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Comparison of morbidity of elderly patients in August and November in Attica, Greece: a prospective study

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Disclosures
None.

SUMMARY

Background: In our clinical practice, we have experienced a consistent increase in the morbidity of elderly in Greece during August. **Methods:** We prospectively analysed and compared the morbidity of elderly patients (≥ 75 years old) between August and November of the same year (2010), using data from the SOS Doctors (a network of physicians performing house call visits). **Results:** We analysed data on 739 and 738 elderly patient house-calls in August and November, respectively. Overall, the most common diagnoses were cardiovascular (17.6%), musculoskeletal (10.7%), gastrointestinal (9.5%), respiratory (8.5%), renal/genitourinary (8.1%), and neurologic/psychiatric (7.9%). In August, patients were older ($p < 0.01$), carried a heavier burden of disease (as inferred by specific types of comorbidity and associated medical conditions), were more frequently recommended emergency hospitalization ($p < 0.01$) and had a worse outcome of primary illness ($p < 0.05$). Mortality of elderly visited in August was significantly higher compared to November (5% vs. 2%, $p < 0.01$). The sole independent predictor of mortality was patient's bedridden status [adjusted odds ratio (OR) = 5.59, 95% confidence intervals (CI) 2.83–11.06, $p < 0.001$]. The identified independent predictors of recommendation for emergency hospitalization were patient's lethargic status [OR = 2.88 (1.80, 4.59), $p < 0.001$], fever [OR = 2.55 (1.84, 3.54), $p < 0.001$], heat stroke [OR = 2.08 (1.19, 3.64), $p = 0.01$], Alzheimer's disease [OR = 1.77 (1.15, 2.72), $p = 0.01$] and bedridden status [OR = 1.45 (1.07, 1.97), $p < 0.05$]. **Conclusion:** Morbidity and mortality of elderly patients was significantly higher in August compared with November, substantiating the informal term 'Augustitis' for the Greek elderly. Large, prospective population-based studies are warranted to further enlighten this field.

What's known
Previous studies have shown that there are some noteworthy changes in morbidity and mortality depending on the season. However, most of these studies have not focused on specific patient populations.

What's new
We compared the morbidity and mortality of elderly patients (≥ 75 years old) in August and November in the area of Attica, Greece. • Morbidity and mortality of elderly patients was significantly higher in August compared with November, substantiating the informal term 'Augustitis' for the Greek elderly.

Introduction

The elderly constitute a steadily growing patient population. In Western Europe, 17.8% of the population aged 65 years or older in 2008; 8.5% aged at least 75 years (1). Greece is ranked 4th among the 'world's oldest countries'; 19.1% of the population was 65 years and older in 2008 (1). The elderly are associated with specific patterns of morbidity, with chronic, non-communicable diseases comprising most of the cases. The heavier burden of disease in elderly living in high-income countries in 2001 was considered to derive (in descending order) from ischaemic heart disease, cerebrovascular disease, depression, Alzheimer's disease (and other dementias), lung and respiratory tract cancers, hearing loss, chronic obstructive pulmonary disease, diabetes mellitus, alcohol abuse and osteoarthritis (2).

As a result of the common above-mentioned types of comorbidity of various severity, polypharmacy, as well as social factors (including neglection/abandonment), elderly, frail individuals are considered as more vulnerable to specific types of morbidity. Specifically, climatic changes seem to have a greater impact on elderly compared with younger individuals. In particular, excess elderly mortality has been reported during heat waves. Of note, elderly women (> 75 years) are considered to be affected the most (3,4). Winter has also been associated with excess cardiovascular mortality in the elderly (5), while influenza-related mortality in the elderly was also high (6). In addition, published evidence suggests

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that in-hospital mortality is considerably high for elderly patients (7). In this regard, outpatient, primary care health services seem to be valuable for this subpopulation (8).

In our clinical practice, we have experienced a consistent increase in the morbidity of elderly in Greece during August. In this regard, physicians sometimes refer to this observation using the informal term 'Augustitis'. The SOS Doctors comprise a network of physicians performing house-call visits, which is primarily utilized by the elderly (9). In this context, using data from the SOS Doctors, we sought to prospectively evaluate the comparative morbidity of elderly between August and November of the same year (2010).

