ABSTRACT

Aim To investigate an association of auditory lifestyle and risk behaviours with hearing loss and to identify the leading hearing problems among college students in Serbia exposed to loud music.

Methods The participants of the study comprised 780 college students of the High Medical School of Professional Studies of Belgrade (653 females and 127 males), the majority of whom were between 19 to 24 years of age. A cross sectional study was conducted in order to investigate the association between exposure to noise in one’s leisure time and subsequent hearing problems using a self-reporting questionnaire.

Results A total of 640 (82.1%) of students had a habit of listening to loud music, 421 (65.8%) experienced tinnitus and 79 (10.1%) had a subjective feeling of hearing loss. The most significant association between self-reported hearing loss was living in noisy environments (p=0.000), and the appearance of difficulties (vertigo, anxiety) (p=0.000), as well as usage of personal music devices (p=0.087).

Conclusion While students who were exposed to loud sound levels may still not have shown serious hearing problems or hearing loss, a great number did experience tinnitus or some other difficulties after listening to music at loud volumes.

Key words: young people, loud music, life style, hearing loss.
INTRODUCTION

Noise has become a growing environmental problem in today’s western society and has an important role to play in the development of general hearing health problems (1). Noise-induced hearing loss represents the most frequently occurring preventable disability and can be caused by occupational or recreational sources (2). Furthermore, hearing loss is the most frequently recorded communication handicap, restricting several aspects in one’s quality of life (3).

Many leisure activities may prove risky or dangerous to one’s hearing: visiting dance clubs, using personal listening devices (MP3 or other media players), and attending concerts, among others (1). Young people are particularly likely to expose themselves to potentially damaging loud sounds. A number of studies have been recently published on the auditory effects of music exposure at dance clubs and rock concerts (4-7). Moreover, with the massive and widespread rise in the popularity of portable MP3 players, exposure to high sound levels has also increased dramatically (8). Several studies have reported increasing numbers of adolescents and young adults suffering from symptoms such as distortion, tinnitus, hyperacusis, or other threshold shifts (2,6,9,10). Some studies have considered exposure to harmfully loud sounds through personal music systems or other leisure activities to be likely associated with a lack of knowledge about the potential harmful effects of the exposure to excessively loud sounds (6).

Hearing loss among young people caused by recreational sources represents a significant public health issue. Many previous studies (1-10) have been published, but there was no research about life styles and hearing issues among college students in Serbia. This study was made to investigate the auditory risk behaviours and hearing issues among young people. The data of this research may be relevant for the researches in the future and to public health experts and health policy creators as well, in order to keep up to date with current research and to create adequate health policy and programs related to this issue.

In this regard, the objective of the study was to label the non-healthy life style and risk behaviors among college students in Serbia, which are frequently related to hearing problems.

EXAMINEES AND METHODS

A cross-sectional study was conducted on 780 students of the High Medical School of Professional Studies of Belgrade during the six-month period, from October to December 2012. A self-reporting questionnaire was created to target college students who had auditory risk behaviour associated with such health issues, in accordance with those used in similar studies (1,6). The survey was designed to address key demographic data (sex, age group, living environment), and to subsequently address lifestyle and auditory risk behaviours (exposure to high level music, frequent use of personal devices, visiting disco clubs and other high volume music environments), as well as hearing problems (tinnitus after listening to music at high volumes, hearing loss and other difficulties-vertigo, anxiety) among students. Questions were related to the habit of smoking and consuming alcoholic drinks, occasionally or on a daily basis (11,12) and practicing any kind of sports activities (13,14) referred to as “yes” or “no”. The respondents group comprised both male, 127 (16.3%) and female college students, 653 (83.7%), mean age 22.74±4.52 years. The director of the High Medical School of Professional Studies of Belgrade gave the written approval for this research.

