PRACTICE OBSERVED

Practice Research

Use of a questionnaire in general practice to increase the recognition of patients with excessive alcohol consumption

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Abstract

A self-administered questionnaire, the health survey questionnaire, was designed to detect excessive alcohol consumption and mailed to patients who were registered with two general practices. Replies were received from 2571 (75%) of 3452 patients. Excessive consumption was taken as 42 units of alcohol per week or more for men and 21 units per week or more for women. 1 unit = approximately 10 g ethanol and is equivalent to a half pint of beer, one glass of wine, or one standard measure of spirits. One hundred and twenty men (11%) and 68 women (5%) were identified by their responses to the questionnaire as excessive drinkers. According to their responses, roughly half of these expressed some concern about their drinking. In the practice where a disease register was kept 18 patients had been recorded as heavy drinkers before the study, and an additional 74 were detected by the questionnaire.

Within 12 months after the questionnaire survey three groups of respondents were reviewed: (a) the excessive drinkers, (b) those who indicated concern about drinking but did not exceed the limits for excessive consumption, and (c) a random sample of those who were in neither of these two categories. Patients in these three groups were interviewed in a standard fashion to determine their alcohol consumption. Breath alcohol measurement was also carried out and a blood sample taken for the

estimation of mean cell volume, γ glutamyltranspeptidase activity, and serum aspartate transaminase activity.

There were highly significant correlations between estimates of consumption obtained by the questionnaire and those obtained at interview except among the women who were excessive consumers, whose responses to the questionnaire indicated levels of consumption that were much higher than those to which they admitted at interview. Stated weekly consumption at interview that was above the limits set for the study was used as the standard measure for comparing the questionnaire with the other indicators of excessive drinking. The questionnaire had a considerably greater estimated sensitivity in detecting male excessive consumers than any of the blood tests. Among the women it apparently performed less well, although the numbers stating excessive consumption at interview were small. Breath alcohol measurement was positive in only a few of the excessive drinkers.

The use of this simple and inexpensive instrument is likely to provide widely acceptable to patients in general practice and should result in a considerable increase in the recognition by general practitioners of patients with excessive alcohol consumption.

Introduction

Alcohol consumption has been rising since the second world war in the United Kingdom and many other countries (at least until the late 1970s) and has been accompanied by a parallel increase in associated morbidity and mortality.¹ It has been suggested that preventive measures should be taken to halt this trend.² General practitioners are well placed to take preventive action as they generally see some 70% of their patients each year and at least 90% over a three year period,³ but there is evidence that they may fail to detect many of the excessive drinkers in their care.⁴ This may be due not only to lack of skills in early detection but also to the limited sensitivity and

COMPARISON OF RESPONSE TO QUESTIONNAIRE WITH STANDARD INTERVIEW, BREATH ALCOHOL MEASUREMENT, AND BLOOD TESTS

Completed questionnaires were returned by 2477 patients within six months of the original mailing. Of these, 354 patients were classified as positive responders and were invited to attend for interview and blood tests. Thirteen had died or changed address in the intervening period and, of the remainder, 203 (60%) attended within 12 months of the original mailing. The attendance rate was similar among the random sample of patients who were not classified as positive responders to the questionnaire who were also invited to attend. The mean ages for the patients in the excessive consumption, concern only, and control groups were 45.2, 46.3, and 46.3 years respectively for the men and 44.3, 39.1, and 43.2 years respectively for the women. There was a highly significant association (Spearman's rank correlation coefficient: 0.71 for men and 0.67 for women overall) between the estimates of weekly consumption obtained by the questionnaire and those obtained at interview.

Significant correlations were found within all groups except the female excessive consumers in whom the median value obtained at interview was considerably lower (table 1). Among the men the correlation seemed to be

stronger in the controls than in the heavier drinkers. The laboratory indicators of excessive consumption were raised above the limits of normal in only small proportions (less than 40% in all cases) of the patients in the questionnaire excessive consumption and concern only categories, whereas up to 16% of the controls had results above the normal range (table 1). A similar pattern was evident for patients who were classified as excessive consumers from their interview (table III).

The estimated sensitivity and specificity of the questionnaire and laboratory tests were calculated using exact binomial tests with the standard measure. The cut off points for the laboratory tests were the same as those shown in tables II and III. For the questionnaire both excessive consumption and concern only categories were taken as positive responses. To obtain estimates of the sensitivity and specificity of the different measures in the whole population the findings in the sample who attended the interview and blood tests were weighted according to the proportion of patients in each questionnaire category who attended (table IV).

For the men the questionnaire had considerably higher sensitivity than any of the tests and comparable specificity. For the women, of whom the numbers who attended to excessive consumption at interview were small, the questionnaire apparently performed less well. The mean cell volume was

TABLE I—Reported weekly consumption at interview by questionnaire category

Questionnaire category	No. at interview	Mean cell volume (ml)	Mean γ -GT (U/L)	Mean AST (U/L)	Mean cell volume (ml)	Mean γ -GT (U/L)	Mean AST (U/L)
Excessive consumption	62	49.0	42.0	14	42.0	14	14
Concern only	71	47.0	42.0	14	42.0	14	14
Controls	194	47.0	42.0	14	42.0	14	14
Excessive consumption	52	49.0	42.0	14	42.0	14	14
Concern only	68	47.0	42.0	14	42.0	14	14
Controls	117	47.0	42.0	14	42.0	14	14

*Men: 42 units a week or more; women: 21 units a week or more.
†p compared with proportion of excessive drinkers in control group.

