

A study of the prevalence of developmental anomalies of the external ear among preschool children in Sivas, Turkey

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SUMMARY: Altuntaş EE, Nur N, Cerrah YSS, Müderris S. A study of the prevalence of developmental anomalies of the external ear among preschool children in Sivas, Turkey. Turk J Pediatr 2011; 53: 528-531.

The objective of the current study was to detect the prevalence of developmental anomalies of the external ear among children between aged 4-6 years old in Sivas, Turkey. This cross-sectional study was conducted among 1,096 preschool children. Among the 1,096 children examined, 8 had accessory auricle, and prevalence of the anomaly was calculated at 0.7%. Fifty-one prominent ear deformities (4.6%) were detected among the children. One limitation of the study is that the prevalence of developmental anomalies of the external ear may have been underestimated. In fact, such surveys should be conducted on large random or stratified samples of entire populations. Thus, the true prevalence could be slightly higher, and the apparent difference may not be a racial one.

Key words: protruding ear, accessory auricle, prevalence, preschool children.

Malformations of the auricle are commonly seen and occur in 1 out of 12,500 births. Incomplete or total auricular agenesis, accessory auricle, external ear canal atresia, and protruding ear are the most commonly seen developmental anomalies of the external ear. Most congenital malformations in humans occur during the 3rd to 12th weeks of embryonic life. During this period, the external ear undergoes development and can be affected in many ways. External ear deformities may exist as isolated anomalies or may be associated with other congenital anomalies of the first arch, which may be found with middle or inner ear anomaly¹⁻³.

The objective of the current study was to detect the prevalence of developmental anomalies of the external ear among 4-6 year olds in Sivas, Turkey.

Material and Methods

Study Design

This cross-sectional study was conducted between October 2007 and April 2008 in Sivas, Turkey. This study was done during a screening

program for sensorineural hearing loss in 22 public preschools. Otolaryngologists and Public Health Departments of the School of Medicine performed this study. The study population included 1,261 children. Two otolaryngologists (EEA, YSSC) amongst the authors examined 1,096 (86.9%) of these children, whose ages ranged from 4 to 6 years old.

Study Procedures

Parents of the children who attended the participating preschools were sent an information sheet with a consent form one week before the start of the study. Parents who wanted their child to participate but did not return the consent form were able to give verbal consent on the day of screening. The only criterion for inclusion in the screening was a signed or verbal parental consent for health screening. All subjects were invited to participate on a voluntary basis. In addition, the parents completed a short self-administered questionnaire. Questionnaire items included family demographics, details of the child's environment from gestation to early childhood,

lifestyle, health conditions, parental concerns, and a history of previous operation(s) for congenital anomalies or another ear disease. None of the children had had an operation for congenital anomalies of the ear. The only exclusion criterion for this prevalence study was an unsigned parental consent form.

The study was approved by the Human Research Ethics Committee of Cumhuriyet University of Turkey.

Measurement

A complete otolaryngologic and physical examination was performed on all of the children. Children who were found to have a developmental anomaly in the course of the detailed examination were invited to the Ear, Nose and Throat Clinic of the Cumhuriyet University Medical School Hospital. A Pediatrics Department consultation was requested for evaluation of the mental and motor development of these children. In addition, children and parents who participated in the study were questioned as to whether they suffered in any way as a result of the appearance of the external ear.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL) for Windows version 14.0. Data were expressed as the mean \pm SD and percentage.

Results

Data of 1,096 children (2,192 ears) were used; 52.7% (n=578) of the children were boys, and 47.3% (n=518) were girls. Their average age was 5.5 ± 0.7 years. External ear anomalies were identified in the participating children, and their distribution by gender is shown in Table I.

Among the 1,096 children examined, 8 (0.7%) had accessory auricle and prevalence of the anomaly. Accessory auricles were localized anterior to the tragus and 8 cases were unilateral and single. Two of the cases had elastic cartilage bar on palpation. Average lengths of accessory auricles were 6.13 ± 1.13 mm and 2 mm in width at the base.

Underdevelopment or lack of the antihelical fold, overdevelopment of the concha and a scapha-conchal angle of $>30^\circ$ is accepted as prominent ear. Fifty-one bilateral prominent ear deformities (4.6%) were detected among the children. Family history of prominent ear was positive in 24 children. Complaints in 18 of the children were related to outward appearance. In 33 other children and families, no psychological affection was mentioned.

