------|----------------------------------------|------------|---------------|------------------------------------|-------|
|               | Smoker                                 | Non-smoker | Former smoker | Non-smokers but occasionally smoke |       |
| First         | 9 (25)                                 | 24 (66.7)  | 2 (5.6)       | 1 (2.8)                            | 36    |
| Second        | 3 (5.5)                                | 37 (67.3)  | 3 (5.5)       | 12 (21.8)                          | 55    |
| Third         | 3 (10.7)                               | 16 (57.1)  | 3 (10.7)      | 6 (21.4)                           | 28    |
| Fourth        | 8 (30.8)                               | 13 (50)    | 3 (11.5)      | 2 (7.7)                            | 26    |
| Fifth         | 7 (15.2)                               | 35 (76.1)  | 2 (4.3)       | 2 (4.3)                            | 46    |
| Sixth         | 8 (25)                                 | 20 (62.5)  | 4 (12.5)      | 0                                  | 32    |
| <b>Total</b>  | 38 (17)                                | 145 (65)   | 17 (7.6)      | 23 (10.3)                          | 223   |

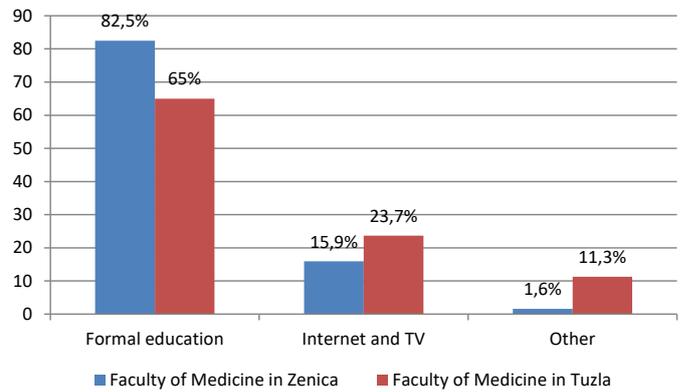
The year of study significantly affected the perception of neglected factors: students from different years did not equally perceive the importance of smoking (by years of study, it ranges from 12.5-47.2%), diet (11.5-25.5%), pollution (17.9-50%), genetics (0-26.9%), or other overlooked risk factors ( $p < 0.05$ ) (Table 4).

**Table 4. Students’ views on the neglect of risk factors**

| Year of study | No (%) of students about the most neglected risk factors |           |               |           |                      | Total |
|---------------|----------------------------------------------------------|-----------|---------------|-----------|----------------------|-------|
|               | Smoking                                                  | Diet      | Air pollution | Genetics  | No neglected factors |       |
| First         | 17 (47.2)                                                | 5 (13.9)  | 11 (30.6)     | 0         | 3 (8.3)              | 36    |
| Second        | 10 (18.2)                                                | 14 (25.5) | 16 (29.1)     | 6 (10.9)  | 9 (16.4)             | 55    |
| Third         | 7 (25)                                                   | 4 (14.3)  | 5 (17.9)      | 6 (21.4)  | 6 (21.4)             | 28    |
| Fourth        | 7 (26.9)                                                 | 3 (11.5)  | 7 (26.9)      | 7 (26.9)  | 2 (7.7)              | 26    |
| Fifth         | 11 (23.9)                                                | 10 (21.7) | 18 (39.1)     | 3 (6.5)   | 4 (8.7)              | 46    |
| Sixth         | 4 (12.5)                                                 | 5 (15.6)  | 16 (50)       | 5 (15.6)  | 2 (6.3)              | 32    |
| <b>Total</b>  | 56 (25.1)                                                | 41 (18.4) | 73 (32.7)     | 27 (12.1) | 26 (11.7)            | 223   |

A statistically significant difference in the method of acquiring knowledge about lung cancer prevention between students from School of Medicine in Zenica and those in Tuzla was found ( $p < 0.05$ ) (Figure 1).