TABLE II—Comparison of laboratory tests with reported consumption at interview

Questionnaire category	Mean cell volume			Mean γ -GT			Mean AST		
	No. at interview	Median (IQR)	Range	No. at interview	Median (IQR)	Range	No. at interview	Median (IQR)	Range
Excessive consumption	59	49.0 (47.0-51.0)	22-58	58	42.0 (40.0-44.0)	14-58	54	14.0 (12.0-16.0)	0-24
Concern only	66	47.0 (45.0-49.0)	17-58	66	42.0 (40.0-44.0)	14-58	54	14.0 (12.0-16.0)	0-24
Controls	181	47.0 (45.0-49.0)	17-58	181	42.0 (40.0-44.0)	14-58	181	14.0 (12.0-16.0)	0-24
Excessive consumption	28	49.0 (47.0-51.0)	8-58	31	42.0 (40.0-44.0)	14-58	30	14.0 (12.0-16.0)	0-24
Concern only	36	47.0 (45.0-49.0)	8-58	36	42.0 (40.0-44.0)	14-58	36	14.0 (12.0-16.0)	0-24
Controls	109	47.0 (45.0-49.0)	8-58	110	42.0 (40.0-44.0)	14-58	109	14.0 (12.0-16.0)	0-24

*Median cell volume: 47.0 ml.
†Mean γ -GT: 42.0 U/L; women: 14.0 U/L.

TABLE III—Comparison of laboratory tests with reported consumption at interview

Questionnaire category	Mean cell volume			Mean γ -GT			Mean AST		
	No. at interview	Median (IQR)	Range	No. at interview	Median (IQR)	Range	No. at interview	Median (IQR)	Range
Excessive consumption	49	49.0 (47.0-51.0)	20-58	51	42.0 (40.0-44.0)	14-58	50	14.0 (12.0-16.0)	0-24
Concern only	254	47.0 (45.0-49.0)	17-58	255	42.0 (40.0-44.0)	14-58	241	14.0 (12.0-16.0)	0-24
Controls	167	47.0 (45.0-49.0)	17-58	167	42.0 (40.0-44.0)	14-58	161	14.0 (12.0-16.0)	0-24

*Median cell volume: 47.0 ml.
†Mean γ -GT: 42.0 U/L; women: 14.0 U/L.

specificity of the laboratory tests that are traditionally used in clinical practice for this. Standard interviews and questionnaires have identified more excessive drinkers than laboratory tests in hospital patients, but little is known about their usefulness in general practice.⁵

Patients and methods

Data on the alcohol consumption and levels of concern about drinking were obtained with the health survey questionnaire, a self-administered questionnaire that we developed for use in general practice. This includes questions relating not only to alcohol consumption but also to other aspects of health—namely, cigarette smoking, weight reduction, and physical exercise. These were included to obtain useful additional information and because there is evidence that a disguised questionnaire may result in more truthful responses to questions on alcohol consumption.⁶ A multiple choice format is used throughout, and every section contains equivalent questions on each of the four areas. The first contains quantity-frequency scales. For alcohol the questionnaire asks the average frequency of alcohol consumption a week and the average quantity of beer, spirits, or wine consumed on each occasion. For the weekly consumption is calculated as the product of these two values. For the study consumption by men of 42 units a week or more and by women of 21 units a week or more was taken as excessive.

The second section is based on the CAGE interview for the detection of concern about drinking or evidence of drinking problems.⁷ In the questionnaire the four CAGE questions are modified to relate not only to alcohol but also to the three other aspects of health. Four options—"never," "sometimes," "often," and "very often"—replace the original yes or no responses. Any response other than "never" is treated as positive. In keeping with the criteria for the CAGE interview respondents with positive responses to two or more of the questions are classified as CAGE positive. In the final section patients are asked to state whether by their own assessment they have a problem in any of the four aspects. Those who answer "definitely" or "possibly" to the questions on alcohol are designated self-assessed problem drinkers.

The study population comprised all the patients aged 17-70 on the age-sex registers of two practices in a health centre that is situated on a council housing estate in Harlesden, north west London. Patients were mailed a copy of the questionnaire, which was accompanied by a covering letter that was signed by their general practitioners and a prepaid envelope. Non-responders received reminder letters at three weeks and six weeks, and the records of persistent non-responders were tagged so that they could be handed a copy of the questionnaire when they attended surgery. The returned forms were coded and double checked before being sent for computer analysis.

