



Susy Safe Newsletter

An European Project on Foreign Bodies Injuries in the Aero-Digestive tract in Children

VWA - VOEDSEL EN WAREN AUTORITEIT / FOOD AND CONSUMER PRODUCT SAFETY AUTHORITY



voedsel en waren autoriteit

www.vwa.nl

Since 1989 the activities of the national authority for market surveillance of consumer products (food and non food) in the Netherlands is organized in one unit. As result of some organizational changes previous names are changed in time. It is now well known as the Food and Consumer Product Safety Authority (Voedsel en Waren Autoriteit - VWA). Centres of expertise for mechanical product safety within the VWA are now located in Zwijndrecht and for chemical safety in Groningen. Those centres have at least 15 years of experience in market surveillance and enforcement of con-

sumer product safety and functions also as knowledge centres.

In the area of consumer products the competence of the VWA includes Food and Consumer Product Safety (amongst others General Product Safety, Cosmetics, chemical product safety and the New Approach directives LVD, toys, machinery, PPE, gas-appliances).

For this purpose the VWA has for product safety a staff of approx. 100 people (approx. 40 enforcement officers). Accredited laboratories for mechanical, electrical and chemical product safety are a part of the centres of expertise.

The VWA has been an active member of the Emergencies/GPSD committee from the outset of the committee and is also represented in several ADCO's (e.g. LVD, MD, PPE, Toys).

The VWA has a close co-operation with the Customs in Veterinary Affairs, Food and for Consumer Product Safety in the framework of EC Regulation 339/93/EEC.

Presently the VWA is also an active member of PROSAFE and the Expert Centre in Zwijndrecht manages the EMARS project.

CONTACT:

Postal address

Food and Consumer Product Safety Authority (VWA)
PO Box 19506
2500 CM Den Haag
The Netherlands

Address

Food and Consumer Product Safety Authority (VWA)
CentreCourt
Prinses Beatrixlaan 2
2595 AL Den Haag
The Netherlands

Phone

+31 70 448 48 48

Fax

+31 70 448 47 47

E-mail

info@vwa.nl



SHORT REPORT FROM GREECE:

SWITCHING TO THE EURO: STILL HARD TO SWALLOW

F C Papadopoulos, E Petridou, C E Frangakis, T Farmakakis, H Moller, G Rider

Injuries from ingestion (choking) of coins are common among children, with non-negligible morbidity,¹ but indications that smaller coins increase the risk of choking are mostly anecdotal. We evaluated this risk using a natural experiment in Greece with the introduction of the Euro in place of previously used larger coins.

METHODS AND RESULTS

Data on inhalation and ingestion events (choking) were collected from a European Union injury monitoring process. A network of three representative hospitals was used for data from Greece, which shifted to the Euro system in 2002. For comparison, we also used similar data from a network of five representative hospitals from Denmark, which has not shifted to the Euro system. Details of these networks are described elsewhere.² Possible unrepresentativeness cannot affect validity of the reported re-

sults, since these refer to the same dynamically evolving populations. For each ingestion or inhalation incident, data were obtained by specially trained interviewers interacting with the children, their guardians, and the attending health professionals. General physical characteristics for the coins were retrieved from the European Central Bank, the National Bank of Denmark, and the National Bank of Greece.

For Greece and Denmark, we obtained the risk of childhood coin choking during the three month period January to March 2002, relative to the risk during the same months over the preceding six years, 1996–2001. We report exact significance levels and confidence intervals under the assumption that the numbers are from two Poisson distributions,³ an assumption that was in agreement with the data. The physical characteristics of the coins involved in the injuries

were compared before and after 2002 using the Wilcoxon test.

During January–March, over the years 1996–2001, the Greek and the Danish databases each reported 39 childhood coin choking injuries, a three month incidence of 39/6=6.5 incidents. During the three first months of 2002, the incidence in Denmark (four cases) is similar to that of the earlier years, which is in accordance with no change in the currency in Denmark. In contrast, a sharp and statistically significant increase was noted in Greece, where 17 coin choking incidents were recorded, in comparison to the observed average of 6.5 for the six previous years. Limiting comparison to Euro coins after 2002 and drachma coins (Greece's currency) before 2002 also indicates a doubling of choking incidence (table 1).