The majority of students (82.5%) believe that passive smoking is equally harmful as active smoking, while 17.5% consider passive smoking to be less harmful. The highest proportion of students who perceive passive smoking as equally harmful is recorded in the second (85.5%) and sixth year (87.5%) of studying with no statistically significant difference.



**Figure 1. Students’ knowledge about risk factors and prevention of lung cancer according to the method of acquiring knowledge**

**DISCUSSION**

The results of our study showed that the majority of students possess a basic understanding of risk factors, particularly smoking and air pollution, which is consistent with findings from other similar studies (12). Similarly, a study from Malaysia found 93% of respondents were aware of lung cancer and all identified smoking as the main risk factor. This high level of awareness may be the result of effective public health campaigns and prevention programs in Malaysia (13). Our findings align with these results, especially in terms of recognizing smoking as a key risk factor, identified by 100% of our participants.

Passive smoking was recognized as a serious health risk by 82.5% of respondents, which is in line with similar research (14). However, a proportion of respondents still considered passive smoking to be less harmful, indicating the need for additional educational efforts. In a study from India, only 35.6% of participants were aware of secondhand smoke, and only 23.3% were aware of thirdhand smoke (14). Secondhand smoke is a recognized public health concern with high exposure rates, which aligns with our finding that medical students acknowledge passive smoking as an important, yet often overlooked risk factor for lung cancer (15).

Air pollution was identified as the most neglected risk factor by the majority of our respondents (32.7%), which corresponds with other studies emphasizing the importance of environmental factors in the development of lung cancer (16). This suggests that medical students are becoming increasingly aware of less obvious risk factors, likely due to the progression of their education during years of study (17).

Our study also showed a statistically significant difference in students’ perceptions across different years of studying regarding the neglect of certain risk factors. This is expected, as senior students – with more clinical experience and theoretical knowledge – tend to have a broader perspective on the complexity of risk factors and lung cancer prevention (18,19).

In our study, a diet was recognized as a neglected risk factor, which is significant as it points to a potential need to incorporate dietary advice into lung cancer prevention programs. Our students demonstrated relatively greater awareness of the importance of nutrition comparing with some other studies where only 31.5% of respondents believed certain dietary habits could be a risk factor (16). Reportedly, a significant negative correlation between Mediterranean diet patterns and the risk of lung cancer in the general population was found (20). The findings from the UK Biobank study, which included 416,588 participants, confirmed that diet plays a significant role in in-

fluencing lung cancer risk (21). Lifestyle modification should include changing eating habits based on a healthy diet, which may be an additional factor in reducing the risk of developing cancer (22).

In our study, students in higher years, especially fifth- and sixth-year students, most often reported receiving adequate education on lung cancer prevention, which is in line with other studies (23).

In our study, a slightly higher percentage of male students than female students felt adequately educated about lung cancer prevention, which is consistent with previous findings (24), although the knowledge about cancer risk factors among medical students remains suboptimal across both sexes (25).

This study is limited to two medical faculties, which may restrict the generalizability of the findings, and the use of a questionnaire may reflect subjective perceptions rather than actual knowledge or behaviour. Also, the cross-sectional design precludes any inference of causality, and potential response and recall biases may have influenced the results. Finally, the relatively small sample size may reduce statistical power and limit the possibility of detailed subgroup analyses.

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- In conclusion, this study provides the first systematic assessment of medical students' knowledge of lung cancer prevention in Bosnia and Herzegovina, incorporating comparisons across secondary education types and exploring students' perceptions of lifestyle- and environment-related determinants. These findings offer novel, context-specific evidence that can support curriculum enhancement and inform local public health strategies. Despite acceptable overall knowledge, gaps in awareness of passive smoking and environmental risks highlight the need for more targeted and continuous educational activities. As future healthcare providers, medical students will play a key role in health promotion and prevention, underscoring the importance of strengthening cancer prevention topics early in medical education.

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## TRANSPARENCY DECLARATION

Conflicts of interest: None to declare.

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