Methods

Ethics statement

The study was approved by the ethics committee of the SOS Doctors network. Written informed consent was not considered necessary by the ethics committee.

Study design and patient population

We conducted a prospective observational study. For each patient, a standardized case report form was completed by the physician on-site and a follow-up call was performed 1 week later by a secretary of the SOS Doctors. The data collection took place for 3 weeks in August (8/2/2010–8/22/2010) and 3 weeks in November (11/1/2010–11/21/2010). The study population comprised of all patients ≥ 75 years old who requested medical services from the SOS Doctors in Attica, Greece during the study periods. The study was approved by the Ethics Committees of SOS Doctors, Greece and the Alfa Institute of Biomedical Sciences (AIBS), Athens, Greece.

Data collection

The collected data consisted of the date and time of physician visit, patients' demographics (i.e. age, gender, marital status, living conditions), morbidity (i.e. primary illness and comorbidity, need for hospitalization), and management, as well as the evolution of the patients' primary illness and overall health status. We analysed the data and compared the two patient groups (August vs. November) with regard to these variables.

Definitions of analysed outcomes

Our primary outcomes were *mortality* (1-week, all-cause mortality) and physician's *recommendation for emergency hospitalization*. Secondary outcomes included the *outcome of patients' primary illness* (improved, stable or deteriorated) and *overall health status* (improved, stable or deteriorated), assessed at the follow-up.

Data analysis

To identify any differences with regard to the evaluated outcomes between the compared groups, we performed a univariate analysis for both primary and secondary outcomes. In addition, to identify any factors independently associated with the primary outcomes we performed a multivariate analysis.

Continuous patient characteristics (i.e. age) were compared between the groups using the Student's *t*-test (for normally distributed variables) or Wilcoxon rank-sum test (for non-parametric variables). Categorical variables (i.e. gender) were compared using the χ^2 test. For multivariate analyses, we used binary logistic regression models. Variables having a significant association ($p < 0.1$) with the examined outcomes in the univariate analysis were entered in a multivariate backward, stepwise, binary logistic regression model and the adjusted odds ratios (OR) and 95% confidence intervals (CI) were calculated. All analyses were performed with SPSS 17.0 software (SPSS Inc., Chicago, IL, USA). A p-value of < 0.05 was considered as indicative of statistical significance.

Results

The SOS Doctors received 2108 and 1718 calls during the specified time periods in August and November respectively. Elderly patients (≥ 75 years old) accounted for 61% (1285/2108) and 52% (901/1718) of calls for August and November respectively ($p < 0.001$). Prospective data were recorded for 739 elderly patients in August (58%) and 738 in November (82%), ($p < 0.001$).

Overall, the primary illness was most commonly classified by the visiting physician as a cardiovascular (17.6%), musculoskeletal (10.7%), gastrointestinal (9.5%), respiratory (8.5%), renal/genitourinary (8.1%) or neurological/psychiatric (7.9%) disease, while in many cases the diagnosis was not initially apparent (non-specific medical conditions: 15.1%). The frequency of these diagnoses, distributed by month, is presented in Figure 1. Regarding the elderly patients who eventually died, the primary illness was most commonly classified as a respiratory (18.5%), cardiovascular (16.7%), or neurological/psychiatric (7.4%) disease or a non-specific medical condition (13%).

August vs. November

Patient characteristics for both the evaluated periods are depicted in Table 1. Patients visited in August

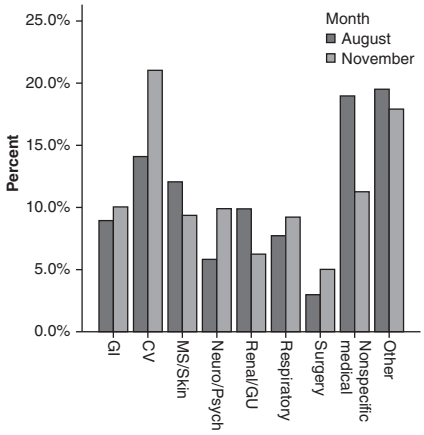

Figure 1 Primary illness assigned by the visiting physician (GI, gastrointestinal; CV, cardiovascular; MS, musculoskeletal; GU, genitourinary.)