The bottom section of table 1 explores potential reasons for the above findings. First, within Greece or Denmark, and within a

Table 1 Coin related inhalation and ingestion injuries, and characteristics of coins involved in inhalation and ingestion injuries, during January–March 2002 in comparison to January–March 1996–2001 in Greece (drachmas before 2002, Euros after 2002) and Denmark (same currency before and after 2002)

Country	1996-2001 per year	2002	RR	95% CI	p value
Coin related incidents					
Greece					
All coins	6.5	17	2.62	1.39 to 5.74	0.003
Euro in drachma coins	6.5	14	2.15	1.08 to 4.08	0.029
Denmark (all coins are krone)	6.5	4	0.62	0.16 to 1.71	0.49
Coin characteristics					
Greece					
Mean diameter (mm)	24.7 [25.0]	19.8 [21.6]			0.0001
Mean weight (g)	6.9 [7.1]	4.4 [5.2]			0.007
Total circulation (million pieces)	1780	1600			
Denmark					
Mean diameter (mm)	19.7 [24.9]	20.0 [24.9]			0.67
Mean weight (g)	4.7 [7.4]	4.2 [7.4]			0.77
Total circulation (million pieces)	1790	~ 1990			

Comparison between "prior to 2002" and 2002 for coins involved in inhalation and ingestion incidents through the Wilcoxon test. Mean values of the totality of the circulating coins are given in square brackets.

time period (prior to 2002, or 2002), the smaller of the circulating coins are selectively involved in coin related incidents. Second, in Greece (with an increase in coin related incidents in 2002 compared to earlier years), there was also a decrease in the size of the coins involved, as the country switched currency (see fig 1). Third, in Denmark, (with no increase in coin related incidents in 2002 compared to earlier years), there was no change in type or size of currency.

Using sampling ratios previously calculated² and taking into account that the study period in 2002 was three months long, we can estimate that throughout Greece, 1411 coin related incidents are expected to occur annually. Of these, slightly more than half ((2.15-1.0)/2.15) represent coin related incidents that would have not occurred were it not for the change from drachma coins to Euro coins.

DISCUSSION

The findings from a natural experiment in Greece suggest that the change to smaller size

coins with the introduction of the Euro is responsible for an increase in coin related incidents. Moreover, no other explanation appears compatible with the data; the paediatric population in Greece is decreasing, and the total circulation of Euro coins (1600 million pieces) in 2002 is lower than the corresponding circulation of drachma coins in previous years (1780 million pieces).

For these findings to be used for policy on coin design, they need to be combined with a future study on the association between coin size and more specific medical measures of morbidity, although reliable analysis of the latter was not possible with our data. Nevertheless, our findings justify and promote policy actions like that of Scandinavian countries, which have made sure that small and light coins have holes so that the flow of air is not obstructed in case of choking.⁴ Such studies will be especially relevant to countries that consider changing size and form of coins, including those planning to adopt the Euro.



ACKNOWLEDGEMENTS

This research was partially supported by the European Commission and the Ministry of Health. Dr Frangakis' work was supported in part by the US NIH (NEI) grant R01 EY014314-01.

Authors' affiliations

F C Papadopoulos, E Petridou, T Farmakakis, Athens University Medical School, Athens, Greece

C E Frangakis, Johns Hopkins University, Baltimore, MD, USA

H Moller, National Institute of Public Health, Copenhagen, Denmark

G Rider, RAM Consulting, USA

Correspondence to: Prof. E Petridou, Department of Hygiene and Epidemiology, Athens University, Medical School, 75 M. Asias Str., Goudi, PO Box 11527, Athens, Greece; epetrid@med.uoa.gr

Accepted 22 June 2003

REFERENCES

- 1 **Rider G**, Wilson CL. Small parts aspiration, ingestion, and choking in small children: findings of the small parts research project. *Risk Anal* 1996;16:321-30.
- 2 **Dessypris N**, Petridou E, Skalkidis Y, et al. Countrywide estimation of the burden of injuries in Greece: a limited resources approach. *J Cancer Epidemiol Prev* 2002;7:123-9.
- 3 **Cox DR**, Hinkley DV. *Theoretical statistics*, 8th edn. New York: Chapman and Hall/CRC, 2000.
- 4 **Rimell FL**, Thome A Jr, Stool S, et al. Characteristics of objects that cause choking in children. *JAMA* 1995;274:1763-6.



