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Economic Burden of Inadequate Management of Allergic Diseases in the European Union: a GA²LEN Review

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Summary

Background: In the European Union (EU) between 44 and 76 million individuals of the 217 million EU-employees suffer from allergic disease of the airways or the skin. Up to 90% of these persons are untreated or insufficiently treated. This has major socioeconomic consequences, in absence from work (absenteeism) but particularly in reduced productivity at work (presenteeism).

Methods: We used published literature and online statistical information from Eurostat and Eurofound to assess the costs of allergic disease to society.

Results: Allergies have an impact on direct, indirect, intangible and opportunity costs. Most importantly, avoidable indirect costs per patient insufficiently treated for allergy for the EU range between 55 and 151 billion per annum due to absenteeism and presenteeism, i.e. 2405 per untreated patient per year. On the other hand, appropriate therapy for allergic diseases is available at comparatively low costs at an average 125 per patient annually, equalling only 5% of the costs of untreated disease, allowing potential savings of up to 142 billion.

Conclusions: A better care for allergies based on guideline-based treatment would allow Europe's economy substantial savings. In addition allergies have an impact on learning and performance at school and university leading to opportunity costs for society. This cannot be calculated moneywise but will have an impact in a modern knowledge-based society. Still allergies are trivialized in society, noting that the costs of therapy are paid by patients and healthcare services whereas economic savings are made by employers and society. A change of this mind-set is urgently needed.

Introduction

Allergy covers a wide spectrum of diseases many of them being very frequent like allergic rhinitis, allergic asthma, atopic dermatitis, urticaria or contact allergies.

Allergies had meanwhile become the most frequent chronic disease in the European Union. Already in 2004 the estimated overall prevalence of airways allergies was 23% in a more recent investigation 31% (1, 2) and looking at any types of allergy in employees in Germany newest figures report 41%.

Even with their vast prevalence, relative severity and huge impact on quality of life, allergic diseases are invariably trivialized. Trivialization is observed throughout all parts of society, not the least in medical universities where allergies have very little room in the curricula. In the media and in politics as well as research funding allergies are taken less seriously than medical conditions with potentially lethal consequences.

Because patients with allergic disease themselves often perceive it as trivial, it is not surprising that a recent survey (3) reported that over half of individuals with allergic rhinitis had not seen a medical professional in the past year and almost one third

preferred non-prescription medication because they considered it not necessary to visit a doctor. However, there is a substantial group whose symptoms are inadequately controlled by pharmacological treatment. These patients have severe chronic upper airway diseases (SCUAD) (4). In these individuals, their disease is far from trivial as it causes impaired quality of life, social functioning, sleep, and school/work performance.

Also, in a survey of chronic urticaria patients (5), only two in three respondents were taking prescription medication for their condition. In another survey (6), although 78% of the respondents were taking prescription or over-the-counter medication, only 33% took it regularly. Furthermore, itching and physical discomfort remained inadequately treated for 68% of the respondents and sleep disturbances remained a problem for 48% of respondents. In spite of the evident frequency and burden so far the overall economic damage is caused by allergies in Europe in general have not been assessed in the literature.

The paper is based on a task force initiative of the EU Network of Excellence in Allergy GA²LEN (Global Allergy and Asthma European Network) created to address this question.

Methods

In this manuscript, we estimated the socioeconomic costs to the European Union of allergic diseases by use of published literature and online statistical information from Eurostat (<http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>), a Directorate-General of the European Commission providing statistical information

about member states, and Eurofound (<http://www.eurofound.europa.eu/>), the European Foundation for the Improvement of Living and Working Conditions. Initially, we divided the total costs of allergic disease to both health services and society into its constitutive elements, namely direct costs, indirect costs, intangible costs and opportunity costs.

The first studies taking into consideration the costs to the health services and society of allergic diseases have only been published in recent years. However, while many of these addressed lost productivity in terms of absence from work (absenteeism) and reduced working capacity (presenteeism), they have used only the employees' gross salary as a variable in the calculation (7) and ignored additional indirect costs, such as social security for the employer. To acknowledge this, in this study the employers' costs calculated by Eurostat were used. Not taken into account were the overhead costs (e.g. overhead for administration and cost of equipment used by the employee) as well as lost profits. Lost profits are part of opportunity costs and are based on the fact that an employer simply earns more per hour than the employee costs by selling the results of an employees labour but are impossible to calculate in this study.

In studying the economic burden of disease in employees it has thus been accepted to concentrate on direct costs and indirect costs. This approach is also followed in this manuscript but the other cost factors will also at least be mentioned in the annex.

