

ORIGINAL PAPER

Quality of life and psycho-social development in children with otitis media with effusion

Qualità di vita e sviluppo psico-sociale nei bambini con otite media secretiva

L. BELLUSSI, M. MANDALÀ, F.M. PASSÀLI, G.C. PASSÀLI, M. LAURIELLO¹, D. PASSALI
ENT Department, Siena University Medical School; ¹ University of L'Aquila Medical School, Department of Experimental Medicine and S. Raffaele Pisana, Rome, Italy

Key words

Middle ear • Otitis media with effusion • Children • Quality of life • Psycho-social development

Parole chiave

Orecchio medio • Otite media secretiva • Età pediatrica • Qualità di vita • Sviluppo psico-sociale

Summary

Purpose of this study was to correlate results from a survey on otitis media and the State-Trait Anxiety Inventory test. This survey investigated prevalence of otitis media (OM) in our territory, influence on development of language and personality and social costs. State-Trait Anxiety Inventory is a suitable test to differentiate state anxiety caused by a specific event [in this case, otitis media with effusion (OME)] from a trait anxiety (anxious personality) in parents and caregivers. The otitis media study was conducted, retrospectively, in two primary public schools in Colle Val D'Elsa (Siena) on 252 children (6-11 years old). The State-Trait Anxiety Inventory test had been administered to the parents or caregivers of 20 paediatric outpatients (4-12 years, mean 6.8) at the ENT Department of Siena University. The results of the OM survey showed a correlation between OM and difficulties in speech and reading, delayed answering and limited vocabulary. All these problems improved as children grew up. On the other hand, psycho-social development appeared to be more problematic even in the 4th and 5th class, mostly due to persistent attention disturbances. In the State-Trait Anxiety Inventory test, 50% of parents or caregivers had a high state-anxiety score and so were mostly concerned with health status of the children. The State-Trait Anxiety Inventory results indicated that 50% of parents or caregivers had a high trait-anxiety score and thus had an anxious personality. These findings could be helpful in understanding the real severity of symptoms. The two proposed tests could provide complementary data to evaluate children with OME: the OM survey can be used as a screening test to detect children with non-symptomatic OME, to establish whether delayed language development may be associated with OME, to predict prognosis and children's quality of life as well as social costs of OME; the State-Trait Anxiety Inventory test can be used to reveal a state or a trait anxiety in parents and caregivers in order to better understand their point of view. Parents' and caregivers' personality has a marked influence on the impact of OME on the children's quality of life. Quality of life in children with otitis media with effusion is one of the most important parameters to be taken into consideration on account of the possible correlation with problems in development.

Riassunto

Lo scopo del presente studio è stato quello di correlare i risultati di un'indagine sull'otite media (OM) con lo State-Trait Anxiety Inventory (S.T.A.I.) test. L'indagine conoscitiva sull'OM valutava la prevalenza dell'Otite Media nel nostro territorio, l'influenza sullo sviluppo del linguaggio e la personalità, ed il costo sociale della stessa. Lo S.T.A.I. è un test in grado di differenziare l'ansia di stato, causata da un evento specifico (in questo caso l'OM secretiva), dall'ansia di tratto (personalità ansiosa) nei genitori o parenti dei bambini. L'inchiesta sull'OM è stata condotta retrospettivamente in 2 scuole pubbliche elementari di Colle Val D'Elsa (Siena) su 252 bambini tra i 6 e gli 11 anni. Lo S.T.A.I. test è stato somministrato ai genitori o parenti di 20 pazienti pediatriche esterne (4-12 anni; età media 6,8) con diagnosi di otite media secretiva. I risultati dell'indagine sull'otite media hanno dimostrato una correlazione tra OM e difficoltà nel linguaggio e nella lettura, ritardo nelle risposte e vocabolario limitato per l'età. Tutti questi problemi migliorano con la crescita del bambino. Al contrario, lo sviluppo psico-sociale appare più problematico anche nella IV e V classe, soprattutto a causa della persistente alterazione dell'attenzione. Nello S.T.A.I. test il 50% dei genitori ha evidenziato un elevato punteggio di ansia di stato, dimostrando una specifica preoccupazione per lo stato di salute dei loro bambini. Nel restante 50% dei genitori era evidenziabile un elevato punteggio di ansia di tratto, compatibile con una personalità ansiosa. Questi dati possono essere di aiuto nella comprensione della reale gravità dei sintomi. I due test proposti possono fornire dati complementari per valutare i bambini con OM secretiva: l'indagine OM può essere utilizzata come test di screening nella selezione di bambini con OM secretiva non sintomatica, per ipotizzare se il ritardo dello sviluppo del linguaggio può essere associato con l'OM secretiva, per avere un'idea sulla prognosi, sulla qualità di vita del bambino e sul costo sociale dell'OM; lo S.T.A.I. può essere di ausilio nell'evidenziare un'ansia di stato o tratto nei genitori allo scopo di comprendere meglio la gravità dell'impatto dell'OM sulla qualità di vita dei bambini. La qualità di vita nei bambini con OM secretiva dovrebbe essere uno dei più importanti parametri da prendere in considerazione a causa della sua possibile correlazione con i disturbi dello sviluppo.