Figure 1 A 10 cent coin (left) and a 20 drachma coin (right). The size of the 20 drachma coin (24.5 cm diameter) is the typical (median) size of drachma coins ingested in the period before 2002. The size of the 10 cent coin (19.8 cm diameter) is the typical (median) size of euro coins ingested in the period of 2002.



FROM GREECE:

MAGNITUDE AND OBJECT-SPECIFIC HAZARDS OF ASPIRATION AND INGESTION AMONG CHILDREN IN GREECE

Farmakakis Theologos [a], Dessypris Nick [a], Alexe Delia-Marina [a], Frangakis Constantine [b], Petoussis George [c], Malliori Melpomeni [a], Petridou Th. Eleni [a],[d]

a Unit of Preventive Medicine, Department of Hygiene and Epidemiology, Athens University Medical School, Athens, Greece

b Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health, Baltimore, USA

c First Department of Surgery, Aglaia Kyriakou Children's Hospital, Athens, Greece

d Department of Epidemiology, Harvard School of Public Health, Boston, Massachusetts, USA

INTRODUCTION

Injuries due to foreign body aspirations and ingestions are quite common in childhood because of their link with some important developmental factors, such as the exploration of the environment using the sense of taste ('mouthing') and the diversification of infant's diet with solid food [1,2]. Foreign bodies can either enter the airways at different levels, resulting in their obstruction or the digestive tract, with usually less dangerous health outcomes [2,3]. Complications of injuries due to foreign bodies, such as infections of the respiratory tract and other conditions following airway blockage, may put children at risk of permanent disability and even death [1,3].

The information concerning the magnitude and characteristics of these injuries is, however, limited. In the United States, data from the Centres for Disease Control and Prevention (CDC) show that mechanical asphyxia due to foreign bodies is involved in the aetiology of about 5% of deaths among children less than 4 years old; moreover, to each fatal event correspond more than 100 visits to emergency departments due injuries related to foreign bodies [3,4]. To our knowledge, in Greece, no

specific investigation has been undertaken to explore the burden of injuries due to foreign bodies in the paediatric population. Currently available data concern the management of oesophageal injuries [5] and some findings from a worldwide epidemiological approach to the prevention of injuries due to aspirations and ingestions of foreign bodies [2].

Our investigation aimed to assess the magnitude, characteristics and risk factors for injuries due to foreign body aspirations and ingestions among children less than 15 years old, using injury data from a large database with more than 400,000 records in Greece.

MATERIALS AND METHODS

The European Home and Leisure Accident Surveillance System (EHLASS) is as an extensive home and leisure injury database, which gathers data from accident and emergency departments of selected hospitals in participating European Union (EU) countries. In Greece, the Emergency Department Injury Surveillance System (EDISS), run by the Centre for Research and Prevention of Injuries, Athens University School of Medicine, is the extension of EHLASS. EDISS collects all injury information (all ages included) in four

hospitals across the country. Specially trained health visitors routinely record data through personal interviews with injured persons and/or their guardians on the basis of a pre-coded questionnaire that covers socio-demographic variables, event coordinates, injury characteristics, as well as details about products involved in injury events. Notably, this information can be used to generate reasonably reliable national estimates [6].

For the purpose of this study, EDISS data concerning injuries due to foreign body aspirations and ingestions sustained by children less than 15 years old were retrieved for the study period 1996–2000 using specific EHLASS codes and key word searches of free text descriptions of injuries [7–10]. SAS software (SAS Institute, Inc., Cary, North Carolina) was used to perform all analyses, specifically a descriptive analysis, simple cross-tabulations and an analysis of free text descriptions of these injuries [11]. Approximate countrywide estimates of overall and object-specific incidence rates were computed using sampling ratios based on some specific variables such as the age of patient and his/her place of residence [6]. In addition, foreign

bodies involved in injury causation were scored (from one-least important to six-most important) based on (1) frequency of injuries produced; (2) relative frequency of hospitalisations and (3) relative length of stay caused. Subsequently, a composite scale by multiplying these scores was developed in order to provide a measure for the overall object-specific impact in injury aetiology and rank these objects accordingly.

