SCIENTIFIC LETTERS

Seasonal analysis of blood cultures sent from a hospital emergency department

Análisis estacional de los hemocultivos solicitados desde un servicio de urgencias hospitalario

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We have read with interest the article by Ferreras Amez et al.[1] which analyzes the seasonal factor in requests for blood cultures made by hospital emergency departments (ED). This diagnostic technique is being used with increasing frequency and it seems necessary to study its usefulness in the ED in greater depth[2]. Considering the interesting results[2], we believe that in order to analyze a seasonal or temporal association it is necessary to cover a longer period of time than that analyzed by the authors (2 years), which would allow us to study both the trend of the series and their seasonality with greater precision.

This paper presents a small analysis of blood cultures requested among patients over 18 years of age in the ED of the Hospital Universitario Río Hortega de Valladolid during the last six-year period, from January 1, 2014 to December 31, 2019. In a complementary view to the original1, a study was carried out using a monthly and annual analysis of the following variables: total number of blood culture requests, number of daily requests, diagnostic yield (number of bacteremias/number of requests), contamination rate (contaminated blood cultures/total vials). Contamination was defined as the presence of coagulase-negative *Staphylococcus* or gram-positive microbiota. A temporal analysis was carried out using a monthly seasonal decomposition by the multiplicative method, adjusted for the size of the months. In this way, the value of the seasonal component of each month of the year is obtained, referencing this data with the value 100%, which implies a month without seasonal variation. Pearson's correlation coefficient was also used to relate the variables analyzed with the average monthly temperature of the city of Valladolid.

In the period studied, a total of 41,300 vials were analyzed, corresponding to 9,826 requests, of which 14.6% were positive. A great variability is observed in the years studied, although the trend in the last 2 years is that more and more positive results have been documented, 21.4% in the last year, a higher prevalence than that observed by Farreras Amez et al.[1] but in line with other Spanish studies[3]. In the monthly seasonal decomposition, more requests were observed in January. The difference between the number of daily requests observed in this month and each of the others was always higher than 18%, even reaching 30% higher than that observed in the adjacent month of February ($p < 0.01$ -corrected for the multiplicity of comparisons- for the difference between January and each of the other months) (Table 1, Figure 1). We have also observed that in August a higher diagnostic yield is achieved and in June is when the highest contamination rate is obtained, although here the differences with the other months are not so large (Table 1). The mean monthly temperature did not show a statistically significant relationship with the monthly number of requests, diagnostic yield and contamination rate (with explained variability values in all cases, less than 2%).

Table 1. Monthly and annual distribution of the variables analyzed and seasonal factors of the monthly seasonal decomposition