Introduction

Diseases of the rhino-pharyngeal-tubal district are common in childhood on account of anatomical, functional and immunological immaturity. Otitis media with effusion (OME) is defined as the presence of a seromucous exudate in the middle ear for more than 12 weeks with no signs or symptoms of infection (fever, pain)^{1,2}. OME has a high prevalence in childhood, almost 90% of children, according to some reports, have suffered from at least one episode in the first years of life and 30% have presented acute otitis media^{3,4}. The hearing loss associated with OME (ranging from negligible to 50 dB) occurs during a "critical" developmental period and causes a sensory deprivation likely to affect several aspects of children's development and quality of life (QoL)⁵. Bilateral middle ear effusion in infancy and early childhood and the consequent conductive hearing loss, have been blamed for impairment of speech, language and psychosocial development. These negative influences may be associated with a permanent auditory deficit, like ABR inter-aural inter-peak latency asymmetries⁶, whereas other Authors found no differences in binaural abilities in adults with and without a previous early history of OME⁷.

Health related quality of life (HRQL) is now considered an important outcome measure in conjunction with objective clinical parameters. HRQL measures are influenced by the patient's personality (experiences, psychological conditions, habits): therefore, it is important to evaluate not only OME symptoms (fullness, hearing loss), but also the emotional distress, the costs, the limited activity as well as the caregiver concerns that can result. OME is primarily a paediatric disease and parents or caregivers are always concerned with the health status of their children. They want their children to feel and function better and they are less concerned about the hearing levels in a soundproof booth, the "beauty" of the tympanic membrane or the quantity/quality of middle ear effusion⁴.

The purpose of this study was to correlate the results from a survey on otitis media (OM), carried out in our territory and the State-Trait Anxiety Inventory (STAI) test⁸. The survey investigated the prevalence of OM in our territory, the influence on the development of language and personality and the social costs. The STAI test is suitable to differentiate a state anxiety caused by a specific event (in this case OME) from a trait anxiety (anxious personality) in parents and caregivers.

Methods

The survey on OM was a retrospective study carried out in two primary public schools in Colle Val d'Elsa (Siena), on 252 children (aged 6-11 years), in the school year 1997-8. The parents or caregivers were asked to answer questions concerning the anamnesis (age, sex, number and kind of OME episodes, mouth breathing, upper respiratory airways diseases), the development of language, the number of school days lost by the children or working days lost by the parents (Fig. 1). Furthermore, the children's teachers were asked to answer questions about the learning skills, speech impairment and social activity of the children (Fig. 2). No specific inclusion or exclusion criteria had been adopted.