RESULTS

A total of 2207 injuries occurred due to aspirations and ingestions of foreign bodies during the study period, representing about 2% of all unintentional childhood injuries. Three of these injuries were fatal. The estimate based on the weighting that was applied resulted in an annual incidence of about 2.3 ingestions and aspirations of foreign bodies per 1000 children in Greece; specifically, there were 1.2 injuries per 1000 children due to inedibles, 0.8 due to edibles and 0.3 where the nature of the object involved in injury causation could not be specified.

In about 1 out of 10 cases, children's guardians had attempted to provide first aid prior to seeking medical assistance and 11% first sought care in primary health services and were subsequently referred to the emergency departments of EDISS participating hospitals. Overall 3.5% of children were transferred to the hospital by ambulance, almost half of them being referred by the primary health care physicians. Half of the referred cases were eventually hospitalised and only 17% of those who sought care directly to the emergency departments.

Table 1 shows the distribution of injuries according to the type of object involved in injury events. Injuries due to inedibles were more frequent

Table 1 Distribution of children recorded in the Emergency Departments Injury Surveillance System EDISS for an injury due to aspiration or ingestion of foreign bodies by type of object involved in the event

Object	Total number	Percent of injury by object category	Incidence rate/1000
Inedible			
Toy	177	16.5	0.20
Coin	134	12.5	0.15
Jewellery	90	8.4	0.10
Graphic instrument	85	7.9	0.10
Nail, pin, sharp instrument	73	6.8	0.08
Sewing object	72	6.7	0.08
Clothing accessory	63	5.9	0.07
Kitchen utensil	44	4.1	0.05
Battery	43	4.0	0.05
Thermometer	35	3.3	0.04
Christmas decoration	29	2.7	0.03
Package	29	2.7	0.03
Decoration	28	2.6	0.03
Plastic piece	23	2.1	0.03
Lamp, electric object	23	2.1	0.03
Piece of metal	22	2.1	0.02
Stone, ceramic	21	2.0	0.02
Piece of wood	16	1.5	0.02
Piece of glass	16	1.5	0.02
Other inedible	49	4.6	0.05
Partial total	1072	100.0	1.20
Edible (food)			
Fish bone	579	67.6	0.54
Nut	88	10.3	0.08
Meat bone	51	6.0	0.05
Candy	35	4.1	0.03
Fruit and vegetables	31	3.6	0.03
Liquid	18	2.1	0.02
Other food	54	6.3	0.05
Partial total	856	100.0	0.80
Unidentifiable	279	100.0	0.30
Total	2207	100.0	2.30

than those due to edibles (56% versus 44%). Among inedibles, small parts of toys, coins and jewellery (e.g. lucky charms and small religious objects), were the foreign bodies most frequently ingested or aspired. Graphic instruments (e.g. caps of pens, erasers), nails, pins and other sharp instruments also produced injuries with a relatively high frequency. By contrast, injuries due to small stones and ceramic pieces or pieces of wood and glass were rarely reported. As for those injuries related to edibles, fish bones were involved in the majority of ingestions and aspirations (68%), followed by nuts (10%) and meat and bones (6%).

Compared with injuries related to edibles, those due to inedibles were more frequently sustained by males, children less than 5 years old and those of immigrant status (Table 2). These injuries happened usually in the bedroom or living room, during afternoon and early evening hours, more often when the child was left without adult supervision. By the time period of the year, injuries due to inedible foreign bodies were more frequently recorded during cold months.

