Passive Smoking and Middle Ear Effusions in Children of British Servicemen in West Germany – A Point Prevalence Survey by Clinics of Outpatient Attendance

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SUMMARY: Three hundred and twenty eight children of British servicemen serving in West Germany were studied in order to ascertain any relationship between parental smoking and the presence of middle ear effusion. The age range of the children was 18 months to 8 years.

A questionnaire was completed by the parents of each child, and clinical examination and audiological tests demonstrated the presence or otherwise of middle ear effusions. One hundred and sixty four patients who had been referred with otological symptoms to the Ear, Nose and Throat Out Patient Department (ENT OPD) were surveyed, as were 164 other patients drawn from the Paediatric, Orthopaedic and Ophthalmic Out Patient Departments (OPDs) at BMH Rinteln. These 2 groups had similar age and sex distributions.

The presence of middle ear effusions amongst children attending the ENT OPD was strongly associated with maternal cigarette smoking. This finding implies that mothers should not smoke at all in the same living accommodation as that used by their children. Paternal cigarette smoking showed no significant association with the presence of middle ear effusions.

“...recognise that the life of a soldier, in peace and war, is one that inevitably attracts resort to tobacco as an antidote to boredom and stress; and better tobacco, I suppose than abuse of drugs of any kind” – Lord Carver(1).

Introduction

Chronic middle ear effusions (commonly called ‘Glue Ear’) are the most frequent cause of paediatric surgical admissions to hospital(2). At BMH Rinteln a total of 320 such cases was admitted for myringotomy and grommet insertions under general anaesthesia during 1988. Children referred to this BMH by their family general practitioners provided a discrete group suitable for study; and as previous surveys performed elsewhere(3) have shown, 80% of children have experienced at least one episode of otitis media with effusion by the time they are 5 years old. A point prevalence survey of this condition amongst such patients seemed likely, therefore, to demonstrate statistical trends of interest to all concerned with the family health of BFG personnel.

Numerous reports to date have demonstrated a positive statistical link between passive exposure to parental cigarette smoke and an increased rate of middle ear effusions in young children(3-6). Although there has been much speculation about the cause of middle ear effusions in children, no one factor or series of factors has been shown to be present in all cases(7). In this regard allergy, virus infections, eustachian tube malfunction and/or obstruction by adenoids and abuse of antibiotics have all been investigated, with statistically insignificant correlations being found(7).

With this background and with the permission of the consultants concerned a point prevalence survey was performed.

Patients and Methods

We surveyed a total of 328 children between 18 months and 8 years of age. One hundred and sixty four of these presented at the ENT OPD clinic at BMH Rinteln with a history in all cases of recurrent otalgia and deafness, and 164 others (matched for sex and age within 3 months) presented with other complaints at the Paediatric, Ophthalmology and Orthopaedic clinics of the same hospital during the summer of 1988.

The patients of each child completed an anonymous questionnaire which asked the age, sex, sibling order and birthweight of the patient. Details of the length of time that the child was breastfed as well as the presence or absence of asthma, eczema and allergy were also elicited, together with the number of ear infections suffered to date.

Maternal and paternal smoking, in terms of cigarettes smoked per day, was measured on a five point scale between 0 and 40+ cigarettes per day. Cigar smoking

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and amounts of pipe tobacco smoked by each parent were measured, as well as whether or not a conscious effort was made by the parents to avoid smoking close to their children. Household smoking was defined as at least one parent smoking.

The results of otoscopy (and tympanometry if necessary) were also recorded, as were the results of myringotomy if performed.

We tested the null hypothesis (by clinic of attendance) that there is no association between any of these factors and the presence of middle ear effusions. Our most significant finding was a strong association between any degree of maternal cigarette smoking and the presence of middle ear effusions amongst the children attending the ENT OPD clinic (Chi² = 8.395 with 1 df significant at 0.01 level).

Results
As expected, an overwhelming majority of the ENT OPD patients demonstrated middle ear effusions at the time of presentation. One hundred and forty of these patients out of a total of 164 were shown to have effusions compared with 77 out of a total of 164 from the paediatric OPD group.

The most significant statistical association from our results was that between any degree of maternal cigarette smoking and the attendance of a child at the ENT OPD. Eighty four out of a total of 164 mothers of children attending the ENT OPD smoked, compared with only 58 out of a similar total of children attending the Paediatric OPD (Table 1), giving maternal non-smoking totals of 80 and 106 respectively.

Hence Odds Ratio (OR) = 84/58 ÷ 80/106 = 1.918

Standard Error (SE) = √logₑ OR = 0.2260

For 95% confidence interval

\[ W = SE - \left( N \times SE \right) \]
\[ X = SE + \left( N \times SE \right) \]

where N = standard normal distribution value for the 95th percentile(8).

\[ W = 0.2083 \]
\[ X = 1.09043 \]

Hence 95% confidence interval for the population.