The STAI test⁸ had been carried out in the parents or caregivers of 20 paediatric outpatients (4-12 years, mean 6.8) at the ENT Department of Siena University Medical School, between January and February 2004. The test is validated in the Italian language⁹ and comprises two separate sections: STAI 1, which investigates the state-anxiety, and STAI 2, which evaluates the trait anxiety. The parent or caregiver was asked to answer questions concerning how he/she felt, at that moment, referring to the health status of his/her child (STAI 1); furthermore, he/she was invited to answer questions concerning how he/she usually feels. Specific inclusion criteria were: children aged between 6 months and 12 years, children presenting OME (presence of middle ear effusion, in one or both ears, type B tympanogram mono- or bilaterally). No specific exclusion criteria had been adopted.

Results

All the parents and caregivers completed the study. The incidence of OM was estimated to be 41.26% (104/252 children) and 43.26% (45/104) of those cases of otitis was probably OME. A correlation between speech impairment and otitis media had been revealed in 18 children, mostly in the first three classes (Table I).

The chi-square statistical test was used to analyse some parameters related to the psycho-social development in otitis positive and otitis negative children. Otitis media correlated with distraction ($p = 0.007$), delayed answering ($p = 0.001$) and the need to repeat sentences ($p = 0.000$), mostly in the first class. Distraction and need to repeat sentences were also recorded in the classes with older children (Table II). The chi-square statistical test was used to analyse some parameters related to school performance. A significant correlation was found between otitis and speech difficulties ($p = 0.019$), limited vocabulary (p

Age:.....

Breathing: physiological oral
 Snoring: present absent
 No. visits to ENT specialist: none 1st 2nd 3rd more
 Causes of visits to ENT specialist: ear pain adenoiditis tonsillitis epistaxis
 pain in oropharynx follow-up examination do not remember

Diagnosis: don't remember none adenoiditis otitis adenotonsillitis sinusitis tonsillitis pharyngitis
 Had your children ever suffered from Otitis before? yes no
 Which kind of Otitis was it? Otitis with serous effusion bacterial Otitis do not know
 No. episodes this year: 0 1 2 3 4 5 6 more do not know
 No. episodes in past years: 0 1 2 3 4 5 6 more do not know
 At what age did first symptoms start?
 less than 1 year 1 year 2 years 3 years 4 years 5 6 more do not know
 No. episodes of disease of upper respiratory ways (rhinitis, sinusitis, pharyngitis, tonsillitis, adenoiditis)
 0 1 2 3 4 5 6 more do not know

1- At what age did your child start saying its first words?
 less than 1 year 1 year 2 years 3 years 4 years 5 6 more do not know

2- At what age did your child start saying first logical sentences?
 less than 1 year 1 year 2 years 3 years 4 years 5 6 more do not know

3- Does your child have problems in speaking correctly? yes no
 4- Does he/she look absent-minded? yes no
 5- Does your child answer questions correctly? yes no
 6- Does he/she frequently say "what"? yes no
 7- Does he/she watch television with the sound excessively loud? yes no
 8- No. days of child's absence from school: none less than 10 days more than 10 days do not know
 9- No. days of absence from work for parents: none less than 10 days more than 10 days do not know

Fig. 1. First part of OM survey for parents or primary caregivers.

1- School results during this year: insufficient sufficient good very good excellent
 2- School results in previous years: insufficient sufficient good very good excellent
 3- Does your pupil follow lesson with attention? yes no
 4- Can he/she speak correctly? yes no
 5- Does he/she know enough words for his age? yes no
 6- Has he/she problems in reading? yes no
 7- Are his/her school results better in written or oral tests? written oral no difference
 8- Is his/her mnemonic skill similar to that of other students? yes no
 9- Has he/she problems in socializing with other children? yes no

Fig. 2. Second part of OM survey for teachers.

= 0.055), reading difficulties ($p = 0.010$). A high significant correlation was observed between otitis and delayed answering ($p = 0.005$), need to repeat questions ($p = 0.005$) and distraction ($p = 0.000$) (Table III). All these problems were mostly present in the first three classes.

In these children, a mean loss of 51 school days/calendar year (19.77% of cases) because of otitis, was observed, but only 3.57% of children lost > 10 days.

Their parents lost 24 (mean) working days (9.52% of cases), with 5.95% of cases < 10 days. It is should be pointed, however, that several mothers were housewives, therefore, absence from work is certainly underestimated.