Descriptive statistics was used with a purpose of prevalence determination. In addition, different parameters were compared by exploratory analysis. The cross tabulation method and χ²-square test were used to examine the relation between qualitative variables. Fisher’s exact test was used to examine the significance of the association (contingency) between the two kinds of classification. The strength of presence or absence of an event in a given population was quantified by the Odds Ratio (OR) and Relative Risk (RR) was used as the ratio of the probability of an event occurring in an exposed group. Multivariate binary logistic regression analysis (Method Forward Stepwise Conditional) was used to predict a binary response from independent predictors. The level of statistical significance was defined as p<0.05.
RESULTS

The majority of respondents, 499 (64.0%) grew up in a noisy environment and at the time of the research lived in a noisy environment. Six hundred and ninety three (88.8%) lived in an urban area, and conversely, only 87 (11.2%) of the participants lived in a rural area. A total number of 297 (38.1%) students, from both groups, were of the opinion that they lived in a noisy neighbourhood. A total number of 640 (82.1%) students wilfully exposed themselves to potentially harmful, loud music, and 204 (26.2%) respondents reported habitual use of personal listening devices. Majority of students, 488 (80.4%) visited disco clubs and other places that offer loud music at least once a week, where 284 (46.7%) of them usually spent 2-3 hours. In such noisy environments, 154 (25.3%) students spent over 3 hours (Table 1).

Table 1. Lifestyle and auditory risk factors of students

<table>
<thead>
<tr>
<th>Life style and auditory risk factors</th>
<th>Number (%) of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to high level music</td>
<td>640 (82.1)</td>
</tr>
<tr>
<td>Frequent use of personal media devices</td>
<td>204 (26.2)</td>
</tr>
<tr>
<td>Visiting disco clubs and other high volume music environments</td>
<td>609 (78.1)</td>
</tr>
<tr>
<td>Time spent at places that offer loud music:</td>
<td></td>
</tr>
<tr>
<td>1-2 hours</td>
<td>170 (28.0)</td>
</tr>
<tr>
<td>2-3 hours</td>
<td>284 (46.7)</td>
</tr>
<tr>
<td>More than 3 hours</td>
<td>154 (25.3)</td>
</tr>
<tr>
<td>Frequency of visiting clubs and other places with high volume music:</td>
<td></td>
</tr>
<tr>
<td>Once a week</td>
<td>488 (80.4)</td>
</tr>
<tr>
<td>2-3 times a week</td>
<td>115 (18.9)</td>
</tr>
<tr>
<td>Every day</td>
<td>4 (0.7)</td>
</tr>
<tr>
<td>Smoking</td>
<td>261 (33.5)</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>312 (40.0)</td>
</tr>
<tr>
<td>Sports activities</td>
<td>185 (23.7)</td>
</tr>
<tr>
<td>Previous head injuries</td>
<td>60 (7.7)</td>
</tr>
<tr>
<td>Previous ear disease</td>
<td>76 (9.7)</td>
</tr>
</tbody>
</table>

For majority of cases who reported tinnitus, 303 (72.0%), it ceased quickly. In 106 (25.2%) cases tinnitus was reported to last for 1-2 hours, while in 11 (2.6%) respondents it was reported to last one day. In addition to tinnitus, 33 (6.1%) students experienced some other difficulties, such as vertigo, anxiety, reduced attention span and bad memory. From all students who were participants in this survey, 79 (10.1%) reported subjective feeling of hearing loss (Table 2).

The prevalence of self-reported hearing loss among students who lived in noisy environments was 45 (57.0%) (p=0.000). Significantly more students with self-reported tinnitus visited noisy places once a week, 337 (83.6%), while 64 (15.9%) students went to such places 2-3 times a week and only two (0.5%) of them did so daily. This is comparable with those students, 27 (93.1%), who reported other difficulties in addition to tinnitus and visit to noisy places one per week.

However, 16 (48.5%) students who suffered from some other hearing problems in addition to tinnitus habitually listened to music with personal listening devices (p=0.087). Moreover, 29 (87.9%) students who suffered from hearing problems in addition to tinnitus had visited disco clubs and concerts, and 13 (44.8%) of whom spent over three hours there (p=0.000), when visiting such noisy environments.