Value of OR

\[ e^{0.2083} \text{ to } e^{1.0943} \]

ie 1.23 to 2.99

Paternal smokers were 90 and 77 in number for the ENT OPD and Paediatric OPD clinic patients respectively (Table 2). Similarly, household smokers numbered 115 for the ENT OPD and 95 for the Paediatric OPD patients.

No significant association was found between paternal or household smoking and attendance at ENT OPD.

Similarly no association was found between the presence or absence of breast feeding or the presence of allergy and the attendance at ENT OPD.

The number of ear infections suffered to date was not significantly associated with the presence of middle ear effusions in either group, nor was there any correlation between the relative numbers of cigarettes smoked (as measured on the 5 point scale between 0 and 40+ cigarettes per day) and attendance at ENT OPD.

No significant association was found between the numbers of smoking parents who made a conscious effort to avoid smoking close to their children and attendance at ENT OPD.

The numbers of parents who smoked cigars or pipes only were too small for a meaningful analysis to be performed.

Discussion
The presence of middle ear effusions which required referral to the ENT OPD in the population of children studied was strongly associated with maternal cigarette smoking. The price of this extra morbidity is obvious in terms of delayed speech development and extra hospital admissions for myringotomy operations.

Strachan et al(6) in their study of 732 children concluded that approximately one third of such cases of middle ear effusions were statistically attributable to exposure to cigarette smoke; if this were also to be the case in our study a reduction of 30% in the occurrence of such middle ear effusions could be expected.

### Table 1

<table>
<thead>
<tr>
<th>Effects of Maternal Smoking</th>
<th>ENT OPD Patients</th>
<th>Paediatric OPD Patients</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Smokers</td>
<td>84</td>
<td>58</td>
<td>142</td>
</tr>
<tr>
<td>Maternal Non-smokers</td>
<td>80</td>
<td>106</td>
<td>186</td>
</tr>
<tr>
<td>Totals</td>
<td>164</td>
<td>164</td>
<td>328</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Effects of Paternal Smoking</th>
<th>ENT OPD Patients</th>
<th>Paediatric OPD Patients</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paternal Smokers</td>
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<td>77</td>
<td>167</td>
</tr>
<tr>
<td>Paternal Non-smokers</td>
<td>74</td>
<td>87</td>
<td>161</td>
</tr>
<tr>
<td>Totals</td>
<td>164</td>
<td>164</td>
<td>328</td>
</tr>
</tbody>
</table>
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case amongst the 320 children admitted to BMH Rinteln for myringotomies during 1988, then the potential for reducing OPD and theatre waiting lists is clear.

Several ways have been suggested in which passive exposure to tobacco smoke predisposes to the development of middle ear effusions through alteration of the milieu of a child's upper respiratory system, of which the middle ear is considered to be a part.

These include(3):

a. A direct irritative effect of tobacco smoke on the mucosa of the middle ear and the eustachian tube.

b. A direct irritative effect of tobacco smoke on adenoid tissue, histamine release from which could lead to middle ear effusion.

c. A direct irritative effect of tobacco smoke on the child's respiratory epithelium in general, leading to more frequent respiratory tract infections, which in turn are associated with an increased incidence of middle ear effusions.

d. Increased rates of cross infection amongst the children of smokers, consequent upon the increased rates of respiratory tract infections found in smokers per se.

We therefore recommend that mothers should not smoke in the same living accommodation as that used by their children.

Paternal smoking showed no significant association with the presence of middle ear effusions in either group, presumably on the basis that the servicemen's commitments away from home (eg military exercises and unaccompanied postings) minimized their children's exposure to paternal cigarette smoke.

A similar explanation would account for the statistically insignificant association between household smoking (ie at least one parent smoking) and the presence of middle ear effusions in either group.

The lack of correlation between the presence of middle ear effusions and either the presence of allergy or the absence of breast feeding is consistent with the findings of previous studies(7).

A larger prospective study utilising multiple logistical regression would undoubtedly provide data of much interest to all involved with the health care of families in BFG. Strachan's(6) work in correlating salivary cotinine concentrations with the presence of middle ear effusions in passively smoking children relied on a simple biochemical measure of exposure to tobacco smoke which could be easily performed in Service hospital laboratories.

Finally, the Froggatt Report(9) has already given due warning of the health hazards which may be faced in the long term by passive smokers. This paper demonstrates that avoidable morbidity which often necessitates general anaesthesia and surgery for its resolution, is caused in the short term as well.

Acknowledgements:
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REFERENCES