No incomplete or total auricular agenesis, external ear canal atresia, microtia, or other developmental abnormalities of the external ear were observed. No congenital craniofacial or systemic anomalies were detected, and all of the children were developmentally normal. The mental and motor development of all of the children was normal, and no hearing disorders were found. Further, otolaryngologic history and examinations were unremarkable in all 59 cases.

Discussion

The external ear is divided into the auricle and the external canal. The auricle begins with the appearance of 6 hillocks around the first pharyngeal groove. The lowest hillock anterior forms the tragus and the lowest hillock posterior forms the antitragus. The developing pinna is complete by 20 weeks but moves posterolaterally by birth and is fully grown at puberty. The external auditory canal is composed of three parts: the tympanic

Table I. Prevalence of Congenital External Ear Deformities Among Turkish Preschool Children (n=1,096)

		Girls Number (%)	Boys Number (%)	Overall Number (%)
Normal		546 (94.4)	491 (94.8)	1037 (94.7)
Developmental anomalies of the external ear are determined	Accessory auricle	5 (0.9)	3 (0.6)	8 (0.7)
	Protruding ear	27 (4.7)	24 (4.6)	51 (4.6)
Total		578 (100.0)	518 (100.0)	1096 (100.0)

ring, the tympanic membrane and the canal itself. The normal distance between the helix and mastoid is 15 to 20 mm and the angle is 20-30° in adults. In addition, the height of the pinna is 5.5 to 7.5 cm and in adults, the width of the pinna is half of its height. The prominent or outstanding ear has a mastoid/helix angle >40°^{1,2}.

In 1926, Marx⁵ was one of the first to attempt a classification of congenital ear malformation. Since then, many authors have developed their own classifications. In 1910, Lockett analyzed the primary deformity in most protruding ears as either the absence or the underdevelopment of the antihelical fold³⁻⁶. Protrusion of an ear may be due to an unfolded or poorly developed antihelix, an enlarged concha, an abnormal concha-cephalic angle, a large prominent lobule, or any combination thereof. One ear may be more prominent than the other. Family history is usually positive for the prominent ear deformity. The rate of prominent ear deformity is 5% in the white population, and the genetic trait of prominent ear deformity is autosomal dominant⁷. It should be noted that the prevalence of prominent ears in our study (4.6%) is similar to that quoted for the entire white population.

This deformity usually occurs in combination with two other defects: excessive growth of the concha and inadequate development of the antihelix. The protruding ear is a defect which, when correctly repaired, can be a source of happiness for the patient and his or her family⁷. An evident congenital defect in a child evokes enormous feelings of anxiety and guilt in his or her parents. The most important effect of protruding ears on a child is psychological. The child might be teased about his or her appearance, which may contribute to the development of psychosocial disorders. This congenital anomaly may cause the child to avoid personal contact. Therefore, the parents should treat prominent ear anomalies before the child's psychological health is affected. Therefore, surgical intervention should be done as early as possible.

An accessory auricle is the failed fusion of the six auricular hillocks during gestation. Accessory auricle occurs in a cartilaginous skeleton covered with skin like a tragus. It may be single or multiple and unilateral or

bilateral. It is located on different regions of the face, but the accessory auricle is most commonly located just anterior to the tragus or ascending crus of the helix. The frequency of the accessory auricular abnormality is 5 in 1,000 live births. Gao et al.⁸ reported the prevalence of accessory auricle anomalies as 0.22%. Beder et al.⁹ reported the rate at 0.47%. Similarly, the prevalence of accessory auricular anomalies was found to be 0.7% in our study. The accessory auricular anomaly is just an isolated symptom in many patients. However, this anomaly may be associated with other congenital anomalies of the first arch. The genetic trait of accessory auricle anomaly is autosomal dominant, but the anomaly is seen sporadically in the majority of cases^{9,10}.

Among the limitations of the study, the prevalence of developmental anomalies of the external ear in Sivas, as reported herein, may be an underestimation of the true prevalence. The researchers gained access to children through their preschool. Thus, those children not attending preschool were not available for possible enrolment in the study. In fact, such surveys should be conducted on large random or stratified samples of entire populations. Thus, the true prevalence could be slightly higher, and the apparent difference may not be a racial one.

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