Research article

Appendicectomies in Albanians in Greece: outcomes in a highly mobile immigrant patient population

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Abstract

Background: Albanian immigrants in Greece comprise a highly mobile population with unknown health care profile. We aimed to assess whether these immigrants were more or less likely to undergo laparotomy for suspected appendicitis with negative findings (negative appendicectomy), by performing a controlled study with individual (1:4) matching. We used data from 6 hospitals in the Greek prefecture of Epirus that is bordering Albania.

Results: Among a total of 2027 non-incidental appendicectomies for suspected appendicitis performed in 1994-1999, 30 patients with Albanian names were matched (for age, sex, time of operation and hospital) to 120 patients with Greek names. The odds for a negative appendicectomy were 3.4-fold higher (95% confidence interval [CI], 1.24-9.31, $p = 0.02$) in Albanian immigrants than in matched Greek-name subjects. The difference was most prominent in men (odds ratio 20.0, 95% CI, 1.41-285, $p = 0.02$) while it was not formally significant in women (odds ratio 1.56, 95% CI, 0.44-5.48). The odds for perforation were 1.25-fold higher in Albanian-name immigrants than in Greek-name patients (95% CI 0.44- 3.57).

Conclusions: Albanian immigrants in Greece are at high risk for negative appendicectomies. Socioeconomic, cultural and language parameters underlying health care inequalities in highly mobile immigrant populations need better study.

Background

Immigrant populations may present with peculiarities and/or inequalities in access to and delivery of health care worldwide [1,2,3]. Most studies of health care among immigrants have been performed in minorities already residing in their new country. Other immigrant populations may be more mobile, crossing the borders repeatedly without necessarily establishing a new permanent residence. Such populations are very difficult to study epidemiologically and their health care profile remains elusive.

Albanian immigrants in Greece comprise one such highly mobile, elusive population. In this study, we evaluated comparatively the outcomes of Albanian immigrants and matched Greek subjects in terms of suspected acute appendicitis resulting in appendicectomy. Acute appendicitis is the most common acute serious surgical condition and preoperative diagnosis is often difficult. Our aim was to evaluate whether Albanian immigrants were more likely to be misdiagnosed with resulting excess in negative appendicectomies (laparotomies that show no appendicitis) and/or perforation.

Materials and methods

Study setting

Our study used retrospective information on biopsies of surgical material from appendicectomies performed during 1994-1999 in the two major hospitals in Epirus and in 4 other provincial hospitals of the same geographic area. We excluded incidental appendicectomies performed during laparotomies done for other reasons. Epirus is the prefecture of Greece bordering on Albania. We used the records of the Departments of Pathology of the Ioannina University Hospital and the General Hospital of Ioannina. The former hospital receives also all biopsies from the provincial hospitals of Arta, Lefkada, and Filiates that don't have a Pathology registrar in-house, and some biopsies from the provincial hospital of Preveza (those obtained in periods when there is no Pathology registrar in-house). The catchment area of the 6 hospitals has a population of approximately 350,000. The hospitals searched through include all the hospitals covering this area.

Identification of Albanian patients with appendicectomy

Albanian immigrants in Greece are difficult to identify from hospital records for several reasons. Immigrants may assume Greek names and/or declare a Greek residence, even if they reside permanently in Albania. Identity cards, passports, and insurance documents are sometimes falsified and the information provided in such documents may be unreliable. Moreover, such information is often missing from hospital records and immigration related details are rarely recorded with any accuracy. For the purposes of this study, we opted to use only the name of the patient as recorded in the hospital records as a criterion of Albanian ethnicity. With this approach, we may have missed several patients who might have changed their name as well as patients belonging to the Greek minority in Southern Albania. However, it would be very unusual for a patient with a recorded Albanian name, not to be of Albanian origin.

Two investigators first screened all the records of appendicectomy biopsies to identify names of non-Greek origin, excluding names of easily identified foreign ethnicity other than Albanian and those where a different ethnicity was clearly recorded in the hospital records. Then two independent native Albanians were asked to evaluate names that passed this screening stage. Names were not linked to clinical information. The raters generally agreed on which names were typical for Albanian origin. There was potential disagreement on only two patients, whose inclusion would not affect the results of the study. The kappa coefficient was 0.93.