After the questionnaire survey a sample of the patients who had returned a completed questionnaire within six months of the original mailing was invited to attend for an interview, breath alcohol measurement, and venesection for the estimation of mean cell volume, γ glutamyltranspeptidase activity, and serum aspartate transaminase activity. This included all the patients whose responses to the questionnaire indicated excessive consumption (excessive consumers) and all those classified as positive CAGE responders or self-assessed problem drinkers without stating a weekly consumption in excess of the limits (concern only). In addition, a random sample of those

whose responses indicated neither excessive consumption nor concern about their drinking was also invited to attend.

The patients were interviewed (mostly by one of two interviewers) about their lifestyle and general health. A systematic history of their alcohol consumption in the previous week was taken, and they then underwent a brief physical examination during which measurement of breath alcohol was carried out with a Lion Alcolmeter. Finally, the venesection was performed.

The comparisons between the interview and other measures of excessive consumption were based on the results from those patients who were seen within 12 months of completing the original questionnaire. In view of the non-normal distribution of alcohol consumption and laboratory variables,

Fig. 2—Positive responses to health survey questionnaire (CAGE). CAGE interview to detect concern about drinking or evidence of drinking problems.⁷

median values and ranges are given in the tables. Wilcoxon's test and Spearman's rank correlation coefficient were used to compare the medians and the intercorrelations between the measurements respectively, while the χ^2 test was used to compare the proportions of patients in different categories. The small differences in the number of observations available for comparison of the laboratory and interview data are due to some incomplete blood samples.

Results

QUESTIONNAIRE SURVEY

Of the 3997 patients between the ages of 17 and 70 on the age-sex registers of the two practices, 3452 had died or changed address, as indicated by post being returned marked "address unknown." From the remaining 3452 patients whose addresses were apparently correct, 2571 (75%) questionnaires were returned, giving an overall response rate of 75%. Of the 1939 men (78%) returned a questionnaire compared with 1117 (70%) of the 1593 men (72.8%, $p < 0.001$). As described in an earlier paper the response rate was higher among the older age groups.⁸ Two hundred and twenty-three men (20%) and 337 women (37%) denied having drunk alcohol at all in the three months before completing the questionnaire, and a further 199 men (17%) and 389 women (37%) stated that they had been drinking only occasionally. Altogether, 641 men (57%) admitted to regular drinking (at least one drink a day per week): 289 (26%) drank only on one or two days and 352 (51%) every day. For women there were 469 (33%) regular drinkers, with 286 (20%) drinking on one or two days a week and 183 (23%) drinking every day. A further 60 (5%) men and 58 (4%) women, who stated that they had been drinking, failed to complete the quantity-frequency scale satisfactorily. The distribution of alcohol consumption in the regular drinkers is shown in figure 1. A total of 245 (22%) men and 131 (9%) women were classified as positive responders to the questionnaire—that is, excessive consumers, positive CAGE responders, self-assessed problem drinkers (fig. 2), or two or more of these.

The hundred and twenty men (11%) and 68 women (5%) were identified by their responses to the questionnaire as excessive consumers. There were no important trends by age for either sex. In the one practice where a disease register was kept 11 patients had been recorded as heavy drinkers before the study, and a further 74 were detected by the questionnaire. Sixty-six (55%) of the 120 men and 24 (25%) of the women who were classified as excessive consumers answered positively to two or more CAGE questions or the self-assessment questions. A further 125 (11%) men and 63 (4%) women answered positively to the CAGE or self-assessment questions, or both, but did not indicate a weekly consumption in excess of the limits.

Fig. 1—Weekly alcohol consumption (regular drinkers).

housing estate in Harlesden, north west London. Patients were mailed a copy of the questionnaire, which was accompanied by a covering letter that was signed by their general practitioners and a prepaid envelope. Non-responders received reminder letters at three weeks and six weeks, and the records of persistent non-responders were tagged so that they could be handed a copy of the questionnaire when they attended surgery. The returned forms were coded and double checked before being sent for computer analysis.

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the most sensitive of the laboratory tests for both men and women. The γ glutamyltranspeptidase activity, though more specific than the mean cell volume, was considerably less sensitive, while serum aspartate transaminase activity, though comparable in sensitivity and specificity to the γ glutamyltranspeptidase activity, for the men, failed to detect any of the female excessive consumers. Positive breath alcohol readings were obtained from only 11 (8%) men and one (1%) woman in the questionnaire excessive consumption and concern only categories, whereas in the control group four (2%) of the men and one (1%) woman had positive readings.

TABLE IV—Estimated sensitivity and specificity of questionnaire, mean cell volume, γ glutamyltranspeptidase activity, and serum aspartate transaminase activity, with excessive consumption at interview as the standard measure

Measure	Sensitivity %		Specificity %	
	Men	Women	Men	Women
Questionnaire	77	44	82	84
Mean cell volume	27	26	82	84
γ -GT	26	26	82	84
AST	26	26	82	84
Excessive consumption	14	14	82	84
Concern only	12	12	82	84
Controls	0	0	82	84

*42 units a week or more for men; 21 units a week or more for women.
†Excessive consumption or concern only, both.

