

# Awareness of musicians on ear protection and tinnitus: A preliminary study

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## Abstract

Music induced hearing loss (MIHL) is linked to chronic, extended exposure, and progress at a rate proportionate to exposure conditions. The aim was to document hearing deterioration; awareness of ear protection devices (EPDs); presence of tinnitus, measurement of temporary threshold shift. Thirty-four musicians filled a questionnaire regarding: years of experience, instrument/splayed, hours of music exposure per week with/without amplification, through earphones and speakers, use of EPDs and tinnitus. Hearing screening in five subjects was done before and after one hour and ten minutes of practice session. Among the participants, 8.8% reported hearing deterioration subjectively and 38.2% reported unilateral intermittent tinnitus, 79.4% lacked awareness about EPDs and 21.6 % were aware but never used them. Mean for temporary threshold shift at 500 Hz and 1 KHz was 5dB HL and 10dBHL at 2 KHz. Musicians are at risk for hearing problems, but the awareness on auditory damage is limited, hence conservative measures must be taken for their well being.

## Introduction

Professional musicians spend varied amount of time practicing, playing solo and as a member of different groups, as well as

enjoying the music of others. Studies have reported that classical musicians play an average of 25 hours per week but this could vary widely from the types of music played, their duration from week to week, and also from musician to musician.<sup>1</sup> The Occupational Safety and Health Administration (OSHA) begins to enact sound safety regulations when the noise exposure is 85 (A) dB since harmful sound exposure begins at an 85 dB (A) average over an eight-hour work day. Sound levels were measured during live concerts and practice sessions and varied from 102.5 dB (A) to 106 dB (A), which exceeds the safety limits.<sup>2</sup> The term music-induced hearing loss (MIHL) is linked to chronic, extended exposure, and progress at a rate proportionate to exposure conditions.<sup>3</sup> Apart from music induced hearing loss, musicians also reported of tinnitus, hyperacusis and diplacusis. Since musicians are fully dependent on their hearing for their livelihood, changes in auditory function cause a dramatic alteration in their livelihood. Although musicians are at risk for hearing loss, tinnitus, hyperacusis and diplacusis, studies suggest that musicians are less concerned regarding these issues. A high amount of practice hours is also a risk factor for the incidence of hearing problems.<sup>4</sup> Hearing loss can affect the ability to maintain livelihood of musicians and there is strong evidence to support the notion that musicians are at risk for damage to the auditory system from noise/music exposure.<sup>5</sup>

## Need and objectives of the study

Research shows that musicians frequently experience hearing loss and tinnitus and are more susceptible to develop tinnitus than an average individual. In India, the awareness of the effects of loud music on hearing is itself restricted which lessens the use of ear protective devices. This further increases the risks for the incidence of hearing problems in musicians. The main objectives were to document: any deterioration in their hearing sensitivity, awareness and use of EPDs among musicians, tinnitus in musicians and measurement of temporary threshold shift (TTS) in musicians after practice session.

## Materials and Methods

### Participants: inclusion and exclusion criteria

Group A comprised of 36 musicians in the age range of 20-35 years (mean age of 27.8 years) and Group B comprised of 34 non-musicians (mean age was 27.2 years). Musicians who played at least one musical instrument were included in the study. Those

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Key words: Musicians; music induced hearing loss; tinnitus; ear protection devices.

See online Appendix for additional material.

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who had additional exposure to noise at work or home setting and those with hearing related complaints since childhood were excluded from the study. Two subjects in group A were excluded from the study based on the exclusion criteria.

## Method

The study was carried out in two phases: i) development and administration of questionnaire; ii) measurement of temporary threshold shift (TTS).

### Phase I: Development and administration of questionnaire

In phase I, a questionnaire was developed and administered to group A and Group B. The questions were predominantly closed ended to sustain the interest of the participant and for the ease of completion. Apart from the demographic details, the following information were obtained using the questionnaire: year in which the musician started playing the instrument, the type of instrument played [Guitar (Lead/Acoustic), Piano, Drums or others], number of years of experience as a musician, hours of music exposure with/without amplification per week, hours of exposure to music through ear phones and speakers per week, musician's preference of music in terms of loudness. Other questions included were regarding awareness and use of EPDs, deterioration of hearing sensitivity, type and nature of tinnitus, impact of tinnitus on music perception. Data was also obtained to confirm auditory dysfunction related only to music exposure (see Appendix).

### Phase II: Measurement of temporary threshold shift

In Phase II, five participants who were involved in playing different music genres such as rock, hip-hop, pop and classical music were included. Among them, three played stringed instruments, one played the drums and the other played the Keyboard. These participants filled the questionnaire and were screened using an Elkon (Graphic Classic one) screening audiometer. in a sound treated room where the practice session was conducted. After a daily listening check was made, hearing thresholds were measured at 500Hz, 1 KHz and 2 KHz before and after a practice session

(one hour and ten minutes) with amplified music and temporary threshold shift (TTS) were measured.