were more likely to be older and not married (single, divorced or widowed). They were more likely to be taken care of by a maid (solely, or in addition to family, neighbours, and/or friends) or not be taken care of by anyone. They were more likely to be bedridden, to be fed *via* a nasogastric or gastrostomy/jejunostomy tube and to have had some recent changes in their life (i.e. abandonment, death in close environment). More elderly patients in August were febrile, suffered a heat stroke and were considered lethargic by the visiting physician (detailed data are presented in Table 1). Patients visited in August were significantly more likely to suffer from a renal/genitourinary disorder ($p = 0.013$) or a nonspecific medical condition ($p < 0.001$), compared with those visited in November (Figure 1). Patients visited in August were less likely to suffer from a cardiovascular ($p < 0.001$) or neurological/psychiatric ($p = 0.004$) disease.

In addition, more elderly patients in August were recommended to be hospitalized as an emergency, compared with November (22% vs. 17%, $p = 0.007$) and more patients were eventually hospitalized (17% vs. 12%, $p = 0.005$). The initial assessment of the patients' primary illness, as well as its eventual

Table 1 Univariate analysis of patient characteristics and outcomes evaluated in August vs. November

Variable	Total $N = 1477$*	August $N_1 = 739$*	November $N_2 = 738$*	p-value
Age (median, quartiles)	84 [80, 88]	85 [80, 89]	84 [80, 88]	**< 0.01**
Gender (female)	58%	59%	57%	0.39
Marital status (married)	35%	32%	38%	**< 0.05**
Lives with (alone)	15%	14%	17%	0.12
Cared by				
(no one)	4%	7%	0	**< 0.001**
(maid)	40%	45%	36%	**< 0.001**
Recent changes (stressors)	10%	13%	8%	**0.001**
Bedridden	30%	34%	26%	**0.001**
Permanent Foley	13%	14%	13%	0.48
Febrile	20%	27%	14%	**< 0.001**
Heat stroke	5%	9%	1%	**< 0.001**
On antidepressants/sedatives	36%	38%	33%	0.054
Parkinson's disease	4%	4%	4%	0.58
Alzheimer's disease	9%	9%	9%	0.58
Agitated	4%	4%	5%	0.12
Lethargic	7%	9%	5%	**0.001**
OPAT	3%	3%	3%	0.63
Recent hospitalization	24%	25%	23%	0.46
Recent nursing home	1%	1%	1%	0.80
Feeding (other than PO)	5%	7%	4%	**< 0.05**
Recommended emergency hospitalization	21%	23%	18%	**< 0.01**
Emergency hospitalization	15%	17%	12%	**< 0.01**
Mortality	4%	5%	2%	**< 0.01**

OPAT, outpatient parenteral antimicrobial therapy; PO, per os. Statistically significant variables ($p < 0.05$) are in bold. *The number of patients may be slightly lower for some variables due to limited data.

outcome was worse for patients visited during August. More patients visited during August died compared with November (5% vs. 2%, p = 0.003).

Mortality and recommendation for emergency hospitalization

The patient characteristics that were found to be significantly associated with mortality in the respective univariate analysis are presented in Table 2; unfavourable initial assessment of primary illness, recommendation for emergency hospitalization, emergency hospitalization, outcome of primary illness and outcome of overall health status were found to be significantly associated with mortality (p < 0.001). On multivariate analysis, only patient's bedridden status was independently associated with mortality [adjusted odds ratio (OR) = 5.59 (95% CI: 2.83, 11.06), p < 0.001].