Discussion

The health survey questionnaire seems to be both acceptable and intelligible even to a relatively deprived urban population as judged by the high rates of response and satisfactory completion. Indeed, the true response rates may have been higher than indicated by our calculations because of the probable underestimation of the numbers of those who changed address without the knowledge of the practice.⁹

The principle theoretical disadvantages of such an instrument are the possibility of misinterpretation or misrecording inherent in any self-administered questionnaire and its reliance on an estimated weekly consumption that may fail to detect binge drinkers. The accuracy of this estimate also may have been reduced by the failure to use separate quantity-frequency scales for beer, wine, and spirits, although increasing the complexity of the scale might have resulted in a greater potential for error in completion. None the less, the findings are similar to those of several previous community studies, both in the overall patterns of consumption and in the preponderance of excessive drinkers among men.¹⁰⁻¹² The proportions of abstainers were higher than those found in other studies, perhaps due in part to the fact that the questionnaire asked about drinking in the previous three months rather than in the past year, but it is also possible that the drinkers were overrepresented among the non-responders.

The cut off points that we used to define excessive drinking in men and women are lower than those used in most other studies. None the less, there is much evidence to suggest that they are appropriate for primary prevention. The results of a study of male civil servants indicated that mortality may increase at levels of consumption in excess of 35 g a day (24.5 units a week),¹³ while the results of a case-control study in France showed that the risk of cirrhosis in men may be increased by consumption of 60 g a day (42 units a week),¹⁴ and there is now considerable evidence that women are more susceptible to the adverse effects of alcohol than men, particularly to hepatic disease.¹⁵ In a recent survey of expert opinion on the appropriate upper limits of alcohol consumption to be advised in health education the median values suggested by the respondents both for men and for women were close to the cut off points chosen for this study.¹⁶

A total of 168 patients, 11% of the men and 5% of the women, indicated excessive alcohol consumption on their questionnaire. In the one practice where a disease register had been kept 74 of these had not apparently been recognised as heavy drinkers by their general practitioners. Despite the considerable increase in recognition resulting from the questionnaire it is likely that our figures

underestimate the true extent of excessive drinking because of the possible overrepresentation of heavy drinkers among the non-responders. Though the overlap between excessive consumption and positive response to the CAGE and self-assessment section was considerable, a substantial proportion of patients was classified in the concern only category. This finding may have been due to several factors. Some of the patients may genuinely have an average weekly consumption below the limits set for the study but may have been concerned because of occasional binge drinking. Others may have been concerned because of a family history of drinking problems or the belief that even small quantities of alcohol can be harmful. Twenty per cent of the men in this category, however, who attended for interview subsequently admitted to excessive consumption when carefully questioned about their previous week's drinking, and this suggests that these questions may be a useful supplement to the quantity-frequency scale in improving the detection of excessive consumers.

A comparison of the estimates of weekly alcohol consumption obtained by the questionnaire with the previous week's consumption as stated at interview showed generally good agreement between these measures. Indeed, this may have been underestimated both because of the lapse of up to 12 months between completion of the questionnaire and attendance for interview and because the previous week's alcohol consumption may not have been typical. The agreement was less good in the excessive consumption categories than in the two others, and for the women in this category there was no correlation between the two measures. Regression to the mean may account for some of this tendency for consumption according to the questionnaire to be higher than at interview, but it is unlikely to explain the pronounced difference found for the women. There is no evidence that the interval between the completion of the questionnaire and interview was longer for the women than for the men, and much of the difference may have been due to underestimation of consumption at a face to face interview that results from the greater stigma attached to women drinking.

Calculation of sensitivity and specificity is difficult because of the absence of a "gold standard" for the estimation of excessive alcohol consumption, but a detailed previous week's drinking history is generally regarded as the most reliable measure. The system of weighing used in calculating the estimates of sensitivity and specificity is based on the assumption that the samples of patients in each of the categories who attended for interview were representative of the patients in these categories in the study population as a whole. Since it is impossible to be certain that this was indeed the case these estimates should be treated with some caution. None the less, for the men the questionnaire seems to be much more sensitive in identifying those who admit to excessive consumption at interview than any of the other measures, and its specificity was comparable. Although it appeared to perform less well for the women, few were classified at interview as excessive drinkers. We have discussed the possibility that the interview may seriously underestimate the actual numbers of women who drink excessively, and the true sensitivity of the questionnaire may be greater than these calculations suggest.

The sensitivity of breath alcohol measurement was so low that it called into question the usefulness of this in general practice, although its performance might have been better had the patients been attending for a routine surgery appointment. The laboratory tests were of limited sensitivity and specificity in detecting excessive drinkers. Although this may have been in part due to the low cut off points taken for the definition of excessive consumption, these findings agree with the results of previous studies in suggesting that the use of such tests alone in a general population may result in many missed cases. They can, however, be useful for detecting heavy drinkers and may provide a valuable indication of changes in alcohol consumption of such patients during follow up.