## Results

In group A, 8.8% reported deterioration of hearing sensitivity subjectively and also of intermittent high frequency tinnitus. All of these participants had more than eight years of experience, and had used earphones to listen to music for four hours a week and preferred listening to loud music (except for one). In the present study, 38.2% of all the musicians reported of tinnitus and all of them had been a musician for more than eight years. Among those who reported of tinnitus, 7.7% of them practiced with amplification for more than eight hours a week (Figure 1) and used earphones for about two hours a week to listen to music. It was also found that 30.8% of the tinnitus sufferers listened to music through speakers for more than eight hours a week (Figure 2). In the control group, tinnitus was reported in 5.8% of them and none of them reported any other symptoms of auditory dysfunction. 3 participants used earphones for more than 8 hours a week 5 participants preferred to listen to loud music.

In group A, 79.4% reported that they were not aware of ear protective devices (EPDs). Among the remaining participants, 21.6 % of those who were aware reported that they never used them as they could not access the devices and also agreed that they were unaware of its vital importance in hearing conservation.

Each musician played at least one instrument in each of the three categories. Guitar - Lead/acoustic, Piano, Drums and were asked to specify if any other additional instruments were played. The distribution is shown in Figure 3.

## Discussion

### Deterioration in hearing sensitivity and tinnitus

The present study was a preliminary effort to document subjective reports of hearing deterioration and tinnitus in musicians, their awareness and use of EPDs and measurement of temporary thresh-

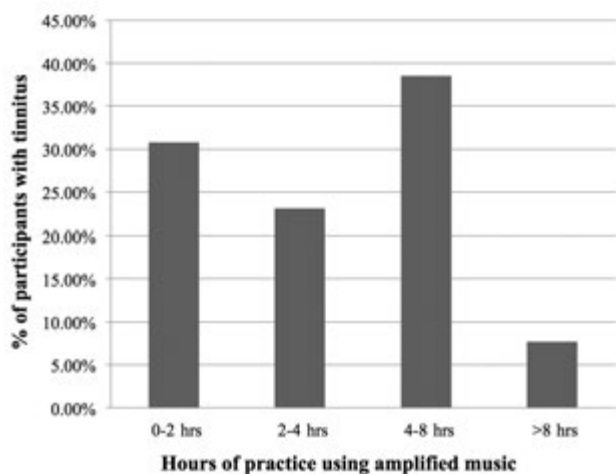


Figure 1. Percentage of participants with tinnitus and hours of practice using amplified music.

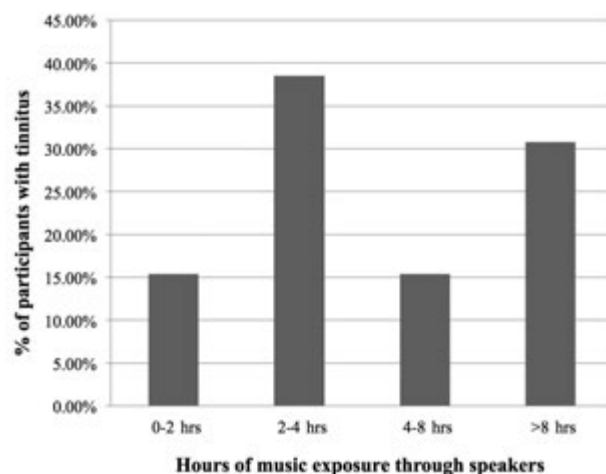


Figure 2. Percentage of participants with tinnitus and hours of music exposure through speakers.

old shifts following a practice session. In the study, 8.8% of musicians who reported hearing deterioration and tinnitus in left ear had more than eight years of experience. The present finding indicates a positive relationship between the years of experience as a professional musician and its detrimental effects on the hearing system. Similar findings have been reported by Dana *et al.*<sup>6</sup> in which a positive correlation has been found between the extent of exposure to amplified music and hearing thresholds at 3-6 kHz. Greater the years of experience as a professional pop/rock/jazz musician, poorer the hearing thresholds due to exposure to amplified music. In addition to the years of experience, hours of music exposure per week has been found to have greater effect in predicting hearing loss in both ears. Ralli *et al.*<sup>7</sup> reported significant differences between subjects with respect to gender, auditory threshold and tinnitus laterality. Subjects who were employed in jobs with a high risk of noise exposure were mostly males and reported poorer hearing threshold mostly in the left ear; tinnitus was mostly bilateral, followed by left-sided, and described as buzzing or high-pitched.

In the present study, 38.2% of all the musicians reported of tinnitus and all of them had been a musician for more than eight years. No difficulty in music perception was reported, as it was intermittent. One of the subjects reported the occurrence of tinnitus after every show, which usually disappears after some hours. This shows that the longer they have been musician, the more likely they are to have tinnitus. In the control group, tinnitus was reported in 5.8% of them and none of them reported any other symptoms of auditory dysfunction. In a study done by Pouryaghoub *et al.*,<sup>8</sup> among musicians with a minimum of 5 years of experience, 50% of participants reported experiencing tinnitus after a performance and 28% had ear pain during the performance. In total, 56% of the subjects had experienced one of these symptoms during or after the performance. A higher risk of NIHL was observed in musicians who had experienced acute symptoms of exposure to loud noise (tinnitus or ear pain). This finding highlights the importance of preventive measures in individuals with similar experiences.