Alternatively, aspirations and ingestions of edibles were recorded more often among children of older ages (5–14 years

Table 2 Distribution of children with foreign body aspirations and ingestions recorded in the Emergency Departments Injury Surveillance System (EDISS) by type of object involved (inedibles vs. edibles) and demographic, event and outcome-related variables

Variable	Inedibles		Edibles		p-Value
	N	%	N	%	
Demographic variables					
Age (years)					< 0.0001
< 1	110	10.2	46	5.4	
1-4	587	54.8	430	50.2	
5-14	375	35.0	380	44.4	
Gender					0.002
Male	622	58.0	437	51.1	
Female	450	42.0	419	48.9	
Nationality					0.001
Hellenic / tourist	1015	94.7	835	97.5	
Immigrant	57	5.3	21	2.5	
Event related variables					
Place					< 0.0001
Kitchen	124	13.7	228	73.6	
Living room	239	26.9	51	16.4	
Bedroom	380	42.0	8	2.6	
Other place inside home	65	7.2	8	2.6	
Veranda / yard	31	3.4	5	1.6	
School	35	3.9	1	0.3	
Other place	31	3.4	9	2.9	
Time (missing values: 78)					< 0.0001
8:00—11:59	176	16.7	59	7.4	
12:00—15:59	302	28.7	294	36.9	
16:00—19:59	305	28.9	162	20.4	
20:00—23:59	205	19.4	150	18.8	
24:00—7:59	66	6.3	131	16.5	
Day					0.29
Weekday	760	70.9	588	68.7	
Weekend	312	29.1	268	31.3	
Month					0.01
November—April	614	57.3	442	51.6	
May—October	458	42.7	414	48.4	
Supervision (missing values: 996)					< 0.0001
No	410	59.2	32	13.0	
Yes	283	40.8	214	87.0	
Outcome of injury related variables					
Outcome					< 0.0001
Medical examination and advise only	631	58.8	138	16.1	
Treatment	244	22.8	596	69.6	
Hospitalization	197	18.4	122	14.3	
Length of hospitalization					< 0.0001
< 2 days	94	48.0	37	30.6	
2 –3 days	82	41.8	47	38.8	
> 3 days	20	10.2	37	30.6	
No. of X-rays performed					< 0.0001
0	195	18.2	678	79.2	
1	418	39.0	96	11.2	
> 1	459	42.8	82	9.6	

30% of these children spent more than 3 days in the hospital, finding probably reflecting the need for bronchoscopy to remove these foreign bodies.

Injured children were usually examined in outpatient settings, an X-ray was performed for each child who sought care in the emergency department and hospitalisation was necessary in 18% of these cases. On average children were hospitalised for less than 3 days and none of them presented any worth noting complication during their stay. Regarding treatment, upper gastrointestinal endoscopy was required in about 1 out of 10 and laryngoscopy or bronchoscopy in 1 out of 20 cases. In 4 out of 10 cases, the foreign body was detected under direct vision and tongue depressor, whereas the object was spontaneously removed in less than 3% of the events. In the remaining cases it was not considered necessary to undertake any action.

Table 3 gives information about certain objects or categories of foreign bodies involved in the causation of injuries, which showed a significant differentiation by gender. Boys had a higher frequency of aspirations and ingestions of

old) and of Hellenic nationality; these occurred typically in the kitchen, during lunch hours and in the presence of an adult and were

usually treated in outpatient settings. Hospitalisation was necessary for less than 15% of children; it is worth noting, however, that

pieces of metal, toys, coins and nuts, while girls sustained more often injuries with jewellery, sew-

ing and clothing accessories (e.g. needles, buttons), fish bones and other food.

As expected, during the cold time period of the year (November—April), winter holiday included, there was a peak of injuries due to aspirations and ingestions caused by Christmas decorations (data not shown).

Sewing and clothing accessories, jewellery and Christmas decorations and liquid food, fruit and vegetables and other food, produced more frequently injuries to infants (Table 4). Among these, 5% were injuries due to by fish bones. Toddlers (1—4 years old) had a relatively high percent of aspirations and ingestions of fish bones and coins; importantly, 86% of all injuries due to nuts were recorded in this age group. Older children (5—14 years old), sustained usually injuries due to fish bones, followed by coins and sewing and clothing accessories. One of the three deaths was recorded in this age group following an injury with a bottle cap (data not shown).