The scores of the two parts of the STAI test have been calculated separately, adding a score from 1 to 4 for each answer. In the STAI test, 10 (50%) parents or caregivers had a high state-anxiety score and were

Table I. Number of children with OM and speech impairment in the primary school.

	No. OM children with speech impairment
First class	4
Second class	4
Third class	4
Fourth class	2
Fifth class	0

mostly concerned with the health status of their children. The other 10 (50%) parents or primary caregivers had a high trait-anxiety score thus displaying an anxious personality (Fig. 3).

Discussion

The results of the OM survey showed a correlation between OM and difficulties in speech and reading, delayed answering and limited vocabulary. All these problems improved as children grew up. On the oth-

Table II. Correlation between OME and distraction in each class.

	Otitis positive	Distraction	Delayed answering	Need to repeat sentences
First class	27	10 (p = 0.007)	11 (p = 0.001)	14 (p = 0.000)
Second class	27	11 (p = 0.086)	5 (p = 0.689)	10 (p = 0.250)
Third class	19	6 (p = 0.122)	3 (p = 0.546)	5 (p = 0.414)
Fourth class	18	4 (p = 0.880)	3 (p = 0.527)	3 (p = 0.272)
Fifth class	13	2 (p = 0.701)	0 (p = 0.482)	3 (p = 0.663)

Table III. Correlation between OM positive and OM negative children with speech impairment, distraction, delayed answering, difficulties in reading.

	Otitis positive	Otitis negative	Chi-square test
Speech impairment	14	6	p = 0.013
No speech impairment	90	142	
Distraction	33	23	p = 0.004
No distraction	71	125	
Delayed answering	82	135	p = 0.005
No delay in answering	22	13	
Need to repeat sentences	35	26	p = 0.005
No need to repeat sentences	69	122	
Distraction during lessons	32	14	p = 0.000
No distraction	72	134	
Limited vocabulary	5	99	p = 0.055
Vocabulary not limited	19	129	
Difficult in reading	7	97	p = 0.010
No difficulty in reading	28	120	

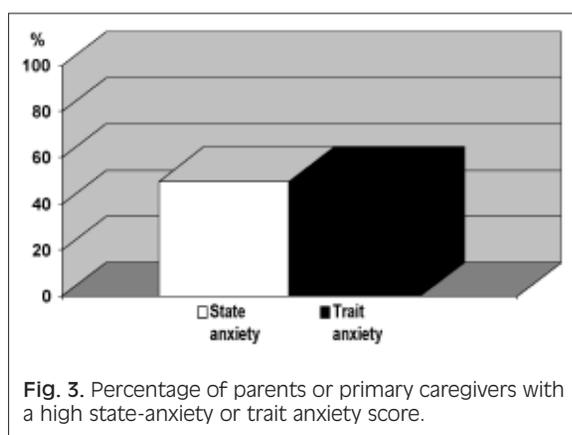


Fig. 3. Percentage of parents or primary caregivers with a high state-anxiety or trait anxiety score.

er hand, the psycho-social development appeared to be more problematic even in the 4th and 5th class, mainly because of persistent attention disturbances. As the OM survey was a retrospective study, based on the parents' and teachers' answers, the results cannot be highly specific, even if 43.26% (45/104) of the otitis cases were probably OME. Due to the prospective design and the inclusion criteria, the STAI study enrolled fewer patients, but reached a higher specificity for OME.

The STAI results indicated that 50% of parents or caregivers had a high trait-anxiety score and thus these parents had an anxious personality. These findings could be helpful in understanding the real severity of the symptoms. Parents with an anxious personality tend to exaggerate their children symptoms and problems.

The two proposed tests could provide complementary data to evaluate children with OME: the OM survey can be used as a screening test to detect children with non symptomatic OME, to establish whether the delayed language development may be associated with OME, to possibly predict prognosis (language impairment caused by OME recovers as the children grow up) and the children's QoL as well as the social costs of OME; the STAI can be used to reveal a state or a trait anxiety in parents, in order to gain a better understanding of their point of view. The parent's and caregiver's personality has a marked influence on the impact of OME on the children's QoL: for example, anxious parents are more likely to restrict the child's activities (i.e., sports, parties, friends), decreasing their QoL.