Our results indicated that the health survey questionnaire can be used in general practice to increase substantially the recognition of patients with excessive alcohol consumption. In men it works considerably better than the blood tests traditionally used for this purpose, although its performance in the case of women requires further evaluation. By distributing the questionnaire to patients attending surgery costs and inconvenience could be reduced to a

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minimum. The general practitioner could use part of the consultation time to take a more detailed drinking history in those with positive responses to the questionnaire, intervening where appropriate with advice to reduce consumption. Evaluation of the effectiveness of such intervention should now be carried out, preferably by means of a randomised controlled trial.

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Study of middle ear disease using tympanometry in general practice

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Abstract

Tympanometry was used to provide evidence of middle ear effusions in a prospective study of middle ear disease in 264 children aged 3 months to 6 years in general practice. Adequate measurements on both ears were obtained in 220 children, of whom 68 (31%) had evidence of middle ear effusion at entry to the study, 28 (42%) of the 68 children persistence of the tympanometric findings was recorded for at least three months. Children of European descent were more likely to have evidence of middle ear effusion at the initial examination compared with African and West Indian children, as were those children whose siblings had a positive history of otitis media compared with those whose siblings had no such history. Children under 3 years were more likely to have evidence of an effusion than older children.

Middle ear effusion as shown by tympanometry was not associated with a previous history of otitis media in the child but was associated with recent symptoms of respiratory infection or otitis. A previous consultation for otitis media was, however, strongly associated with a greater likelihood of a consultation for otitis media during the follow up period. Comparing evidence

of effusion by tympanometry with that by pneumatic otoscopy showed that using the appearance of the eardrum alone the sensitivity of otoscopy was 55%; the addition of mobility improved the sensitivity to 76% with little reduction in specificity.

Further studies on populations using tympanometry are needed to determine the natural history, aetiology, and indications for referring children with middle ear effusion.

Introduction

Middle ear effusion is a common cause of hearing impairment in children but may be undetected by otoscopic examination.¹ For epidemiological purposes audiology alone seems to be inadequate for the detection of middle ear disease since a proportion of children with effusion have no evidence of clinically relevant hearing loss. The use of tympanometry in addition to audiology in screening programmes in schools has been proposed, with repeat testing to reduce the number of referrals of children with transiently abnormal tympanograms.² There is concern that some children with chronic effusions but normal hearing may remain undetected until they present later in life with irreversible middle ear disease and mastoid complications. The results of a recent study in London³ suggest that 20% of 5 to 6 year old children may need referral because of persistently abnormal tympanograms. Even in those children in whom deafness is associated with effusion parents may be unaware of conductive hearing losses of 30-35 db. Such losses may lead to delay in speech and cognitive development.^{4,5}

Although a persistent effusion may follow an episode of otitis media, many children with middle ear effusion have no such history. Community studies of children younger than 5 years with tympanometry have been undertaken in other countries, such as Denmark, but apparently not in the United Kingdom.^{6,7}

We carried out this study to provide data on the prevalence of tympanometric "abnormalities" in British children, to examine the factors associated with tympanometric evidence of middle ear

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effusion: 16 (23%) of 71 compared with 49 (38%) of 130 ($\chi^2 = 4.56$, $p < 0.05$). The prevalence of a type B tympanogram in one or both ears was 17 (26%) in 66 children without siblings, whereas, 29 (28%) of 102 children whose siblings had no history of otitis media as recalled by their parents had type B compared with 29 (44%) of 64 children whose siblings had a positive history of otitis media ($\chi^2 = 4.19$, $p < 0.05$).

A history of illness in the preceding two weeks was associated with the prevalence of type B tympanograms in one or both ears as follows: 32 (29%) of 111 children without illness, 10 (20%) of 51 with cough and cold or cough only, 19 (39%) of 48 with fever, fever and cough, fever, anorexia, or vomiting, and seven (70%) of 10 with earache ($\chi^2 = 12.1$, 3 df, $p < 0.007$). There were no significant associations of type B tympanograms with a history of otitis media in the parents; previous episodes of otitis media in the child as recalled by the parent; history of otitis media (by fever, anorexia, or earache); mother's smoking, breast feeding, supine bottle feeding, or social class of the father.

A review of the parents' records before entry into the study showed that 5% of children under 1 year and 28% of children aged 1 to 2 years had previously been diagnosed as least once as having otitis media (fig 2). Of those 2 years and older, half had been diagnosed as having otitis media, and there was little change in the proportion with single or multiple episodes. As Table IV shows, when the parents' consultations for otitis media and the tympanogram results at entry into the study were considered the best predictor of a consultation for acute otitis media in the follow up period was

Fig 2—Previously diagnosed otitis media according to parent records in 257 children, excluding seven children whose records were not available.

Table III—Association of previous history of otitis media and tympanogram classification for otitis media during follow up period

Tympanogram classification	History	+	-	Total
A	2 (5.4)	4 (20.0)	8 (40.0)	14 (28.0)
B	4 (8.1)	13 (63.9)	17 (85.9)	34 (68.0)
Total	6 (13.5)	17 (83.9)	25 (125.9)	48 (97.8)

* Classified by the parents of each child. 95 of 64 children classified as B had history B. History of otitis media was recorded for acute otitis media in the follow up period. Effect of tympanogram classification on $\chi^2 = 4.19$, $p < 0.05$. Effect of previous consultation on $\chi^2 = 12.1$, 3 df, $p < 0.007$.

previous history: 33% of those with a positive history subsequently consulted for acute otitis media. This was pronounced among children aged over 3 years, all but one of the 17 consultations for otitis media during follow up were with children who had a previous diagnosis episode.

