Statistical Survey of Influenza and Influenza-Like Diseases in a Rural General Practitioner Database

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Abstract **— A rural general practitioner's database was investigated to create statistics about influenza and influenza like diseases. The number, gender, vaccination and age distribution of patients were collected and analyzed. The collected dataset is homogenous from the aspects of medical persons and originates from a small rural town. We created a time series of data between 2007 and 2015. The distributions of vaccination and illnesses were visualized and interpreted.**

I. Introduction

Increasingly severe economic and social problem is that the European population is getting rapidly older. The same problem can be detected also in Hungary. The number of the medical supply obliged people at the end of the year 2015 was the next: in the 0-17 years old age group: 1 716 600 person, in the 18-22 age group: 476 900 person, in the 23-39 age group: 2 086 500 person, in the 40-61 age group: 2 889 800 person, and finally in the age group over 62 years: 2 147 500 person [1].

The health-state of Hungarian people was on average compared to the European Union's population. This state is different in the different part of the country. In given sector the g.p. has got a significant role to survey and maintain the health-state of the people.

It is clearly observable [2], that the healing of human population is a big expense for the country. In the consequence it is a very sensitive problem. Every political leadership wants to change the state of the medical supply. In the focus of our paper the influenza and influenza like disease are investigated.

Influenza, varicella (in older ages shingles), and rubeola – three viruses of them – are such kind of viruses, that have 100 percent of contagiousity. The Spanish-snuffles was one subgenus of influenza viruses. We realized, that in the circle of specific kind of risk factor living people, the chance of the illness is much more smaller caused by the influenza viruses. It could be very interesting, to take act of the vaccination of the whole population, and to search for the group of people, where the chain of the virus infection could be broken.

The viruses of influenza is not the only one, but one of the most important viruses, what can be transform into a world contagious disease. The importance of it is not only the infection of whole countries or continents, the more dangerous fact is, that the runoff can be very fast.

The Epidemiology Center of Hungary collects data about the facts of illnesses caused by the influenza viruses since 1931. This institution makes surveys in the field of epidemiology since 1937. From the doctor's practices collected samples are tested and analyzed for influenza. The statistics of influenza-infected people are published for the information on the Web-site week after week.

II. Bouts of influenza

For the first time it is very important to explain why the g.p.'s aren't able to recognize with certainty of 100 percent that one or more of his patients are infected with influenza viruses.

Let's see the definition of it: „the influenza is a respiratory disease caused by the influenza viruses. The most relevant symptoms are: high temperature, headache, coughing, sore throat, pain in the articulation and in the muscular system, general depression, as well. Not all patients are suffering from these symptoms. The influenza is a heavy weight disease, more dangerous than a simple snuffle. The clinical image can varied from the minor, to the very serious one. In the worst case, is getting pneumonia, brain-fever or septicemia. These symptoms are caused by influenza viruses, but the weak and ill organism can get additional bacterial or viral infections". [3]

Table I. compares the symptoms of general snuffles and influenza.

By the time we are speaking about vaccinating, is very important to mention the behavior of the influenza viruses. The virus is changing himself year for year. The construction of the new influenza viruses and the built-in viruses in the vaccine will be reviewed by specialists yearly. These two type will be compared, and analyzed.

I. Data and Methods

The origin of data was a rural g.p. database of the praxis between 2007 and 2015, the queries are no containing any name and personal identification data. The database was written in dBase and FoxPro, queries were run on the own graphical interface of the medical information system. The g.p.'s program was able to execute queries including date period and BNO code. (BNO is the international classification of diseases.) We had to ask different BNO codes one by one with different queries. For results we got the patient number and ratio of gender.

TABLE I. THE COMPARISON OF SNUFFLES AND INFLUENZA [3]

Symptoms	Snuffles	Influenza
fever	Not typical, but sometimes the patient has got low fever (38°C and under).	common with high temperature (38°C and above)
pain in the muscles and in the limbs	rare	common
weariness and general exhaustion	rare	common
headache	common	common
snuffles	nearly always	Common, but this is a symptom with small importance.
sneeze	nearly always	Common, but this is a symptom with small importance.
tears	common	a symptom with small importance
sore throat	nearly always	a symptom with small importance
coughing	common	common

The resulted data sets were collected in Excel spreadsheets. Diagrams and statistical calculations were made by using Microsoft Excel 2013. The influenza and influenza-like diseases were stood into the center of the investigation. The count of male and female patients and their illnesses and vaccination data were collected. The count of total cases and the patient numbers was got. The total case number is a count, that shows how many times the g.p. was visited by the patients with influenza-like diseases. If a patient falls back in a disease, he/she can repeatedly visit the g.p. The patient count shows the number of different people who was suffering in influenza-like diseases.