Data extracted and definitions

For each subject included in the analysis, we recorded the hospital, sex, and age as well as the interpretation of the appendicectomy biopsy. Biopsies were rated as positive (when typical features of appendicitis were recorded) and negative (when the biopsy showed no active inflammation). Negative appendicectomy was the primary outcome of interest. We also recorded information on perforation of the appendix as a secondary outcome.

Study design and analysis

Given the fact that Albanian immigrants are a relatively small proportion of the population of subjects undergoing appendicectomy, a classic case-control design where cases would be defined as "negative appendicectomies" and controls would be defined as "positive appendicectomies" would not be statistically efficient. For example assuming a 3% representation of Albanian-name subjects among operated cases with negative appendicectomy, even if 500 negative appendicectomy cases were assembled and ascertained, there would be only 15 Albanian-name subjects in this group and presumably even fewer in the control group with positive appendicectomy. In order to study the relationship between an uncommon postulated risk factor and an outcome, we matched subjects based on the postulated risk factor, instead of matching the subjects based on the outcome [4]. Thus, we selected all Albanian-name subjects for inclusion in the analysis. This small group was then matched against the group of Greek-name patients that had no such limitations in the number of available subjects.

The theoretical efficiency of a 1:M matching ratio for estimating a small relative risk relative to having complete information on all available subjects is approximately $M/(M+1)$. Thus one-to-one matching is 50% efficient, while four-to-one matching is 80% efficient. Increasing M further does not improve the efficiency of the study design substantially [5,6]. This is generally true for risk ratios of 5 or less. In our study, each patient with a verified Albanian name was individually matched to 4 patients who had a Greek name. Albanian-name and Greek-name subjects were matched for hospital, sex, calendar time of operation and age. A strict matching algorithm was used to avoid selection bias. The matching

algorithm selected the Greek-name subjects who had appendicectomy at the closest calendar time to each Albanian-name patient in the same hospital, were of the same sex and differed by less than 5 years in age. When not enough such Greek-name subjects were found for a given Albanian-name subject, the age difference criterion was relaxed.

When an individually-matched design is used, then it is inappropriate to calculate the odds ratio by the traditional formula of the ratio of the products of the diagonals in a 2 by 2 table [7]. Instead, matching needs to be taken into account in the framework of conditional logistic regression with maximization of conditional likelihood. The robust formula of Mantel-Haenszel gives a more simply computed and accurate estimate of the odds ratio (OR):

$$OR = \Sigma\,(M-m+1)N_{1,m-1} / \Sigma\,mN_{0,m}$$

where m takes all integer values from 1 to M; M is the matching ratio (M = 4 in our study); $N_{1,m-1}$ is the number of Albanian-name subjects with negative appendicectomy for whom m-1 of their 4 Greek-name matched subjects also had negative appendicectomies; and $N_{0,m}$ is the number of Albanian-name subjects with positive appendicectomy who have m of their 4 Greek-name matched subjects with negative appendicectomy. Confidence intervals were computed as per Breslow and Day [7].

The study was designed to have at least 80% power at α = 0.05 to detect an odds ratio of 4. Heterogeneity between estimates of subgroups based on patient characteristics was assessed by a chi-square statistic. As secondary supplementary analyses, we also applied the Fisher's exact test separately within the group of Albanian-name subjects and the group of matched Greek-name subjects to evaluate whether any parameters related sig-

nificantly to the probability of a negative appendicectomy in each group. Analyses were performed in SPSS 9.0 (SPSS Inc., Chicago, IL). All p-values are two-tailed.

Results

We identified 30 appendicectomies performed on patients with verified Albanian names during the period 1994-1999 (n = 2 in 1994, n = 2 in 1995, n = 1 in 1996, n = 6 in 1997, n = 9 in 1998, n = 10 in 1999). The number of appendicectomies performed on patients with Albanian names increased in more recent years (p = 0.01 for linear trend). There were 16 male and 14 female patients. The procedures had been performed at the Ioannina University Hospital (n = 9), the General Hospital of Ioannina (n = 16), and other provincial hospitals (n = 5). The median age (range) of the patients was 21 (<1 to 58) and the interquartile range was 16.8 to 26.5 years. The 120 selected patients with Greek names had a median age (range) of 20 years (<2 to 64) with interquartile range 15 to 23.8 years. The 150 patients included in the study represented 7.4% of the total number of non-incidental appendicectomies performed at these hospitals during the same time period (n = 2027 of which n = 752 in the University Hospital, n = 788 in the General Hospital and n = 487 in provincial hospitals). There was no evidence that the total number of appendicectomies changed over time.