At least one repeat tympanogram was obtained on 181 (82%) of the 220 children in whom an initial tympanogram had been recorded. Follow up was less complete for those with a bilateral type A than in those with type A or B, reflecting the greater emphasis placed on follow up of abnormal results. Table V gives the results of the follow up tympanograms; 10% of the tympanogram type classified according to the child's worst ear. Of children who had type B initially, 35 (55%) remained type B at follow up, and in 28 (41%) follow up was longer than three months. The children with type A or

C tympanograms were more changeable, with only 23 (40%) remaining in the initial classification on follow up. Less than 20% of those who had type A, A or C, or C tympanograms at entry had a type B tympanogram at follow up.

Table IV—Follow up results by initial tympanogram type

Initial tympanogram type	No.	No. followed up	No. of visits after initial consultation	Final tympanogram type	%
A	14	14	14	A	100
B	34	34	34	A	100
C	10	10	10	A	100
Total	58	58	58	A	100

Discussion

The prevalence of middle ear effusion as shown by tympanometry in a prospective community study in Denmark was approximately 20% of 3 year old children, the effusion persisting for three months in only 6% of the whole population.¹ In our study, over a broader age range, 31% had evidence of middle ear effusion by tympanometry at the initial examination. In 28 children the middle ear effusion had lasted for at least three months as suggested by tympanometry—that is, 13% of the 220 children in whom two or more tympanograms were recorded. It seems unlikely that the evidence of middle ear effusion used in the study resulted in overdiagnosis of the condition. In fact it was probably underdiagnosed. Studies comparing tympanometry with evidence of middle ear effusion at myringotomy indicated that the association of middle ear effusion was 80-100% for type B tympanograms and less than 3% for type A. A small proportion of children with type B tympanograms may have had a thickened non-compliant drum rather than fluid. The association with effusion was more variable (8-75%) for type As. Roughly a quarter of ears with type C tympanograms had effusions.^{8,9}

The use of tympanometry is not without methodological problems; on occasion a false positive tympanogram may be due to the lumen of the probe impacting on the wall of the auditory canal. In general, however, it will not produce a tracing when the lumen of the probe is occluded or when there is an inadequate seal between the rubber tip of the probe and the external meatus. The higher proportion of failed recordings among the younger children was due to the difficulty in obtaining a seal owing to their small auditory canals or to lack of cooperation for the seven to 10 seconds required per ear, or both. This study was undertaken in the winter; there may be seasonal variations in the prevalence of middle ear effusion.

Otoscope findings around to be somewhat subjective but fairly good agreement was obtained between otoscopy and tympanometry in the children on whom it was possible to perform both. Neither observer was specially trained in otoscopy, and even closer agreement may have been obtained with greater experience. A mobile drum does not necessarily indicate an absence of pathology—for instance, increased mobility may be associated with necrosis and thinning of the pars tensa.¹⁰

The results of the repeat tympanograms suggest that types A and C are more likely to proceed to type B than type A is, at least over a relatively short follow up period. This type A and C tympanograms are probably associated with a relatively low prevalence of middle ear effusion in this population. They may represent varying degrees of eustachian tube dysfunction or resolving fluid, or both.

The study of middle ear disease is complicated because there seem to be several diagnostic entities—acute otitis media, recurrent otitis media, and persistent otitis media with or without superimposed acute otitis media.¹¹ The ability to detect middle ear effusion is a critical determinant in any study of the incidence, prevalence, natural history, and response to treatment of these conditions. The differences in age specific incidence that were described in studies in Finland and Denmark, in which the highest incidence was in children under 2, and the 1957 Medical Research

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effusion, and to obtain preliminary data on the natural history of these tympanometric findings. We also wished to determine the relation between tympanometric and otoscopic findings.

Methods

The study was carried out in a general practice at a health centre in north west London that is situated on a council housing estate and serves a deprived population. Using the age-sex register, we identified all 295 children aged 3 months to 6 years on 31 October 1983 and sent letters to the parents explaining the study and requesting attendance at the health centre. From November 1983 to February 1984 264 children (89% invited) entered the study. In a brief standard interview questions were asked on previous history of otitis media in the parents, siblings, and the child, the number of siblings, the mother's smoking habits, and a history of otitis media (by fever, anorexia, and earache) in the child.