In Table 5, foreign bodies involved in injury events were scored and ranked to provide a measurement of their burden, based on the frequency of injury occurrence, hospitalisation rate and the average length of hospitalisation. The objects most frequently

involved in injuries were coins, toys and fish bones. The objects with the highest hospitalisation rate were nuts, sewing objects, coins, liquid food and plastic pieces. A hospitalisation was lengthiest for nuts, pieces of metal and other inedibles. There-

fore, the objects with the highest overall composite score were: nuts, followed by other foods, nails, pins and other sharp instruments, sewing objects, coins, toys and batteries.

DISCUSSION

Injuries related to foreign body aspirations and ingestions are not negligible in terms of health outcomes and health care cost. The burden of these injuries in childhood was previously emphasised by other investigations [2,3,12,13], which pointed out that accidental inhalation of both

organic and nonorganic foreign body material continues to represent an important cause of childhood morbidity and mortality [13,14].

A large study based on a worldwide database recording injuries due to foreign bodies showed a distinct injury pattern among children of different culture or religion, reflecting some specific nutritional customs or manufacturing technology variations [2]. Indeed, such an injury pattern was present in our research, probably underlying some specific exposure by

Table 3 Distribution of children recorded in the Emergency Departments Injury Surveillance System (EDISS) with injuries due to aspirations or ingestions of foreign bodies according to the categories of objects that showed a significant difference ($p \leq 0.10$) by gender

Object	Gender			
	Male		Female	
	N	%	N	%
Fish bones	278	26.3	301	34.6
Nuts	58	5.5	30	3.5
Other food	23	2.2	31	3.6
Toys	123	11.6	54	6.2
Coin	90	8.5	44	5.1
Sewing and clothing accessories	64	6.0	71	8.2
Jewellery	33	3.1	57	6.6
Pieces of metal	17	1.6	5	0.6

χ^2 with one degree of freedom comparing the particular object or category of object with the sum of all other objects or categories of objects by gender.

Table 4 Distribution of children recorded in the Emergency Departments Injury Surveillance System (EDISS) with injuries due to aspirations or ingestions of foreign bodies according to the categories of foreign bodies that showed a significant difference ($p \leq 0.10$) by age group.

Object	Age (years)					
	< 1		1-4		5-14	
	N	%	N	%	N	%
Fish bone	8	5.1	264	26.0	307	40.7
Nut	6	3.8	76	7.4	6	0.8
Other food	9	5.8	24	2.4	21	2.8
Fruit and vegetables	6	3.8	15	1.5	10	1.3
Liquid	12	7.7	6	0.6	0	0.0
Sewing object and clothing accessories	26	16.7	72	7.1	37	4.9
Jewellery	12	7.7	51	5.0	27	3.6
Coin	4	2.6	81	8.0	49	6.5
Decoration and Christmas decoration	11	7.0	38	3.7	8	1.1
Other inedible	9	5.8	20	2.0	20	2.7
Thermometer	1	0.6	29	2.9	5	0.7
Lamp, electric object	6	3.8	14	1.4	3	0.4
Piece of wood	0	0.0	5	0.5	11	1.5

χ^2 with two degrees of freedom comparing the particular object or category of object with the sum of all other objects or categories of objects by age.

Table 5 Distribution of objects involved in aspirations / ingestions of foreign bodies by different measures of hazard (frequency of occurrence, hospitalisation rate, average length of hospitalisation; 1, less important to 6, most important)

Object	Frequency of occurrence	Hospitalisation rate	Average rate of hospitalisation	Overall score
Nut	5	6	6	180
Other food	4	5	5	100
Nail, pin, sharp instrument	4	5	5	100
Sewing object	4	6	4	96
Coin	6	6	2	72
Toy	6	3	4	72
Battery	3	4	6	72
Other inedible	3	4	6	72
Meat bone	4	5	3	60
Liquid	1	6	5	30
Piece of plastic	2	6	4	48
Graphic instrument	5	3	3	45
Decoration	2	4	5	40
Candy	3	4	3	36
Jewellery	5	3	2	30
Kitchen utensil	3	2	4	24
Clothing accessory	4	2	3	24
Fruit and vegetables	2	5	2	20
Piece of metal	1	2	6	12
Stone, ceramic	1	4	3	12
Fish bone	6	1	2	12
Package	2	3	2	12
Christmas decoration	2	1	5	10
Lamp, electric object	2	5	1	10
Thermometer	3	1	1	3
Piece of glass	1	2	1	2
Piece of wood	1	1	1	1

