BRITISH ACOUSTICAL SOCIETY

OCCUPATIONAL HEARING LOSS
23-25 March 1970

70/37

OCCUPATIONAL HEARING LOSS AND THE OTOLOGIST

by

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Occupational hearing loss has attracted increasing attention in recent years.

The practising otologist obtains a somewhat biased view concerning this disease. He sees mainly the more advanced cases of noise-induced deafness, together with those unduly susceptible to noise.

From a practical point of view, what is the incidence of this condition in present-day industrial civilization? To what extent does it prove a handicap in daily life? What relationship does it bear to other types of deafness in the community?

An attempt to answer these questions has been made by studying patients with occupational hearing loss seen over a 5 year period. The relationship between this kind of hearing loss is examined in the context of patients with deafness of other varieties attending the ear, nose and throat department of a teaching hospital serving a large and populous industrial area.

INDUSTRIAL BACKGROUND. Within a radius of 25 miles of the Manchester Royal Infirmary, dwells a population of 4½ million. Contained inside the boundaries of its 2 largest cities, Manchester and Salford, are approximately 7,800 factories and workshops. Placed more peripherally are numerous Lancashire cotton towns still retaining many traditional spinning and weaving mills.

THE POTENTIAL 'AT-RISK' POPULATION. Of an estimated total of 412,825 employees in the principal industries, the number in the main occupations considered 'at-risk' from industrial noise exposure are:

ENGINEERING AND ELECTRICAL	-	39,930
BUILDING CONSTRUCTION	-	24,972
TEXTILE INDUSTRY	-	11,976
METAL MANUFACTURE	-	10,961
TIMBER, FURNITURE	-	4,907
MINING	-	2,145

Adding to this figure of 94,891 those engaged in smaller noisy industrial processes, it will be seen that one quarter of the working population labour in industrial noise environments potentially hazardous to hearing.

TYPE OF HEARING LOSS. 238 patients were examined. 215 showed industrial noise-induced hearing loss; 23, incidents of acute acoustic trauma.

RELATIONSHIP OF OCCUPATIONAL HEARING LOSS TO OTHER TYPES OF DEAFNESS.

During the past year, 438 new patients with deafness were seen. 269 had a conductive hearing loss; 169 were perceptive. Of the latter, 48 were considered occupational in origin. The effects of noise therefore accounted for approximately 8% of all cases of deafness.

DIAGNOSTIC CRITERIA. Diagnosis of "industrial noise-induced hearing loss" was arrived at in accordance with the recommendations of Burns and Robinson (1968). They state "the absence of any clear-cut diagnostic aid to the identification of permanent noise-induced threshold shift in individual cases forces one to fall back on a series of probabilities, based on such direct evidence as the audiogram, evidence which may be slightly less secure such as the supposed noise history, and fairly indirect evidence such as may be elicited by otoscopic and otological examination."

In the present investigation, other causes of sensori-neural deafness were excluded as far as possible by radiological, serological and other examinations. 16% of occupational hearing loss cases had additional ear pathology.

OCCUPATIONS INVOLVED. The commonest occupations in which hearing losses occurred and the number in each group were:

ENGINEERING	52	SHEET METAL WORKERS	8
MILITARY SERVICE	38	MACHINISTS	7
DIESEL ENGINEERS	21	PRINTERS	7
WEAVERS	21	CIRCULAR SAW OPERATORS	6
BOILER-MAKERS	17	RIVETERS	5
SPINNERS	15	DRILLERS	4

Note the preponderance of industries associated with intermittent and high-intensity impulsive noise, as opposed to continuous steady-state noise.

SEX-INCIDENCE. Males predominated, 202 subjects, the remaining 36 being female. The latter were all engaged in some aspect of the textile industry, weaving, spinning or as machinists.

AGE DISTRIBUTION. Other workers have postulated that:

1. During the course of employment in a noise-hazardous environment, it takes 10 to 15 years for an initial Temporary Threshold Shift to become an established Permanent Threshold Shift. (Glorig and Davis, 1961).

2. Individuals may be unaware of a noise-induced threshold shift in early life. This may only constitute a disability when the effects of presbycusis are added later. (Burns, 1968).

3. This disability appears at an earlier age than would be expected as the result of presbycusis alone. (Hinchcliffe, 1959).

4. Noise-free populations retain good hearing even late in life. (Rosen et al., 1962, 1964).

These findings receive confirmation from the following table - the age at which treatment for symptoms associated with occupational hearing loss was sought.

AGE IN YEARS	NUMBER OF CASES
UNDER 20	1
20-30	14
30-40	35
40-50	65
50-60	72
60-70	42
70-80	9

Few cases present during the 15 years after leaving school - the one teenager suffered an acute acoustic accident. Most appear between 40 and 60, but an appreciable rise in numbers occurs from the age of 30 onwards.

SYMPTOMS.

DEAFNESS - 90% attended because of deafness. Pure-tone audiometry demonstrated a high-tone loss involving the speech frequency range. In these, the V-shaped notch at 4KHz, characteristic of acoustic trauma, had widened to encroach on the lower frequencies. A threshold shift of at least 30 Dbs was present at 2KHz. In some cases the IKHz and 500 Hz frequencies were also involved.

TINNITUS Subjective tinnitus occurred in some 30%. Sometimes this was the only symptom, the patient frequently being unaware of deafness. This hearing loss was frequently confined to a dip at 4KHz.

UNSTEADINESS Some disturbance of balance was reported by approximately 20%. Caloric testing often produced normal reactions.

Patients frequently noticed symptoms only on changing from one noisy occupation to another, or from a noisy job to a quiet one.

COMMENT. There are few more depressing or unrewarding patients than those with permanent occupational hearing loss. In the present state of medical knowledge, once the diagnosis is established, little can be done to alleviate matters. The answer lies in the realms of preventive medicine. The education of management and

employees alike and the institution of Hearing Conservation Programmes along lines too well known to be repeated here, should be vigorously pursued.

Finally, the suggestion is made that audiometry performed on school-leavers during their final year at school would prove an extremely valuable base-line, particularly for future entrants into industry or the armed forces. This would provide a useful reference level for any future hearing tests, especially if some method of recording the results in permanent form on a national basis could be devised.

SUMMARY.

1. 8% of all clinic cases of deafness in an industrial area were of occupational origin.
2. Diagnosis was by exclusion, based on assessment of history, noise-exposure, audiometry and clinical examination, etc.
3. Industries with steady-state noise environments appeared less damaging to hearing than those with high-intensity impulsive components.
4. Up to 15 years elapse before TTS becomes an established PTS.
5. Noise-induced threshold shifts may only amount to a disability when the effect of presbycusis is added.
6. This disability tends to occur earlier than that caused by presbycusis alone.
7. The value of final school year, pre-employment, audiometry is suggested.

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