The final calculation of the annual cost of undertreated allergic disease is complex and depends on many factors which may be summarised, for simplification, under seven headings: 1. The number of persons in the 15 – 65 age group possibly

employable; 2. The prevalence of allergic disease in the European Union; 3. Duration of symptoms; 4. Number of insufficiently treated and symptomatic patients; 5. Absenteeism; 6. Effects on cognitive function and related presenteeism; 7. Cost of treatment. The answers were extrapolated from data based on Medline searches and available published official statistics at Eurostat.

Details of the methods are supplied as supplementary data.

RESULTS

Based on the points raised above the following model calculation can be made for the effect of allergies in the working population (Table 1). The figures in this table are based on the following assumptions:

- The 2012, average collectively agreed weekly working time in the European Union, including Croatia, stood at 38.1 hours and 25.3 days annual leave.
<http://www.eurofound.europa.eu/eiro/studies/tn1305017s>
- *Each allergic person has allergic symptoms for 51 working days.* The assumption is based on surmise that the average individual works 5 days a week and the average duration symptoms is 75 days per annum allowing an assumed additional 2.6 days off for holiday and vacation.
- *Each individual works 7.62 hours a day at an employer's cost of 23.1 per hour, including all social costs, (average in the EU according to EUROSTAT, Table S2) (8).* The calculated employer's cost per employee per day is 176.
- *The rate of absenteeism is 3 days per annum.* With an employer's cost of 176.per day, this equates to 528 per worker per annum.

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- *The rate of presenteeism of 10- 20%.* The calculation of presenteeism is more difficult. Reduction of cognitive functions varies between minimally 10% even in mildly affected persons and frequently 30% especially during routine work but cannot be directly translated into presenteeism which is most likely higher as pointed out in the respective section above. To calculate the total cost of presenteeism, we have reduced the number of affected working days to 48 to compensate for those already lost to absenteeism. Therefore, the cost of presenteeism is 4.8 or 9.6 days at 176 per day which amounts to 845 for 1690 per individual per year.
 - *There are approximately 217.2 million employees aged 15- 65 in the European Union (9).* Employment, in this context, covers both externally employed as well as self-employed persons. If we assume the lowest prevalence of allergic disease as 20%, 44 million workers will be affected while with the highest estimate of 35% this figure will be 76 million workers.
 - *Only 10 % of patients are being treated optimally.* The number of untreated or incorrectly treated patients, who are consequently partly or fully symptomatic, in all studies is approximately 90%. Thus, the total costs of absenteeism and presenteeism would apply 40 million workers if we assume the lowest prevalence of allergic disease as 20%, and 68 million with the highest estimate of 35%.

Discussion

The strength of this review is that for the first time a holistic approach is chosen not only to shed light on the overall burden of the plenty and very divergent diseases in the field of allergy but also on possible savings for society. On the other hand, all

outcomes must be checked for their reliability (robustness) and limitations of the chosen approach (and input parameters of the calculation) need to be analysed for sensitivity.

In a sensitivity analysis, factors responsible for a possible underestimation are not quantifiable cost parameters, mainly intangible costs and opportunity costs. Also in the calculation of indirect costs only the direct employment costs were included but relevant aspects for employers like the overhead costs (e.g. overhead for administration and cost of equipment used by the employee) as well as lost profits were not.

The major limitations responsible for a possible overestimation in any model calculation are the assumed input parameters. With the calculation for the cost of allergy to society, many of the assumptions made i.e. the number of affected persons, the number of employees in Europe and the costs per working hour, are extremely solid and are based on Eurostat statistics. The major contentious point is how much the reduction in cognitive function, which in itself is scientifically very solid, impacts the earnings of a company. This is clearly associated with the type of work and may have wide fluctuations and even the impact of absence of work is not undisputed among economists as e.g. the Hanover consensus (10) argues that absence is not equalling a 100% loss, as in some jobs the work will simply be taken over by co-workers. Thus as an input parameter on purpose 3 days absenteeism were chosen which is lower than the published values and the calculated 528 / per person per annum are in line with questionnaire based results of allergic rhinitis sufferers in France, where 543 / per person per annum were calculated (11).

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In presenteeism, the effect is less apparent and work will not be taken over easily by others thus reduction in cognitive functions can be easily translated 1:1 into loss of earnings in those jobs where concentration on mental tasks plays a major role, i.e. mainly all office jobs, it is much more difficult to translate this into a loss of earnings of jobs where manual tasks are needed or jobs where purely the presence of the employee is being paid for, e.g. a guard. However, there is also strong evidence that the lack of concentration caused by allergies and the wrong allergy treatment, mainly sedating antihistamines, causes a lot of damage also in jobs with manual labour. The clearest scientific evidence is found in the area of driving skills where an increased number of accidents is associated with both untreated allergic rhinitis and the use of sedating first-generation H₁-antihistamines (12). Also, of 5383 fatal aircraft accidents in the USA between 1990 and 2005, H₁-antihistamines were found in the blood of 6% of the pilots (13). Deductive from that, it can be assumed that in those jobs where concentration on manual labour, be it in a factory in the assembly process or in jobs like a carpenter distraction, also leads to costs for the employer (14) which may be much higher than the assumed 10-20% loss of salary through reduced performance since the employer will have to pay for accidents of vehicles, secondary losses due to illness of employees after accidents as well as damage in the products produced e.g. in a factory if the quality has been impaired by the concentration of the employee. Another significant aspect in manual labour is the fact that the allergic condition can directly work related and work-related chronic hand eczema is an already acknowledged significant cost factor for employers with estimated indirect costs of 3422 EUR per person per annum (15).