Otoscopy was performed by one of two observers with a pneumatic otoscope. This allows the observer to determine the mobility of the eardrum during alterations in pressure in the external canal that are produced by squeezing a rubber bulb. Both the appearance of the tympanic membrane (normal, absent light reflex, opaque, drum visible, bulging, inflamed, retracted, or perforated) and drum mobility (normal, reduced, or absent) were recorded. Tympanometry was undertaken after otoscopy to avoid introducing bias into the ear examination. A tympanometer 85 AR 11 (American Electro Medical) was used, which provides a graph of drum compliance at pressures from +200 to -400 mm H₂O in the external auditory canal. Tympanograms were classified into one of four groups similar to the Jerger classification.¹² Middle ear pressure was considered to be normal from -100 to +50 mm H₂O and compliance considered to be normal at 0.1 or above, or at 0.1 or below if 0.1 or below on the tympanogram. Table I shows the types of tympanograms.

Type	Tympanogram findings	Pathological associations ^{13,14}
A	Normal pressure, normal compliance, peak at normal pressure	Very small proportion—no clear effusion
B	Normal pressure, low compliance, peak at normal pressure	Variable proportion, 8-25%
C	Low compliance and middle ear pressure 100 mm H ₂ O or above, usually less than 100 mm H ₂ O	80-100% associated with effusion
D	Normal pressure, normal compliance, peak at negative pressure	80-100% associated with effusion

Follow up of children with types B, C, and A was attempted at intervals of two to four weeks until the symptoms resolved. An attempt was also made to re-examine all the participants in the study at least once in the six month follow up period. The medical records of all participants were reviewed to extract information on consultations, home visits, and hospitalisations in which the diagnosis of otitis media was made. Only episodes that occurred more than two weeks apart were considered to be separate events. During the six months from November to May the general practitioners who saw any of the children in the study with symptoms that suggested a respiratory infection or otitis media, or both, filled out a standard form recording their examination findings and clinical diagnosis. In the analysis ears with type B tympanograms were assumed to have middle ear effusion. Such a definition should provide a relatively specific, but probably conservative, estimate of the prevalence of middle ear effusion.

Proportions were tested for statistical significance using the χ^2 test with Yates' correction in 2-way contingency tables. Log linear analysis was used to assess the effects of main factors in the 3-way contingency tables. The sensitivity and specificity of otoscopic findings compared with tympanometric evidence of effusion were calculated. Sensitivity was defined as the true positives divided by the sum of the true positives and the false negatives, and specificity was defined as the true negatives divided by the sum of the true negatives and the false positives.

Results

A total of 452 ears in 232 children were successfully tested by tympanometry in 12 children only one ear was successfully tested. In children under 2 years 74% of ears were successfully tested by tympanometry compared with 91% in those over 2 years. Figure 1 shows the proportion of tympanogram types by age for the 452 ears. Type B tympanograms were

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Fig 1—Tympanogram types by age

most common in children under 1 year (37%). Overall, the proportion of ears with type B was higher in those under 3 compared with children aged 3 and over (31% of 220 v 20% of 130, $p < 0.025$). The proportion of type A as declined at older ages, whereas the proportion of type C tympanograms increased.

The appearance of the eardrum and assessment of mobility by pneumatic otoscopy were compared with tympanometry for the 366 ears that had complete otoscopic examinations and tympanometry. This comparison excluded the ears without adequate visualisation of the tympanic membrane ($n = 63$) and the ears for which mobility was not tested by pneumatic otoscopy ($n = 23$). Although a slightly higher proportion of type B tympanograms was found in this group (35%), the difference was not statistically significant. Table II gives the classification of the ears by appearance (normal v any abnormality) and by mobility (normal v reduced or absent) and the proportion of type B tympanograms in each category.

Table II—Proportion of type B tympanograms by appearance and mobility of the eardrum (percentage in parentheses)

	Normal mobility	Reduced or absent mobility	Total
Normal appearance	27 (14.5)	18 (40.4)	45 (30.3)
Abnormal appearance	27 (29.7)	45 (51.6)	72 (51.7)
Total	54 (27.1)	63 (56.0)	117 (81.8)

Table III compares two definitions of abnormal otoscopy with the type B tympanogram. Appearance alone ignores the mobility assessment, whereas appearance and mobility ignores the appearance assessment. In both definitions appearance and mobility are normal. Consideration of mobility alone to appearance increased the sensitivity of otoscopy from 55% to 76%, but at the cost of a slight increase in specificity from 87% to 89%. When we excluded the 12 children who had had tympanograms done on only one ear, the results on 220 children remained for further analysis. Type A was present normally in 43 (38%), type A or C in one or both ears in 69 (31%), and type B in at least one ear in 68 (31%). Type B was present bilaterally in 39 of the 68 children. Children of West Indian or African descent were less likely than those of European descent to have middle ear

Table III—Comparison of the appearance of the tympanic membrane alone with the appearance and mobility in identifying ears with type B tympanograms (percentage in parentheses)

	Appearance alone	Appearance and mobility
Normal	27 (14.5)	27 (14.5)
Abnormal	26 (29.7)	26 (29.7)
Total	53 (54.2)	53 (54.2)

* Normal v any abnormality, including drum visible light reflex.
† Appearance and mobility v any abnormality.
‡ For explanation see text.

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Council study in the United Kingdom in which the peak annual incidence was around 9 years of age may reflect differing diagnostic criteria.¹⁵ Our results suggest a higher prevalence of effusion in children under 3 than in older children. Follow up of children with recent respiratory infections or otitis may pick up some persistent effusions, but many will remain undetected as they are present in children without such a history.