There is no evidence in the literature¹⁰⁻¹³ of a significant relationship between a history of OME (or conductive hearing loss) and children's later academic skills. Furthermore, a child's home environment is

more strongly related and predictive of all language and academic outcomes than OME. In a recent study, children suffering from OME presented a lower score in expressive language and maths at the younger age, but they caught up in maths on entering school and in expressive language by second grade¹¹. More surprisingly, early detection of OME during the first 3 years¹² of life and prompt insertion of tympanostomy tubes does not measurably improve developmental results at 4 years of age^{10 11 13}, but it can greatly improve the QoL in children with OME¹⁴. Several authors have reported that later behavioural and attention difficulties are associated with recurrent OME in early life¹⁵⁻¹⁸. The Agency of Health Care Policy and Research also reviewed the literature and concluded that there is a weak association between OME in early life and behaviour and attention in children > 4 years of age¹⁹. It is worthwhile pointing out that a history of early middle ear disease appears to have a negative effect in the late teens on reading ability, verbal IQ and even elicits behavioural problems, as reported by parents and teachers, including above all lack of attention, but even hyperactive, antisocial and neurotic behaviour²⁰. So, what is the importance of these tests? Maybe later academic skills are not strongly related to OME, but are the result of multiple factors which affect children's development. In particular, the quality of the home environment (responsiveness of caregivers, organization of the home, child/caregiver relationship, language input available) is emerging as a crucial factor²¹. Negative OME effects on the QoL and on later academic achievements are much more evident and longer lasting over the years in a unstimulating home environment. Probably, the psycho-social development is more related to OME and we believe that this parameter is mostly influenced by the QoL in children suffering from OME.

The importance of the proposed tests is the need to measure the QoL (considered as psychophysical well-being) in OME.

In conclusion, the impact of OME on children cannot be based only on the parent's rating of hearing²² or on a report of the medical history²³, audiometry, tympanometry and appearance of the tympanic membrane. We need to ask parents specific questions in order to assess the QoL. In our opinion, the combination of the results given by the tests proposed by us could provide a useful contribution to define the QoL in children with OME. In fact, QoL should be one of the most important parameters to be taken into consideration because of its possible correlation with problems in development.