The overall negative appendicectomy rate was 40% in Albanian-name subjects (12/30) vs. 20% in the Greek-name subjects (24/120). Table 1 shows the distribution of biopsies taking the matching into account. There was a disproportionate number of cases of Albanian immigrants with negative appendicectomies where all or most of the respective matched Greek-name subjects had positive biopsies. Based on these data, we estimated that the odds for a negative biopsy was 3.4-fold higher (95% CI, 1.24-9.31, p = 0.02) in the Albanian-name subjects than in the Greek-name matched subjects.

Table 1: Distribution of biopsy findings in Albanian-name subjects and the respective matched Greek-name subjects.

	Matched Greek-name subjects with negative appendicectomies				
	None	One	Two	Three	Four
Albanian-name subjects					
with negative appendicectomy	3	6	1	2	0
with positive appendicectomy	11	5	1	1	0

Table 2: Negative appendicectomy rates in various subgroups

	Negative appendicectomies/total in subgroup			
	Albanian-name	P	Greek-name	P
Female	6/14 (43%)	1.00	19/56 (34%)	0.0005
Male	6/16 (38%)		5/64 (8%)	
University Hospital	2/9 (22%)	0.40	3/36 (8%)	0.004
General Hospital	8/16 (50%)		20/64 (31%)	
Other	2/5 (40%)		1/20 (5%)	
Age < 30 years	11/25 (44%)	0.62	23/104 (22%)	0.76
Age > = 30 years	1/5 (20%)		1/16 (6%)	

As shown in Table 2, among Greek-name subjects, the negative biopsy rates were significantly higher in women than in men and there was also evidence that they differed across hospitals. A trend for between-hospital heterogeneity could be discerned for Albanians also, but due to the small numbers the difference was not formally significant. On the contrary, there was absolutely no evidence that the rates of negative biopsies differed between men and women of Albanian name.

The increased risk of negative appendicectomies among Albanian-name subjects and Greek-name subjects was of similar magnitude and not heterogeneous across different hospitals and age groups. Although there was no statistically significant heterogeneity between men and women, the point estimates suggested that most of the increased risk referred to men. Albanian-name men had an odds ratio of 20.0 (95% CI 1.41-285, p = 0.02) for a negative appendicectomy compared to Greek-name men. On the other hand, the odds ratio was less prominent and not formally statistically significant among women (odds ratio 1.56, 95% CI, 0.44-5.48).

The overall perforation rate was 20% (6/30) among the Albanian-name patients and 16.7% (20/120) in the Greek-name patients. Taking the matching into account, the odds for perforation was 1.25-fold higher in Albanians than in Greeks (95% CI, 0.44-3.57). After excluding the cases of negative appendicectomy, the perforation rate among patients with documented appendicitis was 33.3% in Albanians (6/18) vs. 20.8% in Greeks (20/96) (odds ratio 1.90 [95% CI, 0.63-5.69]).

Discussion
In our study, the odds for a negative appendicectomy were 3.4-fold higher in Albanian-name immigrants than in matched Greek-name subjects. This finding was consistent across different hospitals. Although there was no statistically significant heterogeneity between men and women, the point estimates suggested that most of the increased risk may refer to men: Albanian men had an odds ratio of 20 for a negative appendicectomy compared to matched Greek-name subjects. Despite a higher rate of negative appendicectomies, the perforation rate was not lower in Albanian immigrants. If anything, there was a trend for more perforations in Albanians than in Greek subjects. Our data thus clearly show that the diagnosis and management of this common suspected serious surgical condition is more difficult and less optimal in this mobile population.

