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Short Communication

DAI (Disease Aggressiveness Index) Implementation

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Abstract

Although the basic concept of disease aggressiveness has always been used to describe several pathologies, especially defining cancer, a general mathematic formula associated to such a parameter is still lacking. Interestingly, only within the discipline of Plant Pathology investigators were able to develop a Composite Aggressiveness Index (CAI) relative to Phytophora infestans activity on potatoes. This very index was used as a template to develop the formula of DAI (Disease Aggressiveness Index). Taking together all the above evaluations and results, it can be inferred that DAI (Disease Aggressiveness Index) could become a very useful tool to mathematically compare diseases and thus set economical prioritization strategies. Nevertheless, such an index could be very useful and supportive to act as a correction coefficient for predictive algorithms..

Introduction

Although the basic concept of disease aggressiveness has always been used to describe several pathologies, especially defining cancer [1-3], a general mathematic formula associated to such a parameter is still lacking. The tool that comes closest to such an idea in human medicine is a scoring system developed to better define the enzymology of hepatocellular carcinoma [4]. Interestingly, only within the discipline of Plant Pathology investigators were able to develop a Composite Aggressiveness Index (CAI) relative to Phytophora infestans activity on potatoes [5]. This very index was used as a template to develop the formula of DAI (Disease Aggressiveness Index), as described below. Such a system was conceived in order to provide biostatistics of a tool able to both better classify diseases and integrate predictive models such as MuSER and E-Muser [6-8].

Methods & Results

The hereby developed Disease Aggressiveness Index (DAI) is based on the CAI (Composite Aggressiveness Index) formula [5]:

$$(a) \quad CAI = IF * LS * SC / LP$$

in which IF: Infection Frequency, LS: Lesion Size (mm2), SC: Sporulation Capacity and LP: Latent Infection Period. Since such an equation was designed to define plant infections, all variables were converted to human epidemiological ones.

$$(b) \quad DAI = I * LS * P / MOA * 105$$

in which DAI: Disease Aggressiveness Index, I: Incidence, LS: Lesion Size (mm2), P: Prevalence and MOA (Mean Onset Age). After trying some comparative calculus, it became clear that the correction coefficient (i.e. 105) was necessary to make the resulting value comfortable and usable. The following elaboration was made about Multiple Sclerosis 2017 worldwide data:

(c) DAI = 0.00073 * 36 * 0.02348 / 35 = 0.00001763 (or 1.76 * 10-5)

(d) DAI = 0.00073 * 36 * 0.02348 / 35 * 105 = 1.76

Table 1: Disease Aggressiveness Index (DAI) calculated for some severe diseases. LS: Lesion Size; MOA: Mean Age at Onset.

Disease	Incidence	LS (mm^2)	Prevalence	MOA	DAI
HIV	1942100 [9]	NA	36822200 [9]	15 [10]	4.77 * 1012
Tuberculosis	1929208600 [9]	56.25 [11]	8965800 [9]	All ages	9.77 * 1017
Stomach cancer	1220700 [9]	9 [12]	2823200	68 [13]	4.56 * 1011
Colon cancer	1833500 [9]	20.25 [14]	9352300 [9]	32 [15]	1.09 * 1013
Stroke	11931100 [9]	3.80 [16]	104178700 [9]	69 [17]	6.85 * 1013

The present work also reports a computation about worldwide DAIs (year 2017) relative to different disease, in order to compare them to each other and make some evaluations (Table 1).

Conclusion

Taking together all the above evaluations and results, it can be inferred that DAI (Disease Aggressiveness Index) could become a very useful tool to mathematically compare diseases and thus set economical prioritization strategies. Nevertheless, such an index could be very useful and supportive to act as a correction coefficient for predictive algorithms.

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Conflict of Interest

No conflict of interest.

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