Month	Applications[1] n (%)	Applications/day[2]	Profitability[3] n (%)	Total Vials[4] n (%)	Contamination Rate[5] n (%)	SF[6] Applications/day	SF[6] Profitability	SF[6] Contamination rate
January	1,073 (10.9)	5.76	155 (14.4)	4,638 (11.2)	244 (5.3)	130.1%	99.4%	111.8%
February	750 (7.6)	4.43	84 (11.2)	3,185 (7.7)	159 (5.0)	104.2%	79.2%	107.0%
March	864 (8.8)	4.64	115 (13.3)	3,678 (8.9)	167 (4.5)	103.3%	91.5%	96.5%
April	725 (7.3)	4.02	94 (13.0)	3,071 (7.4)	150 (4.9)	93.0%	89.2%	103.8%
May	702 (7.1)	3.77	114 (16.2)	2,972 (7.2)	122 (4.1)	84.6%	111.8%	87.3%
June	846 (8.6)	4.70	103 (12.2)	3,562 (8.6)	216 (6.0)	105.2%	83.8%	128.9%
July	903 (9.2)	4.85	130 (14.4)	3,803 (9.2)	190 (5.0)	107.6%	99.0%	106.2%
August	860 (8.7)	4.62	166 (19.3)	3,559 (8.6)	159 (4.5)	102.1%	132.8%	94.9%
September	697 (7.0)	3.87	103 (14.8)	2,900 (7.0)	136 (4.7)	84.2%	101.7%	99.8%
October	770 (7.8)	4.13	119 (15.4)	3,175 (7.7)	133 (4.2)	91.5%	106.3%	88.9%
November	772 (7.6)	4.28	122 (15.8)	3,165 (7.7)	129 (4.0)	92.3%	108.8%	86.6%
December	864 (8.8)	4.64	135 (15.6)	3,592 (8.7)	162 (4.5)	101.8%	107.5%	95.9%
Year								
2014	1,401 (14.2)	3.83	193 (13.8)	6,483 (15.7)	281 (4.3)			
2015	1,420 (14.4)	3.89	114 (8.0)	6,628 (16.0)	302 (4.6)			
2016	1,715 (17.4)	4.68	170 (9.9)	7,182 (17.4)	328 (4.6)			
2017	1,594 (16.2)	4.37	221 (13.9)	6,350 (15.4)	248 (3.9)			
2018	1,992 (20.3)	5.45	377 (18.9)	7,915 (19.2)	419 (5.3)			
2019	1,704 (17.3)	4.66	365 (21.4)	6,742 (16.3)	384 (5.7)			
Total	9,826 (100)	4.48	1,440 (14.6)	41,300 (100)	1,967 (4.8)			

[1]n: number of applications. %: (number of requests/total requests) x 100. [2]n: number of daily requests adjusting for days of each month. [3]n: number of bacteremias. %: (number of bacteremias/total monthly or annual requests) x 100. [4]n: number of vials. %: (number of vials/total vials) x 100. [5]n: number of contaminated vials. %: (number of contaminated vials/total vials monthly or yearly) x 100. [6]FE: seasonal factor of monthly seasonal decomposition.

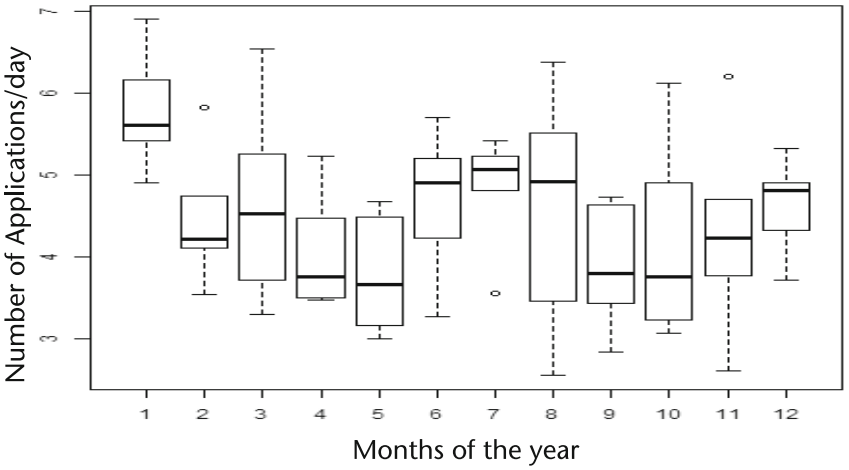

Figure 1. Box plot of the distribution of daily requests adjusted by days of each month.

Although our data indicate that there may be an association between the variables analyzed and the seasons of the year[1], we believe that this association is not so much due to the time of year but to effects linked to shorter periods of the year, such as months, both in blood culture requests and in cost-effectiveness or contamination. Finally, we believe that this type of epidemiological analysis should be carried out with greater temporal precision, preferably monthly, such as that presented here, or even weekly. This could help not only to improve the coordination of the services involved, such as the ED and the microbiology service, but also to know the trends of bacterial isolates and the study of their sensitivity and resistance profiles and, in this way, improve both control measures and diagnostic and therapeutic measures from the beginning of emergency care[1,4,5].

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