Misclassification of Albanians as Greeks is possible since many of them might have changed their names and/or identity cards with 'second' Greek names in order to evade deportation or improve their chances of success in the new country. Nevertheless, such a misclassification would tend to decrease the observed odds ratios. We also need to acknowledge that the method of ascribing ethnicity from names may have variable success, depending on how close the names of different ethnicities are. However, overall for ethnicities with substantially different names, such as in this case, concordance is very good [8,9].

Other studies [10,11,12,13] that have targeted immigrants in other Western societies have mostly dealt with people who reside permanently in the country they have migrated to. On the contrary, Albanian immigrants are a highly mobile population that perpetually crosses the borders without permanent residence in Greece. Authority documents and even medical records are often very unreliable.

Although there are other studies that show immigrants having higher rates of appendicectomies [10], no significant differences have been discerned in the rates of the negative appendicectomies in minority communities [13]. In our study, there are a number of possible reasons for the increased risk of negative appendicectomies among Albanians. The language barrier may contribute to a higher rate of misdiagnosis, even if an interpreter is available. The language barrier is likely to be more prominent in mobile immigrants than in immigrants who have already settled in a new country. Cultural differences in the expression of symptoms are also possible; it has been reported that socioeconomic/cultural parameters may affect the rating of the severity of symptoms among patients with abdominal/gastrointestinal complaints [14]. Low socioeconomic and educational status may also make immigrants vulnerable to receive unnecessary treatments. However, previous studies have not agreed unequivocally that low social class increases the risk of negative appendicectomy [15,16,17,18]. Immigrants may also be more likely to be exposed to gastrointestinal pathogens due to poor food and water hygiene and symptoms may masquerade as appendicitis. Finally, latent inequalities or segregation cannot be excluded. The exact contribution of all these potential reasons is impossible to discern.

This has been a retrospective study and the number of Albanian-name subjects has been unavoidably small, despite the large database that we searched. Nevertheless, we used an efficient study design to maximize our power to detect differences of modest magnitude. Moreover, although there are disadvantages to a retrospective study, a prospective study might not have been able to address the specific question in an equally realistic, objective manner. For example, physicians might have acted differently, if they knew that they are prospectively being studied on their diagnostic skills in acute appendicitis and on whether the accuracy of the diagnosis is affected by ethnicity.

The difference that we observed between Albanians and Greeks was most prominent for men. The reasons for this potential discrepancy between sexes are not clear. The possibility of a chance finding cannot be excluded, given the limited sample size and wide, overlapping confidence intervals. The study was not powered to examine sex differences. Alternatively, it is conceivable that Albanian women may have been, on average, more long-term residents in Greece compared to men. The typical immigration pattern for Albanians is that men are the first to seek employment in Greece, but may only seek temporal transitory jobs. Women and families usually follow only after men have acquired a more solid experience and more secure employment status in the new country. Long-term residents may have less prominent cultural and language barriers and may have a better socioeconomic status. Unfortunately, information on the mobility/residence and immigration pattern of specific patients is very difficult to obtain with any reliability, since it clings on legal and deportation issues and such information was not available in our study.

A high rate of unnecessary appendicectomies is not a problem limited to disadvantaged populations. The phenomenon has been described in developing countries [19] and it has been a concern, to a lesser extent, even for developed countries [20,21].

Conclusion

We have targeted a highly mobile immigrant population that poses major challenges in its epidemiologic evaluation. Our findings show a clear inequality in the diagnosis and management of the most common serious acute surgical abdominal condition. Other aspects of health care need to be studied in this population. Mobile immigrants without permanent residence may increasingly appear in several Western societies. Legal limitations and restrictions to immigration may foster transient, illegal immigration for many disadvantaged people seeking a better outlook. The spectrum and reasons for health care inequalities such as those suggested by the difference in negative appendicectomy rates are important to evaluate in these populations and efforts should be made to dissolve the existing inequalities.

Contributions

The original idea for the study was proposed by Dr. Ioannidis and the protocol was developed by Drs. Ioannidis and Tatsioni. The data were collected and organized by Drs. Tatsioni, Charchanti, and Kitsiou. Dr. Ioannidis is responsible for the statistical analysis. The manuscript was first written by Dr. Ioannidis and Dr. Tatsioni and edited/commented critically by the other authors.

Competing interests

none declared

Are there any non-financial competing interests you would like to declare in relation to this paper? NO

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