The use of the tympanometer is acceptable to patients and easy to learn, but a comprehensive community screening programme does not seem to be indicated until further information is available, particularly on the natural history of middle ear effusion in general practice and its effect on child development and the probability of developing irreversible middle ear disease. Tympanometry can never replace audiology as a screening instrument because it does not detect neurosensory deafness. Until the role of tympanometry in general practice is clarified it seems reasonable for general practitioners to use pneumatic otoscopy in preference to standard otoscopy in view of the consequent improvement in detecting middle ear effusion.

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100 YEARS AGO

The conference between the Subcommittee for Medicine of the Executive Committee of the Association for promoting a teaching University for London, and representatives of the Medical Society in London, was commenced on Monday last, at the rooms of the Society of Arts. An outline of the proposed plan for the constitution of a teaching University was submitted, this plan, the substance of which has already been made public on more than one occasion, provided that the University should be founded on the faculties as constituent bodies, with Boards of studies appointed by the Faculties, and that there should be a "single governing body." It was proposed that the Faculty of Medicine should consist of the teachers and examiners in London, and the persons present, having all teachers, naturally assented; further, it was thought that only the senior teachers should be admitted, and that the younger men, the assistant-professors, the demonstrators and teachers of practical subjects, together with the whole body of the graduates of the future University, should be excluded. This very select body, made up of the Faculty of Medicine, would elect a Board of Studies which would regulate the curriculum, the examinations, and all other matters relating to degrees in medicine, subject to the final decision of the governing body. The board of Studies would therefore only have a consultative voice, and the narrow constituency by which it would be elected would have merely an indirect elective influence. It is, we understand, proposed to provide this University with a staff of professors, laboratories for research, and all the paraphernalia of teaching. The question whether representatives of the medical profession should have seats on the governing body, and how they should be chosen, was not discussed, but will probably be considered when the conference meets again on May 16th. We fear that this scheme will not solve the difficulty, or meet the wants of medical education in London; it is not sufficiently broad and liberal to command the hearty and general support which alone can ensure its endowment necessary to the projected University. The idea of having a local University for London, consisting of colleges linked together for the purpose of granting degrees, is no doubt, one worthy of consideration, and commanding many elements of success; but the scheme of the Association appears to be exceedingly inadequate just where it ought to be precise. What are to be the duties of the professors—to teach, or to make researches? If to teach, who are to be taught? All the undergraduates at all the schools, or is this to be an additional central service school? Why is the Faculty of Medicine—which, after all, would only have to meet once a year, or at worst, to fill up vacancies in a Board of Studies—to be so narrow a constituency? Have the Colleges of Physicians and Surgeons any place in this scheme? They are not teaching bodies in the ordinary acceptance of the term, and the Teaching University is the grant degrees to all London students, who, therefore, will not need the diplomas of the royal colleges. Or are these colleges to conduct the examinations, and to receive the fees and the Board of Studies? Finally, what is to be the body who is to decide on the amount of preliminary knowledge of arts and science who is to be required—be it of the Faculty of Medicine, or of the

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Faculty of Arts, or of the Faculty of Science, or the governing body? This is really the question of most vital importance. Owing to it, the University of London has got into its present difficulties, and there have been no indications as yet that the Association is inclined to profit by this lesson. It is to be hoped that, before the conference is over, this question may be thoroughly discussed. The Association and its proposals present a certain hazy nebula, which is, perhaps, not unwise; it can, according to the development of future events, either resolve itself into its original form, or condense and concentrate it, as present, dissociated nebulae into an useful, life-giving body. (*British Medical Journal* 1885; i:96.)

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Multicultural medicine

Acker—This fruit is a delicacy in Jamaica and is used in "bush tea." The ripe fruit can be eaten after a meal without ill effects, but if it is unripe it may be poisonous. It may cause hypoglycaemia due to two factors: hypoglycin A and hypoglycin B. This may result in vomiting (Jamaican vomiting sickness), coma, and even death due to severe dehydration. Three quarters of the West Indians who live in the United Kingdom have come from Jamaica. They often go home on holiday and bring unripe ackee back with them, which may contain unripe fruit.

Granger Brothers—Preserved ginger root is a popular Chinese snack and, if it is not chewed properly or eaten in a hurry, can cause small bowel obstruction at the ileocecal junction. The ginger root consists of cellulose, which is resistant to gastric juices, absorbs water, and swells up during transit through the gut. An elderly Chinese adult patient or a child may complain of pain in the right iliac fossa; this must be considered in the differential diagnosis of acute abdomen.

Tenth gridding—The British believe that this is a psychological symptom but Indians believe otherwise. They think that grinding the teeth is a symptom of threadworm infestation. An Indian father may bring his child to a British doctor with this problem, expecting to get a stool examination, to receive the test and to be reassured that the child is not infested. All that the doctor has to do is to decide on the amount of preliminary knowledge of arts and science who is to be required—be it of the Faculty of Medicine, or of the

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