The patient characteristics significantly associated with physician's recommendation for emergency hospitalization in the respective univariate analysis are presented in Table 3; initial assessment of primary illness, outcome of primary illness, outcome of overall health status and mortality were significantly associated with recommendation for emergency hospitalization (p < 0.001). On multivariate analysis, factors independently associated with recommendation for emergency hospitalization were patient's lethargic status [OR = 2.88 (1.80, 4.59), p < 0.001], fever [OR = 2.55 (1.84, 3.54), p < 0.001], heat stroke [OR = 2.08 (1.19, 3.64), p = 0.01], Alzheimer's disease [OR = 1.77 (1.15, 2.72), p = 0.01] and confine-

Table 2 Univariate analysis regarding patient characteristics associated with mortality

Variable	Death $N_1 = 54$*	Survival $N_2 = 1395$*	p-value
Month (August)	70%	50%	**< 0.01**
Age (median, quartiles)	86 [84, 89]	84 [80, 88]	**< 0.01**
Gender (female)	52%	58%	0.41
Marital status (married)	44%	35%	0.14
Lives with (alone)	2%	16%	**< 0.01**
Cared by			
(no one)	0	4%	0.14
(maid)	67%	40%	**< 0.001**
Recent changes (stressors)	7%	10%	0.48
Bedridden	75%	28%	**< 0.001**
Permanent Foley	26%	13%	**< 0.01**
Febrile	37%	20%	**< 0.01**
Heat stroke	9%	5%	0.18
On antidepressants/ sedatives	33%	36%	0.68
Parkinson's disease	6%	4%	0.51
Alzheimer's disease	7%	9%	0.67
Agitated	4%	4%	0.83
Lethargic	19%	6%	**< 0.001**
OPAT	6%	3%	0.20
Recent hospitalization	40%	23%	**< 0.01**
Recent nursing home	2%	1%	0.54
Feeding (other than PO)	15%	5%	**< 0.01**

OPAT, outpatient parenteral antimicrobial therapy; PO, per os. Statistically significant variables (p < 0.05) are in bold.
*The number of patients may be slightly lower for some variables due to limited data.

Table 3 Univariate analysis regarding patient characteristics associated with physician's recommendation for emergency hospitalization

	Recommended emergency hospitalization		
Variable	Yes $N_1 = 291$*	No $N_2 = 1126$*	p-value
Month (August)	57%	48%	**< 0.01**
Age (median, quartiles)	85 [80, 89]	84 [80, 88]	0.07
Gender (female)	56%	58%	0.53
Marital status (married)	33%	35%	0.52
Lives with (alone)	12%	16%	0.08
Cared by			
(no one)	3%	4%	0.47
(maid)	47%	38%	**< 0.01**
Recent changes (stressors)	12%	9%	0.18
Bedridden	44%	27%	**< 0.001**
Permanent Foley	15%	13%	0.31
Febrile	39%	16%	**< 0.001**
Heat stroke	13%	3%	**< 0.001**
On antidepressants/ sedatives	37%	35%	0.46
Parkinson's disease	4%	4%	0.65
Alzheimer's disease	14%	8%	**0.001**
Agitated	3%	5%	0.18
Lethargic	15%	5%	**< 0.001**
OPAT	5%	2%	**0.01**
Recent hospitalization	31%	22%	**0.001**
Recent nursing home	1%	1%	0.88
Feeding (other than PO)	7%	5%	0.19

OPAT, outpatient parenteral antimicrobial therapy; PO, per os. Statistically significant variables (p < 0.05) are in bold.
*The number of patients may be slightly lower for some variables due to limited data.

Table 4 Univariate analysis regarding patient characteristics associated with the outcome of primary illness

	Primary illness			
Variable	Improved N_1 = 701*	Stable N_2 = 140*	Deteriorated N_3 = 58*	p-value
Month (August)	48%	43%	64%	**< 0.05**
Age (median, quartiles)	84 [80, 87]	85 [82, 90]	84 [80, 89]	**< 0.01**
Gender (female)	60%	52%	48%	0.09
Marital status (married)	35%	36%	43%	0.47
Lives with (alone)	16%	15%	9%	0.33
Cared by				
(no one)	4%	2%	0	0.18
(maid)	38%	43%	47%	0.31
Recent changes (stressors)	10%	13%	10%	0.69
Bedridden	20%	31%	43%	**< 0.001**
Permanent Foley	8%	13%	20%	**0.001**
Febrile	22%	12%	39%	**< 0.001**
Heat stroke	6%	4%	9%	0.35
On antidepressants/sedatives	36%	30%	46%	0.08
Parkinson's disease	4%	4%	2%	0.73
Alzheimer's disease	9%	11%	12%	0.52
Agitated	3%	4%	3%	0.96
Lethargic	6%	4%	19%	**< 0.001**
OPAT	2%	3%	9%	**0.01**
Recent hospitalization	18%	25%	35%	**< 0.01**
Recent nursing home	0.3%	0.8%	2%	0.24
Feeding (other than PO)	3%	4%	11%	**< 0.01**