Studies done in western population have shown that that 39% of all the musicians suffer from tinnitus<sup>2</sup> and most often localized to the left ear. 24% of professional orchestra musicians reported of tinnitus for at least 5 minutes in duration and half of them reported experiencing constant tinnitus.<sup>9</sup> Findings by Kahari *et al.*<sup>10</sup> and Gribbins<sup>2</sup> have reported tinnitus in 45% and 39% of musicians respectively.<sup>2</sup> In the current study, musicians reported tinnitus in the left ear. Khalifa *et al.*<sup>11</sup> have proposed an explanation regarding the higher susceptibility of left ear to auditory damage in the peripheral hearing mechanism due to noise exposure. This finding could be attributed to the fact that Outer Hair Cell (OHC) motility in middle frequencies of left ear when compared to right ear are strongly attenuated by nerve fibers within the efferent nerve system. When the left ear OHCs are less functional, fibers within the Medial Olivary Complex (MOC) compensate, and may become more functional, especially in mid-range frequencies. This phenomenon increases with human development and affects middle frequencies of the left ear only, resulting in the left ear being more susceptible to auditory dysfunction and tinnitus.

Study reported by Birgit Mazurek<sup>12</sup> did not find any statistically significant differences in the hearing loss between the left and the right sides but found that left-sided tinnitus more distressing than the right-sided one, which could be attributed to neuro-anatomic differences between the left and right parts of the auditory system.

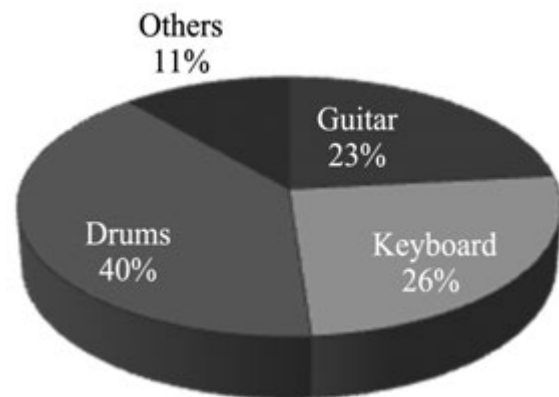
Risk factors for auditory dysfunction includes the type of music played, type of instruments, position in the orchestra or on stage, years of career experience and playing in acoustically unsuitable venues. Musicians located near percussion instruments

(e.g., drums) and brass instruments (e.g., trumpet, trombone), as well as those located near amplifiers, tend to have higher exposures.

In the present study, 70% of musicians were not aware of EPDs and the remaining participants never used them as they did not know where to purchase the EPDs from and its importance in hearing conservation. Similar findings have been reported in college music students where 74% of them were aware of noise and its effect on hearing but none of them reported wearing EPDs all the time. Only 22% of them reported use of ear protection devices when exposed to potentially harmful sound levels.<sup>9</sup> Similar results were found in other studies in which 95% reported no use of EPDs while performing in concerts, 85% never used EPDs during rehearsals, and 64% never used EPDs in other environments, such as when attending rock concerts and using lawn mowers.<sup>13</sup> Only 20% of musicians found hearing protectors acceptable. It is also found that musicians do not wear hearing protection continuously, and many use hearing protection in one ear only. It is reported to be time consuming to get used to hearing protection for most of the musicians. These findings suggest that awareness regarding EPDs were reported to be significantly better in the Western population, when compared to the present group in Indian scenario. The importance of using these devices could be brought into practice only by educating this population about the hazardous effects of noise exposure. The acceptance of hearing protectors and the change in attitude towards hearing conservation among musicians should be of prime importance in the process of creating awareness. Hence more education is needed for the acceptance of hearing protectors and to change the attitudes towards hearing conservation among musicians.<sup>7</sup> Hoffman *et al.*, 2006<sup>14</sup> investigated the use of hearing protectors among percussionists. Better hearing thresholds were found among those who had used hearing protection (foam plugs).

Although most of the subjects seemed aware of the risk, only few had taken preventive measures against hearing loss.<sup>15</sup> O'Brien *et al.*<sup>16</sup> evaluated 367 orchestra musicians and found that only 64% of the participants had occasionally used Ear Protective Devices during their performance. In a study reported by Luszczynska *et al.*<sup>17</sup> 14% of the participants had experienced using personal protective devices when exposed to loud noise and about 30% were aware of the potential risks and intended to use personal protective devices in the future.

This clearly shows that when the awareness of the individual is better, there is a greater chance for using some form of EPD. Hence the present study highlights the importance of educating musicians



**Figure 3. Distribution of types of instruments played by the musicians.**

regarding exposure to loud music and its detrimental effects on the hearing system.

### Limitations of the study

In phase II, the noise level during the practice session was subjectively reported by the Audiologists and objective measures were not obtained.

TTS was not measured at 4 KHz which is a major drawback as higher frequencies are more affected due to noise exposure.

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