The over all burdens core is the product of the three scores.

nationality, as well as a differentiation of injury types by age group and gender. For instance, fish food involved in most injuries due to edibles in our study, is an important component of the Mediterranean diet. Such a high incidence of similar injuries was previously reported in Asian populations, associated with dietary customs of these people [12,15,16]. Fish bone aspirations and ingestions were, however, rarely reported for infants [17], while in our investigation, eight cases of choking with fish bones were recorded in this age group. This reflects that parents in Greece often include fish into child's diet since infancy.

Our separation of injury burden into the three components: (1) frequency (2) hospitalisation rate and (3) length of a hospitalisation increases the interpretation of the findings towards policy and effective

intervention. Specifically, since it is a natural tendency of toddlers and infants to explore objects with their mouths, there are high frequency of an object in ingestion cases may simply reflect high exposure to that object. From an intervention point of view, this means that if we were to limit access to that object, the child could simply 'substitute' it by another object, and so the intervention would have little, and even possibly harmful impact depending on the substitution object. A hospitalisation rate is less prone to such exposure and substitution effects since it indicates, to a degree, the 'need' to be hospitalised when having ingested such an object. However, even this 'need' is not an entirely objective measure of burden, since it may reflect to a degree the urgency that a parent feels to refer the child to the hospital for ingestions that might not have

been serious. Thus, perhaps the more objective measure indication that an object poses real danger to the child is the length of a hospitalised case. An example of an 'object' underscoring the distinction between these three measures of burden is fish bone, which has highest frequency of occurrence, but low hospitalisation rate and length of hospitalisation.

In relation to the above, and in order to strengthen the evidence emerging from investigations [12,18], we are also reporting that nuts have a high injury potential, causing suffocations more often to young children aged 1—4 years old, but also to infants and older children. Apart from some isolated interventions such as the Food Choking Prevention Act (2003) in the United States, urging the introduction of safety labels on food that poses a demonstrably high choking risk to children [19],

little has been done to sensitise parents and guardians about the danger posed by some food when consumed by children. We strongly suggest that safety labelling become compulsory for nuts, which must not be given to children less than 7 years old.

Strength of our investigation was the use of a high-quality national injury database that covers a representative sector of the child population and the possibility to appropriately draw some important coordinates of injury events. The lack of data concerning the actual exposure of children to specific foreign bodies, however, has limited the analysis of the hazard posed by these objects to their consequences in terms of number of injuries and health outcomes. Moreover, as the differential diagnosis of foreign body ingestions and aspirations is very difficult [20] and injury surveillance systems do not usually keep detailed records concerning the symptoms, we could not specifically separate aspirations from ingestions and vice versa.

In conclusion, injuries due to foreign bodies are responsible for a significant burden of injuries in childhood and show a specific epidemiological pattern. Preventive measures, such as raising the awareness of paediatricians and parents about the risk posed by some objects including food, as well as the compulsory labelling at EU level of products dangerous for children, are important steps that may significantly decrease the incidence and severity of injuries due to aspiration and ingestion of foreign bodies.

ACKNOWLEDGEMENTS

We would like to acknowledge the contribution of Dr. Simos Kedikoglou and Dr. Panagiota Grigoriou to this study as well as the support of the European Commission (DG SANCO) and the Hellenic Ministry of Health and Welfare.