OPAT, outpatient parenteral antimicrobial therapy; PO, per os. Statistically significant variables ($p < 0.05$) are in bold. *The number of patients may be slightly lower for some variables due to limited data.

ment to bed [adjusted odds ratio (OR) = 1.45 (95% CI: 1.07, 1.97), $p < 0.05$].

Outcome of primary illness and overall health status

Older, bedridden, febrile, lethargic and recently hospitalized patients, as well as patients with a permanent Foley catheter and those fed via a nasogastric or gastrostomy/jejunostomy tube were more likely to have a worse outcome in both primary illness (Table 4) and overall health status (Table 5). Elderly visited in August and those who received outpatient parenteral antimicrobial therapy (OPAT) were more likely to have a worse outcome in their primary illness (Table 4), whereas elderly taken care of by a maid were more likely to experience deterioration in their overall health status (Table 5). Outcome of primary illness and overall health status were also significantly associated with unfavourable initial assessment of primary illness, recommendation for emergency hospitalization, actual emergency hospitalization and mortality ($p < 0.001$, Tables 4 and 5).

Discussion

Our findings support our initial hypothesis and substantiate the informal term 'Augustitis' for the Greek elderly. Specifically, in August, more elderly patients requested the services of SOS Doctors (compared with November), they carried a heavier burden of disease (i.e. bedridden, fed *via* a nasogastric or gastrostomy/jejunostomy tube), were more frequently recommended emergency hospitalization and the outcome of their primary illness was worse. Notably, mortality of elderly patients visited by the SOS Doctors during August was significantly higher compared with November (38/739 vs. 16/738, $p < 0.01$).

The above findings suggest that elderly patients requesting medical services by the SOS Doctors in August were 'sicker' than those of November. This heavier burden of disease may be attributed to the fact that the majority of families in Greece leave for vacation during August and thus the elderly are not cared for as much. The increased rate of maid employment during August (45% in August vs. 36% in November, $p < 0.001$) is indicative of this hypoth-

Table 5 Univariate analysis regarding patient characteristics associated with the outcome of overall health status

	Overall health status			
Variable	**Improved** $N_1 = 621$*	**Stable** $N_2 = 193$*	**Deteriorated** $N_3 = 118$*	**p-value**
Month (August)	49%	48%	59%	0.13
Age (median, quartiles)	84 [80, 87]	85 [81, 90]	85 [82, 88]	**< 0.01**
Gender (female)	60%	55%	52%	0.20
Marital status (married)	35%	35%	42%	0.42
Lives with (alone)	16%	14%	9%	0.15
Cared by				
(no one)	4%	3%	0	0.08
(maid)	38%	44%	52%	**0.01**
Recent changes (stressors)	10%	14%	9%	0.31
Bedridden	19%	28%	56%	**< 0.001**
Permanent Foley	7%	11%	21%	**< 0.001**
Febrile	21%	19%	36%	**0.001**
Heat stroke	6%	5%	8%	0.56
On antidepressants/sedatives	35%	35%	38%	0.82
Parkinson's disease	3%	4%	6%	0.42
Alzheimer's disease	8%	12%	9%	0.15
Agitated	3%	3%	4%	0.84
Lethargic	6%	5%	14%	**0.001**
OPAT	2%	3%	6%	0.06
Recent hospitalization	17%	24%	36%	**< 0.001**
Recent nursing home	0.2%	1%	2%	0.06
Feeding (other than PO)	2%	2%	13%	**< 0.001**

OPAT, outpatient parenteral antimicrobial therapy; PO, per os. Statistically significant variables ($p < 0.05$) are in bold. *The number of patients may be slightly lower for some variables due to limited data.

esis. Patients who are taken care of by a maid may seek medical services later in the course of the disease for various reasons, such as financial concerns and potentially the language barrier; this in turn may lead to unfavourable outcomes.

