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Influenza vaccine coverage and the attack rate of influenza-like illness among the elderly in Portugal: is there a correlation?

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Vaccination of the elderly (≥ 65 years of age) against influenza is recommended in all European countries and believed to significantly reduce influenza-related morbidity and mortality [1]. However, there have been relatively few studies on the relationship between the vaccine coverage and the attack rate of influenza-like illness (ILI), and their results have differed [2,3,4]. The study described in this paper aimed at establishing the correlation between the influenza vaccine coverage rates and the rates of ILI among Portuguese population aged 65 years and older, during the influenza seasons 1998-1999 to 2006-2007.

Methodology
Influenza vaccine coverage rates

The influenza vaccine coverage rates were obtained from ECOS (Em Casa Observamos Saúde - At Home We Watch Health) [5], a survey of approximately 1,000 households carried out by computer-assisted telephone interview (CATI) [6]. These households were selected randomly from the national telephone directory and recruited considering the representativity of mainland Portuguese families with telephone.

The influenza vaccination surveys, for each influenza season, have been carried out every spring since 1999. In each household, information on the vaccine uptake was obtained from one respondent (aged 18 years or more) on him- or herself and his or her cohabitants. Vaccine coverage estimates are available for the seasons between 1998/1999 and 2006/2007 (with the exception of the 1999/2000 season) by age groups for the country and for each region in Portugal. In this study, we used the data on vaccine coverage of the respondents aged 65 years or older, resident in mainland Portugal.

ILI attack rates

The data on ILI attack rates were obtained from the Portuguese Sentinel Network Médicos-Sentinela (MS). In Portugal, general practitioners (GPs) have been collaborating continuously on influenza surveillance since 1990, providing clinical data to the National Observatory of Health on a weekly basis. The number of new episodes of influenza occurring in patients on the GPs' lists is available for the last 18 years, as well as the weekly estimates of the ILI incidence rate (per 100,000 inhabitants) by age group and sex for the whole country [7].

For the purpose of our study, attack rates were obtained by summing up all weekly ILI incidence rates for the period between week 40 (beginning of October) and week 14 of the next year (end of

rates for the period between week 10 (beginning of October) and week 14 of the next year (end of March) (cumulative incidence rate).

The incidence rates calculated through the GP sentinel network are believed to be underestimated for several reasons, such as patients do not always seek medical assistance when ill with ILI or they consult another doctor or health service. Therefore, a correction of the seasonal attack rates was introduced using the proportion of 0.30 ILI patients aged 65 years and older that consult their GPs, obtained from a previous study [8]. The association between the corrected attack rate for the period defined above (week 40 to week 14) with vaccine coverage was measured by the Pearson and Spearman correlation coefficients. Note that since the correction factor is constant for all the seasons in the study, the correlation coefficients obtained are not affected. A linear time trend was evaluated for values of vaccine coverage and attack rate for the study period (1998-1999 to 2006-2007) through correlation coefficients.

All results were obtained with the use of statistics program package SPSS 14.0.

Results

For the period between 1998-1999 and 2006-2007, no statistically significant linear time trends for vaccine coverage or attack rate were found, indicating that there was no evolution pattern in these parameters during the study period.

The table and figure below show the relation between vaccine coverage and attack rate among the Portuguese population aged 65 years and older during the study period. From the analysis of these results, and without taking into consideration the dominant sub-type of virus, the correlation between vaccine coverage and attack rate was very weak and not statistically significant - Pearson $r=-0.534$, $p=0.173$; Spearman $r_s=-0.359$, $p=0.382$) (in 8 seasons). On the other hand, restricting the analysis to the A(H3) influenza dominant sub-type virus (in 6 seasons), a negative linear correlation was found between vaccine coverage and attack rate - Pearson $r=-0.911$, $p=0.011$; Spearman $r_s=-0.899$, $p=0.015$, suggesting a concomitant variation of vaccine coverage and attack rate.