REFERENCES

- [1] **J.A. Lima**, G.B. Fischer, Foreign body aspiration in children, *Paediatr. Respir. Rev.* 3 (2002) 303–307.
- [2] **S.M. Milkovich**, G. Rider, D. Greaves, D. Stool, X. Chen, Application of data for prevention of foreign body injury in children, *Int. J. Pediatr. Otorhinolaryngol.* 67 (Suppl. 1) (2003) S179–S182.
- [3] **CDC**, Nonfatal choking-related episodes among children, United States, *MMWR* (2001) 945–948.
- [4] **J.D. Rovin**, B.M. Rodgers, Pediatric foreign body aspiration, *Pediatr. Rev.* 21 (2000) 86–90.
- [5] **K. Athanassiadi**, M. Gerazounis, E. Metaxas, N. Kalantzi, Management of esophageal foreign bodies: a retrospective review of 400 cases, *Eur. J. Cardiothorac. Surg.* 21 (2002) 653–656.
- [6] **N. Dessypris**, E. Petridou, Y. Skalkidis, M. Moustaki, A. Koutselinis, D. Trichopoulos, Countrywide estimation of the burden of injuries in Greece: a limited resources approach, *J. Cancer Epidemiol. Prev.* 7 (2002) 123–129.
- [7] **EHLASS**, European Home and Leisure Surveillance System Coding Manual, The European Communities Commission, Brussels, 1986.
- [8] **EHLASS**, European Home and Leisure Surveillance System: Coding Manual, The European Communities Commission, Brussels, 1996.
- [9] **International Classification of Diseases**, 9th rev., World Health Organization, Geneva, Switzerland, 1980.
- [10] **International Statistical Classification of Diseases and Related Health Problems (ICD-10)**, 10th rev., World Health Organization Geneva, Switzerland, 1998.
- [11] **SAS/STAT User's Guide**, Version 6, fourth ed., SAS Institute Inc., 1990.
- [12] **R. Higo**, Y. Matsumoto, K. Ichimura, K. Kaga, Foreign bodies in the aerodigestive tract in pediatric patients, *Auris Nasus Larynx* 30 (2003) 397–401.
- [13] **D.R. White**, C.J. Zdanski, A.F. Drake, Comparison of pediatric airway foreign bodies over fifty years, *South. Med. J.* 97 (2004) 434–436.
- [14] **R.S. Miller**, J.P. Willging, M.J. Rutter, K. Rookkapan, Chronic esophageal foreign bodies in pediatric patients: a retrospective review, *Int. J. Pediatr. Otorhinolaryngol.* 68 (2004) 265–272.
- [15] **P. Nandi**, G.B. Ong, Foreign body in the oesophagus; review of 2394 cases, *Br. J. Surg.* 65 (1978) 5–9.
- [16] **M.W. Pak**, W.C. Lee, H.K. Fung, C.A. van Hasselt, A prospective study of foreign-body ingestion in 311 children, *Int. J. Pediatr. Otorhinolaryngol.* 58 (2001) 37–45.
- [17] **M.W. Pak**, W.C. Lee, C.A. van Hasselt, Fish bone inhalation in infancy, *Eur. Arch. Otorhinolaryngol.* 257 (2000) 393–395.
- [18] **S.P. Gulati**, A. Kumar, A. Sachdeva, S. Arora, Groundnut as the commonest foreign body of tracheobronchial tree in winter Northern India. An analysis of fourteen cases, *Indian J. Med. Sci.* 57 (2003) 244–248.
- [19] **R. Honda**, M. Michael, Food Choking Prevention Act of 2003, To protect children from foods that pose a significant choking hazard, 108th Congress of the USA 1st Session 7/17/2003, 2003. Available at: <http://thomas.loc.gov/cgi-bin/bdquery/z?d108:HR02773:@@L&summ2=m&>.
- [20] **A.E. Muniz**, M.D. Joffe, Foreign bodies: ingested and inhaled, *Contemp.*

PUBLISHED in **The International Journal of Pediatric Otorhinolaryngology** (2007) 71, 317–324, as “Magnitude and object-specific hazards of aspiration and ingestion injuries among children in Greece.”, authors: Farmakakis Theologos, Dessypris Nicka, Alexe Delia-Marina, Frangakis Constantineb, Petoussis Georgec, Malliori Melpomenia, Petridou Th. Eleni;

Journal's web page: www.elsevier.com/

CONTACT:

Center for Research and Prevention of Injuries - CE.RE.PRI.

Dept. of Hygiene, Epidemiology and Medical Statistics

School of Medicine, University of Athens

Phone: (0030) 210 7462187

E-mail: cerepri@med.uoa.gr