

# NOISE EXPOSURE AND NIHL IN DAY CARE CENTER TEACHERS

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**Introduction** There are only few studies about noise exposure at work other than at industrial plants. In Japan the noise exposure of day care center teachers was found round 86 dB<sub>L<sub>Aeq</sub></sub> during workday. This was the highest of all measurements made among workers of several line of activities such as office workers, service and sales workers, skilled workers, drivers, professionals and engineers. (Kono et al 1982) In Canada noise exposure levels in day care centers was found to be from 72 to 80 dB<sub>L<sub>Aeq</sub>8 h</sub>. (Truchon-Gagnon et al 1987) It has been shown (Sala 2001, 2002) that noise levels at day care centers are too high for speech communication. It has also been suspected that noise exposure at day care centers might be high enough to cause hearing loss and tinnitus.

At the time of planing the study in Denmark there rose a suspicion that noise exposure in day care centers may be so high that it may cause hearing loss and tinnitus. The suspicion aroused because of some patients in audiological clinic suffering from tinnitus and high frequency hearing loss were working at day care centers. Later, after detailed analysis, this suspicion of occupational noise as a cause of hearing loss and tinnitus, could not be confirmed. (Nilsson 1998) I spite of this finding, in the project charting prevalence of voice disorders among day care center teachers and related risk factors (Sala 2001, 2002), it was estimated that also noise exposure and hearing sensitivity of workers should be studied systematically to rule out or find out the risk for noise induced hearing loss (NIHL).

**Purpose of the study** was to measure the noise exposure levels at day care centers if they exceed 85 dB(L<sub>Aeq</sub>, 8h) and to measure hearing threshold levels of day care personnel if they have even minimal signs of noise induced hearing loss compared to a control group of nurses. In addition tinnitus symptoms were inquired to find out if this symptom occur as a sign of noise exposure more often among day care workers than among a control group.

**Materials and methods** The participants were day care center teachers working in 26 different day care centers (Sala et al 2001, 2002). Hearing sensitivity was measured in 191 day care center teachers and noise exposure in 51 day care center teachers. The participants were between 23 and 56 years old, the average age being 38 (±7.8). 93% of the teachers had been working in day care centers for more than 5 years. 7% of the teachers had been working in day care centers from 1 to 5 years, 28% from 5 to 10 years, 42% from 10 to 20 years and 23% over 20 years.

Hospital female nurses served as the control group. They were randomly selected from the population of nurses working at the Turku University Central Hospital, and were the same persons who took part in previous studies (Sala et al 2001, 2002). Hearing sensitivity was measured in 121 nurses and noise exposure in 25 nurses. The nurses were between 29 and 58 years old, the average age being 43 (±8.0). 99% of the nurses had been working in a hospital for more than 5 years, somewhat longer than the day care center teachers [ $\chi^2(3)=20.3$ ,  $p<0.001$ ]. The length of the career of nurses (n=109) was from 1 to 5 years in 1%, from 5 to 10

years in 15%, from 10 to 20 years in 43% and over 20 years in 42%. Nobody had shooting as a hobby, but information of detailed noise exposure during lifetime in off duty hours from work in day care center is lacking.

Noise exposure was measured according to ISO-1999 standard. The measurement was performed using noise analyzer (Larson-Davis Noise Badge 705). The microphone of the equipment measuring noise exposure located on the left shoulder of the participants. The lowest limit of measurement capacity was 62-65 dB. The measurement period of teachers was  $6.7 \pm 0.7$  and nurses  $5.8 \pm 0.3$  hours while the duration of one working day was 8 hours.

An ENT-specialist performed otoscopy before hearing measurement to rule out obstruction of ear canal by cerumen or ear diseases. Hearing thresholds were measured in sound-proof booths according to the criteria given in ISO 8253-1 (1989) and the audiometers were calibrated according to ISO 389 (1985) and ISO 7566 (1987).

**Results** Mean noise exposure level of teachers ( $n=51$ ) was  $75 \pm 3$  dBL<sub>Aeq</sub> (min 71 and max 84 dBL<sub>Aeq</sub>) and nurses ( $n=14$ )  $69 \pm 2$  dBL<sub>Aeq</sub> (min 67, max 71 dBL<sub>Aeq</sub>). Noise exposure was measured in 25 nurses, but in only 14 nurses the measures exceeded the lower limit of the measurement capacity (65 dB). In day care centers noise exposure did not reach the level (85 dB), which is adopted as risk for noise induced hearing loss in several countries but in two persons the noise exposure level was higher than 80 dB(L<sub>Aeq</sub>).

Hearing threshold level was normal (20 dB or lower) at all frequencies from 0.25 to 8 kHz in 69% of teachers and 56% of nurses. Nurses had somewhat more pathological findings (threshold >20 dB) in pure tone hearing threshold levels at 3 and 4 kHz than day care center teachers whereas at 6 kHz this was vice versa. At this frequency teachers had from two to three times more frequently pathological findings than nurses did, which was statistically highly significant. This difference predominates in the thresholds of the left ear.

In this study, dip or audiometric notch is defined as a finding in which hearing threshold is  $\geq 10$  dB higher at 4 kHz than at 3 kHz combined with at least 5 dB lower threshold at 6 kHz than at 4 kHz. There was no statistically significant difference in frequency of dip-findings in audiograms of day care center teachers and nurses.

**Discussion** In this study we did not find evidence of the connection between noise exposure and NIHL among day care center teachers although the career of most subjects was over 10 years. The noise exposure during one workday of two out of 191 teachers was found to be over 80 dB. It seems that the risk for NIHL is minimal and only one among several factors affecting hearing thresholds at high frequencies. Another study design and/or bigger population in the study might have given minimum increments in the risk of hearing loss in day care centers.

**Keywords:** Noise induced hearing loss, noise exposure level, A-weighted equivalent continuous sound level, day care center teacher, nurse, day care center, hospital

## References

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