The most significant association between self-reported hearing loss among college students was found to be living in noisy environments (p=0.000) and the appearance of difficulties such as vertigo, anxiety, reduction of one’s attention span and bad memory (p=0.000) and use of personal music devices (p=0.087) as well.

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The majority of students, 24 (75.0%), who experienced other difficulties in addition to tinnitus were 19–24 years of age. Students older than 30 years of age, 59 (7.6%), were visiting disco clubs significantly less (p<0.001) than their colleagues in the age up to 30 years. Furthermore, they listened to loud music significantly less than their younger colleagues (p<0.001) and were using significantly less some personal media devices (p=0.001).

The Mantel-Haenszel Common Odds Ratio Estimation was determined as OR=6.0 (p=0.000) and the Relative Risk for hearing loss, if additional hearing difficulties had already been experienced, was RR=4.9 (95% CI 2.5 – 9.5). This sensitivity is found to decrease with age (Figure 1) (p=0.018).
According to the results of the Multivariate Binary Logistic Regression Analysis, the following variables for category of the subjective sensation of hearing loss were found to be most influential: exposure to high level music (OR=28.76; p=0.000), visiting disco clubs and other high volume music environments (OR=3.364; p=0.026), previous ear disease (OR=5.94; p=0.000) and living in noisy environments (OR=3.263; p=0.000). Nagelkerke R square for presented analyses was 0.430. A confusion matrix (15), done by Multivariate Binary Logistic Regression Analysis, which contains information about actual and predicted classification, was 721 (92.4%).

### DISCUSSION

Music-induced hearing loss is a preventable public health issue that has gained more importance as a health concern in recent years, because of episodic acoustic trauma exposure at public concerts and clubs and extended private exposure from the widespread usage of personal MP3 players (16). Adolescents and young adults are often exposed to potentially damaging loud music during leisure activities (17). The growing exposure of young people to environmental noise and loud music has generated interest in studies on the impact of such exposure, as well as the measures taken in these situations (1). A majority of studies have indicated the increase in the number of young people who suffer from symptoms of hearing impairment (10-13, 18-20). For example, Chung and others have shown that 61% of young people who attend concerts or visit clubs or parties that feature loud music reported experiencing tinnitus or temporary hearing impairment (6), which is comparable with our results, where 65.8% of students commonly report tinnitus. Similar results were obtained in the second MTV survey, involving 2500 young adults, mean age 21.7 years, where the most experienced (77%) ear problem was tinnitus (16). In another survey, approximately 89.5% of the students had experienced transient tinnitus after loud music exposure (17). However, according to our results, significantly more students with self-reported tinnitus visit noisy places once a week (83.6%) and this situation could be an indication that individuals who suffer from certain hearing problems try to avoid places that feature loud music. In 72.0% of cases, tinnitus ceases quickly, in 25.2% of cases it lasts 1-2 hours and in just 2.6% of cases it lasts one day. Slightly different results were presented by Holmes and others (19), where 13.5% of respondents reported prolonged tinnitus.

With the massive growth in popularity of portable MP3 players, exposure to high noise levels has increased dramatically, and millions of young people are potentially putting themselves at risk for permanent hearing loss every time they listen to their favourite music (21). It has been found by Vogel et al that the greater general risk of some hearing problems occur in young people who use personal listening devices (MP3/Media players), more than in young people who visit dance clubs or attend rock concerts (8). Vogel also noted that the prevention of personal media player induced hearing loss should be managed through health protection measures, and making manufacturers of personal listening devices and governmental authorities equally responsible for the prevention of hearing loss among young people as they themselves and their parents are. Nevertheless, our results indicate that 26.2% of respondents use some of personal listening devices and 48.5% of them suffer from tinnitus, or some other hearing problems. Further, McNeill and others evaluated a potential risk to hearing associated with the use of portable digital audio players. Significant
differences in MP3 user listening patterns were found between respondents who had experienced tinnitus and those who had not (22).