Table. Vaccine coverage rates and ILI attack rates in the age group ≥ 65 years, and dominant sub-type virus for seasons 1998-1999 to 2006-2007, Portugal

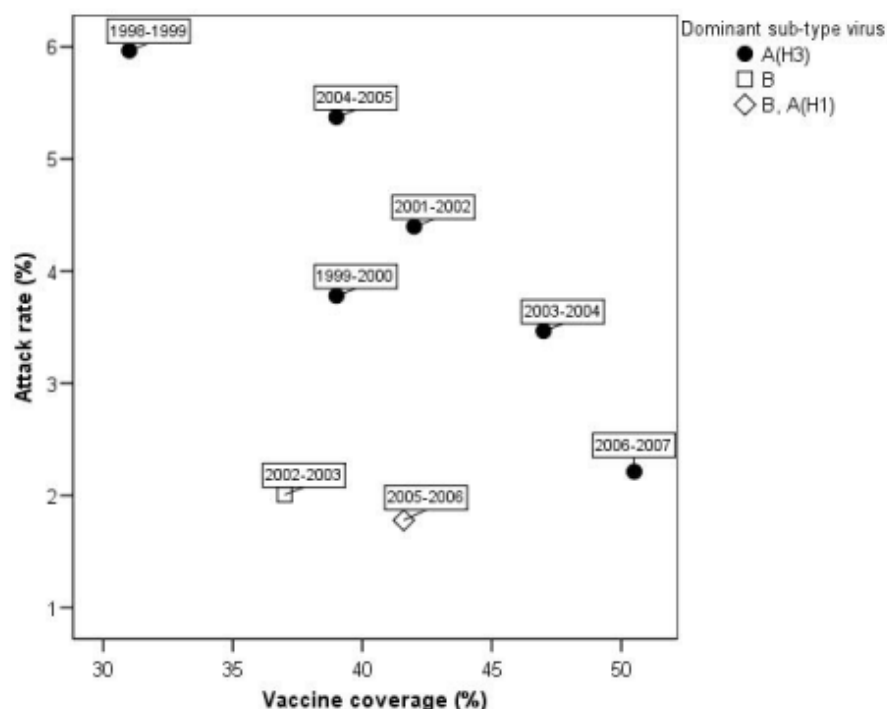
Season	Vaccine coverage (%)	Attack rate (%)	Dominant sub-type of virus [9]
1998-1999	31.3	5.96	A(H3)
1999-2000	39	3.78	A(H3)
2000-2001	n.a.	1.81	B
2001-2002	41.9	4.4	A(H3)
2002-2003	36.9	2.01	B
2003-2004	46.9	3.47	A(H3)
2004-2005	39	5.37	A(H3)
2005-2006	41.6	1.78	B, A(H1)*
2006-2007	50.4	2.21	A(H3)

n.a. - not available

* B, A(H1): no season-dominant sub type of virus [10].

Figure. Scatter plot of the vaccine coverage rates versus the ILI attack rates in the age group ≥ 65

Figure. Scatter plot of the vaccine coverage rates versus the ILI attack rates in the age group ≥ 65 years according to the dominant sub-type virus for seasons 1998-1999 to 2006-2007



Conclusion

In this study, conducted on the Portuguese population aged 65 years and older, a negative linear correlation was found between the vaccine coverage and the ILI attack rate, in seasons with A(H3) dominant sub-type virus.

Considering all the seasons together, no significant correlation between vaccine coverage and the ILI attack rates was found, probably because ILI attack rates during the A(H3)-dominant seasons are usually higher than those associated with other dominant types of virus, which increases the data dispersion. On the other hand, as the non A(H3)-dominant seasons were only two, no correlation coefficient was calculated.

The season attack rates were obtained by summing up all the weekly ILI incidence rates, obtained with clinical diagnosed cases, including some without virological confirmation. This may have led to an underestimation of the correlation coefficients, although the authors consider it unlikely as the obtained coefficients are so high that any underestimation would be irrelevant. This limitation could be overcome by considering only the rates calculated with laboratory-confirmed cases. This has not been done given the instability of the rate estimates caused by the small proportion (and absolute number) of cases with a laboratory-confirmed diagnosis.

Although this is an ecological study, with known limitations (the data is not individual-based and potential confounders are not available precluding the possibility of adjustment), the results suggest an impact of vaccine coverage on attack rates of ILI, in the elderly, at least in seasons with A(H3) dominant sub-type virus. Hence the authors considered it useful to report these results and thus contribute to the discussion on the impact of influenza vaccine coverage in reducing the burden of disease at a community level across Europe.

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