In summary the input parameters for the indirect costs appear to be realistic and the variation range of the model calculation is sufficient to cover both best and worst case scenarios.

The other part of the calculation is the direct costs of treatment. These can be more easily calculated and, on purpose, the highest conceivable average costs in the EU healthcare were used in the assessment. In most EU countries, esp. using generics, costs will be lower.

What may be concluded from this review is clearly that allergies deserve a better public attention. Great advances have been made in Europe with campaigns of better prevention and early treatment of chronic diseases but allergies have not been a significant part of these programs so far. While it is clear that spending money in preventing, for example, cardiac disease, hypertension or diabetes saves later health-care costs, no one has yet calculated the costs of **not** spending money on allergic diseases.

While the later healthcare costs for the progression of allergic diseases e.g. allergic rhinitis to asthma are also high (16) , the impact of **not** spending money on allergic diseases however is certainly the highest in all areas of health as the relation of low cost for treatment compared to high benefits is very favourable. Also an aspect of opportunity costs in healthcare that is often overlooked is at which age therapeutic measures or preventative algorithms should be introduced and what later implications this has to the long-term future of the gross national product. In allergic disease, which affects primarily young people and those of working age, it is evident that medical intervention as early as possible in life will have more impact on the productivity than in diseases affecting primarily the elderly. In young people, failure

to treat allergic rhinitis adversely affects school performance (17) and one in six patients with atopic eczema believed that their disease had a direct detrimental effect on their future careers (18).

The final aspect of opportunity costs that needs to be considered is research funding. This is not the primary thrust of this paper, but suffice to say funding of research onto allergic diseases, their mechanisms and their impact on quality of life is minute compared with cancer, cardiac disease or hypertension. Most of the research money in this area comes from the pharmaceutical companies whose primary aim is to promote studies beneficial to their drugs.

While we have been as objective as possible in deriving the costs of allergic disease, there is obviously some uncertainty about the input parameters that we have used. Clearly more targeted research is needed to get more precise estimates of these input parameters and obtain an even more accurate estimate of the enormous cost to society of what is considered by many to be a trivial disease.

Clearly more targeted research is needed to get more precise estimates of these input parameters and obtain an even more accurate estimate of the enormous cost to society of what is considered by many to be a trivial disease. However, also more research is needed to understand the true economic impact of reduced capabilities of learning by undertreated allergies in school and university. As this is particularly difficult to quantify with missing tools, we here concentrated on the costs in the labourforce only.

In conclusion, the savings to society in terms of avoidable lost productivity is between 55 and 151 billion per annum which can be achieved by investing 5 - 8.5 billion in better treatment. Additional to this are factors that cannot be readily

translated into money, such as opportunity costs to industry and detrimental effects on children's learning and school performance. Thus with adding the other costs especially also occurring education the true cost is the best case scenario will easily be higher than 100 billion and **not** treating allergies is too expensive for our future. However, it needs to be noted, that the costs for treatment are paid by the healthcare services or insurance whereas the economic savings are made by the employer and society. Still this relation between investments and benefits is certainly one of the most favourable in medicine and economy, but it requires a change of mind-set.

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Conflict of Interest:

There is no conflict of interest.

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Table 1. Annual socioeconomic cost for employers due to absenteeism and presenteeism caused by undertreated allergic diseases and potential savings if treated in the EU.

	Assuming a 20% prevalence of relevant allergic diseases and 10% impairment	Assuming a 20% prevalence of relevant allergic diseases and 20% impairment	Assuming a 35% prevalence of relevant allergic diseases and 20% impairment
Cost of absenteeism/worker/annum	528	528	528
Cost of presenteeism/worker/annum	845	1690	1690
Total cost/worker/annum	1373	2218	2218
Number of workers with allergic disease	44 million	44 million	76 million
Number of workers with undertreated allergy	40 million	40 million	68 million
Total allergy cost	54.9 billion	88.7 billion	150.8 billion
Total additional costs for guideline approved treatment of untreated population	5 billion	5 billion	8,5 billion
Total potential savings	50 billion	84billion	142 billion