This study has shown that a majority of college students was exposed to high sound levels during their usual leisure activities and that more than half of them have reported to suffer from tinnitus. Furthermore, the presented results indicate that younger individuals who are exposed to high sound levels during their leisure activities, including the use of personal stereo systems or media devices and visiting disco clubs, do not suffer from serious hearing problems or hearing loss, except tinnitus and some other difficulties. Also, our results indicate that the most important risk factors associated with self-reported hearing problems among college students were living in noisy environment, visiting disco clubs and other high volume music environments, frequent use of personal media devices and spending over three hours at places that offer loud music.

Moreover, it has to be noted, according to previous research, that the analysis indicated a significant correlation between perceived hearing loss and respondent’s overall attitudes towards noise exposure (19). According to all presented above, introducing adequate preventive programs related to hearing problems among college students in Serbia is needed. Some of potential preventive measures and strategies have already been proposed by some other authors in previous research and could be applicable in this situation as well. For example, the volume of portable music players could be reduced effectively with visual warming prompts or a modeling technique (23). Intention to wear earplugs increased when young people were made aware of the potential for permanent hearing loss when encouraged by medical professionals (6,24), and when earplugs were provided free at the door of disco clubs (9,25). Some other authors concluded that young people considered hearing loss to be an important health concern when they had received education about such loss (6).

In conclusion, in order to prevent music-induced hearing loss in youth, awareness into determinants and further theory-based research on the association of young people’s hearing protection behavior during their leisure activities is needed. As visits to disco clubs proved to be among the significant risk behaviours, the need for sound level limitations in disco clubs and similar environments is emphasized. In addition, in order to achieve long lasting behavioral changes in adolescents’ listening habits, preventive strategies must be considered at more levels than just at the individual and modifiable risk factors need to be addressed. Certain screening activities associated to risk of hearing loss, which would be included in systematic physical examination of college students, should be proposed.

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The authors declare no conflict of interest to be present in this study.

REFERENCES


Uticaj stila života na pojavu problema sa sluhom kod studenata u Srbiji

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SAŽETAK

Cilj Ispitati vezu životnog stila i rizičnog ponašanja s gubitkom sluha, te odrediti vodeće probleme sa sluhom nakon slušanja glasne muzike, u populaciji studenata u Srbiji.

Metode Istraživanjem je obuhvaćeno 780 studenata Visoke zdravstvene strukovne škole u Beogradu, 653 ženskog i 127 muškog pola, od kojih je većina pripadala starosnoj grupi od 19 do 24 godine. Studija preseka sprovedena je kako bi se istražila veza između neprofesionalnog izlaganja buci u svakodnevnim aktivnostima mladih i pojave problema sa sluhom, pomoću upitnika koji je dizajniran tako da bi se de-finisali studenti s rizičnim ponašanjem koji su imali problem sa sluhom.

Rezultati Naviku slušanja glasne muzike imalo je 640 (82.1%) studenata. Prisutnost osećaja zujanja u ušima, nakon slušanja glasne muzike, zabilježena je kod 421 (65.8%) studenta, dok je 79 (10.1%) njih izjavilo da ima osećaj gubitka sluha. Za oštećenje sluha kao značajni su se pokazali duži izlaganja buci u svakodnevnim aktivnostima mladih i pojave problema sa sluhom, pomoću upitnika koji je dizajniran tako da bi se de-finisali studenti s rizičnim ponašanjem koji su imali problem sa sluhom.

Zaključak Iako se kod većine studenata koji slušaju glasnu muziku još uvek nisu mogli uočiti ozbiljni poremećaji ili gubitak sluha, većina njih, nakon izlaganja dejstvu glasne muzike, iskusila je zujanje ili neka druga subjektivna tegoba.

Ključne reči: mladi, glasna muzika, životni stil, gubitak sluha