References

- ¹ Bellussi L, Dhooge I, Downs MP, Karma P, Marchisio P, Ogra PL, et al. *Recent advances in otitis media. 8. Diagnosis and screening.* Ann Otol Rhinol Laryngol 2002;188(Suppl):95-101.
- ² Passali D. *L'otite media secretiva. Eziopatogenesi e diagnosi.* In: D. Passali, editor. *Lezioni di Clinica Otorinolaringoiatrica.* Roma: Industria Grafica Romana Srl; 1992. Vol. 1. p. 491-510.
- ³ Rosenfeld RM, Goldsmith AJ, Tetlus L. *Quality of life for children with Otitis Media.* Arch Otolaryngol Head Neck Surg 1997;123:1049-54.
- ⁴ Timmerman AA, Anteunis LJ, Meesters MG. *Response-shift bias and parent-reported quality of life in children with Otitis Media.* Arch Otolaryngol Head Neck Surg 2003;129:987-91.
- ⁵ Paradise JL. *Otitis Media and child development: should we worry?* Pediatr Infect Dis J 1998;17:1076-83.
- ⁶ Gunnarson AD, Finitzo T. *Conductive hearing loss during infancy: effects on later auditory brainstem electrophysiology.* J Speech Hear Res 1991;34:1207-15.
- ⁷ Stephenson H, Haggard MP. *Adult sequelae of middle ear disease: acoustic reflexes and listening noise.* In: Lim DJ, Bluestone CD, Casselbrandt ML, Klein JO, Ogra PL, editors. *Abstracts of the Sixth International Symposium on Recent Advances in Otitis media.* Ft Lauderdale, FL: 1995. p. 218.
- ⁸ Spielberg CD, Gorsuch RL, Luschene RE. *Manual for the state-trait anxiety inventory.* Palo Alto, California: Consulting Psychologists Press; 1983.
- ⁹ Pedrabissi L, Santinello M. *Inventario per l'ansia di "Stato" e di "Tratto": nuova versione italiana dello STAIForma Y: Manicale.* Firenze: Organizzazioni Speciali 1989.
- ¹⁰ Paradise JL, Feldman M, Campbell TF, Dollaghan CA, Colborn DK, Bernard BS, et al. *Early versus delayed insertion of tympanostomy tubes for Otitis media: developmental outcomes at the age of three years in relation to prerandomization illness patterns and hearing levels.* Pediatr Infect Dis J 2003;22:309-14.
- ¹¹ Roberts JE, Burchinal MR, Zeisel SA. *Otitis media in early childhood in relation to children's school-age language and academic skills.* Pediatrics 2002;110:696-706.
- ¹² Butler CC, MacMillian H. *Does early detection of Otitis media with effusion prevent delayed language development?* Arch Dis Child 2001;85:96-103.
- ¹³ Paradise JL, Dollaghan CA, Campbell TF, Feldman M, Bernard BS, Colborn DK, et al. *Otitis media and tympanostomy tube insertion during the first three years of life: development outcomes at the age of four years.* Pediatrics 2003;112:265-77.
- ¹⁴ Richards M, Giannoni C. *Quality of life outcomes after surgical intervention for Otitis media.* Arch Otolaryngol Head Neck Surg 2002;128:776-82.
- ¹⁵ Gravel JS, Wallace IF. *Early Otitis media, auditory abilities and educational risk.* Am J Speech Lang Pathol 1995;4:89-94.
- ¹⁶ Feagans LV, Kipp E, Blood I. *The effects of Otitis media on the attention skills of day-care attending toddlers.* Dev Psychol 1994;30:701-8.
- ¹⁷ Stewart IA, Silva PA, Williams S. *Relationship of Otitis media with effusion in early childhood educational and behavioural disadvantage during the teenage years.* In: Lim DJ, Bluestone CD, Casselbrandt ML, Klein JO, Ogra PL, editors. *Proceedings of the Sixth International Symposium on Recent Advances in Otitis media.* Hamilton, Canada, B.C.: Decker Inc; 1995. p. 337-9.
- ¹⁸ Arcia E, Roberts JE. *Otitis media in early childhood and its association with sustained attention in structured situations.* J Dev Behav Pediatr 1993;14:181-3.
- ¹⁹ Stool SE, Berg AO, Berman S, Carney CJ, Cooley JR, Culpepper L, et al. *Managing Otitis media with effusion in young children. Clinical practice guideline number 12.* AHCPR No. 94-0622. Rockville, MD: US Depart Health Hum Serv 1994.
- ²⁰ Bennet KE, Haggard MP, Silva PA, Stewart IA. *Behavioural and developmental effects of otitis media with effusion into the teens.* Arch Dis Child 2001;85:91-5.
- ²¹ Roberts JE, Burchinal MR, Medley LP. *Otitis media, hearing sensitivity and maternal responsiveness in relation to language during infancy.* J Pediatr 1995;126:481-9.
- ²² Rosenfeld RM, Goldsmith AJ, Madell JR. *How accurate is parent rating of hearing for children with Otitis media?* Arch Otolaryngol Head Neck Surg 1998;124:989-92.
- ²³ Daly KA, Lindgren B, Giebink GS. *Validity of parental report of a child's medical history in Otitis media research.* Am J Epidemiol 1995;142:100-1.

■ Received: July 26, 2005
 Accepted: September 16, 2005

■ Address for correspondence: Prof. L. Bellussi, Istituto di Discipline Otorinolaringologiche, Università di Siena, V.le Bracci 4, 53100 Siena, Italy. Fax +39 0577 47940. E-mail: bellussi@unisi.it