Another factor that may contribute to the excess morbidity and mortality of elderly patients presenting in August has a behavioural basis. When a personal health issue arises during vacation time (e.g. in July/August), people often tend to postpone addressing this until after they get back home. This would lead to increased morbidity qualitatively, including mortality (since people present later in the course of the disease), but decreased morbidity quantitatively (thus fewer house-call visits from the SOS Doctors), since mild diseases often remit spontaneously. In that occasion, the relative increase in the number of calls during August may be attributed to the absence of the elderly patients' families and the increased rate of maid employment, as maids are less likely to drive the elderly patient to a hospital and more likely to make use of the services of SOS Doctors.

One may have anticipated that older, bedridden, lethargic or recently hospitalized patients, as well as those with a permanent Foley catheter or fed via a nasogastric or gastrostomy/jejunostomy tube, are more prone to die as a result of heavier burden of disease. On the other hand, we were surprised to witness that patients living alone were less likely to die ($p < 0.01$) and the patients taken care of by a maid (solely, or in addition to family, neighbours, and/or friends) were more likely to die ($p < 0.001$). This could be explained by the fact that patients with a heavier burden of disease are less likely to live alone and more likely to employ a maid. Yet, only patient's bedridden status was identified as an independent predictor of mortality on multivariate analysis. Of note, confinement to bed was identified as the strongest predictor of mortality during the heat-wave of 1995 in Chicago in a big case-control study including a considerable number of elderly (≥ 75 years) individuals (46% of the evaluated cases) (10).

We used November as a contrast to August after contemplation. November is unique in being a 'neutral' month, unlike September (which was shown to bear the lowest crude mortality rates in the European Mediterranean countries during the last 50 years) (11), and October (which may share some of the

characteristics of the '*September phenomenon*'). The summer months have been associated with increased risk for lower urinary tract infections in Greece (12), whereas the heat waves have been associated with significant excess elderly cardiovascular mortality (13,14). In contrast, the winter months have long ago been associated with excess elderly morbidity and mortality as a result of cardiovascular and respiratory disease (15–17).

Even though our observations derive from the evaluation of data regarding a specific clinical setting, one may speculate that they may also apply to other countries with similar socioeconomic status, climatic conditions and vacation patterns. Of note, a previous study reported a specific pattern of seasonality of mortality which applied to all Mediterranean countries reviewed (11). In this context, this increased morbidity of elderly patients in August, compared with a typical winter month, may also be observed in other Mediterranean countries including Italy, Cyprus, and Turkey.

Our study should be interpreted in view of certain limitations. First, data were collected only for a subset of physician house calls (58% in August, 82% in November). This may probably be attributed to reduced compliance of the participating physicians during the first part of the study (August). In addition, one might acknowledge that the patients requesting the services of SOS Doctors are not totally representative of the general population and thus the extrapolation of our findings to the general population should be done cautiously. Moreover, some variables were not recorded by the physicians, and not all patients could be reached in the follow-up call, thus relevant data on the outcomes of some patients was not available. However, the large sample allowed us to perform proper multivariate analyses on the primary outcomes. Despite the above-mentioned limitations, our findings are valuable for the description and the comprehension of the 'phenomenon' of 'Augustitis'. This is the first study to our knowledge specifically analysing the morbidity of elderly patients in August.

In conclusion, elderly patients requesting medical services from a network of physicians performing house-call visits in Attica, Greece were more likely to carry a heavy burden of disease in August compared with November. Additionally, elderly patients visited in August were more frequently recommended emergency hospitalization. Mortality of elderly patients in August was also higher compared with November. Large, prospective population-based studies are warranted to precisely determine and analyse the seasonality of morbidity and mortality of the elderly.

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