One of the most difficult methodological problem was the data querying, because the most relevant BNO codes had to choose from the database. The Table I. shows, that a g.p. can shuffle snuffles and influenza very easily. The viruses of influenza can be detected only in laboratory conditions. Before the g.p. could get the results of the tests, he/she has to order the corresponding medication for patients, and to start the treatment.

This is the reason, why this article deals not only with influenza, but also with influenza-like diseases. According to this, a whole group of BNO-codes was queried from the database, not only the influenza's. In the treated database was only a few BNO-codes with influenza.

TABLE II. BNO (ICD-10 2016) CODES OF INFLUENZA [4]

BNO-code	Description of the illnesses
J1000	Influenza with pneumonia, seasonal influenza virus identified
J1010	Influenza with other respiratory manifestations, seasonal influenza virus identified
J1080	Influenza with other manifestations, seasonal influenza virus identified
J1100	Influenza with pneumonia, virus not identified
J1110	Influenza with other respiratory manifestations, virus not identified
J1180	Influenza with other manifestations, virus not identified

The g.p. has got the right for free decision-making in choosing of appropriate BNO-code for the current case. The most relevant BNO-codes for influenza are shown in the Table II.

There are a group of BNO-numbers that can be also used by the g.p. in the praxis in influenza like cases. These codes were collected in Table III. To get the relevant BNO codes for the further data-requesting, we discussed a lot with our g.p about the type of illnesses, that can be concern here. Another problem was caused with the doctor's software system, because we could access the data only in separated queries, while the system did not support the complex query terms.

TABLE III. BNO (ICD-10 2016) CODES OF INFLUENZA-LIKE DISEASES CODED BY THE G.P.[4]

BNO-code	Description of the illnesses
B3490	**Viral infection, unspecified**
J0410	**Acute tracheitis**
J0420	**Acute laryngotracheitis**
J0100	**Acute maxillary sinusitis**
J0110	**Acute frontal sinusitis**
J0140	**Acute pansinusitis**
J0290	**Acute pharyngitis, unspecified**
J0390	**Acute tonsillitis, unspecified**
J0680	**Other acute upper respiratory infections of multiple sites**
J0690	**Acute upper respiratory infection, unspecified**
J2090	**Acute bronchitis, unspecified**

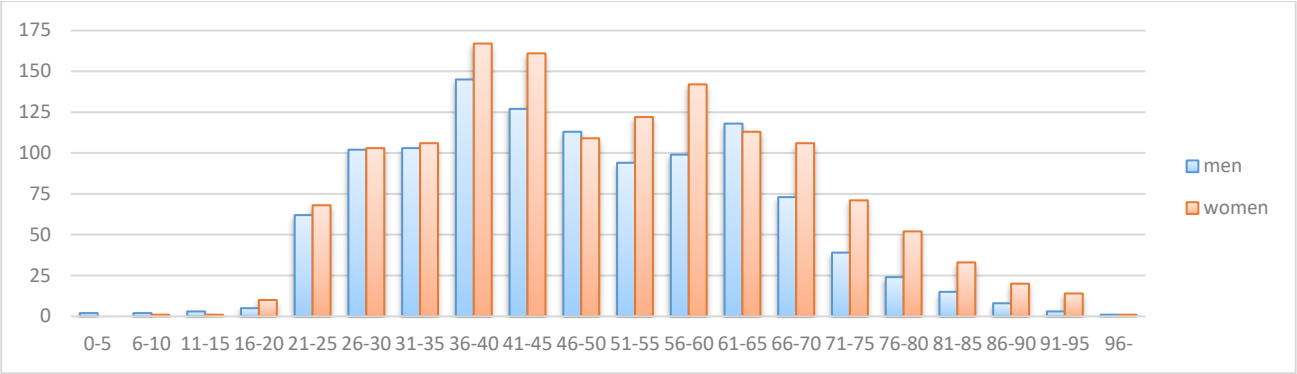

Figure 1. Age-distribution diagram of the praxis' patients in year 2016

The Fig. 1. shows the age distribution graph of the patients in surveyed praxis. The diagram is divided into the number of male-female patients and shows the distribution of the different age-ranges. The praxis contains total 1138 male and 1400 female patients.

The age distribution is very important, because influenza-like diseases are detected primarily in the group of young adults and pensioners. The consequence of this fact is the reason, why these age groups are vaccinated.

II. Results and Discussion

In the most of cases the people are infected by influenza viruses between the 40th and the 20th week of a calendar year. Data about the total amount of patients and the number of vaccination between October and May can be seen on the Fig. 2. Generally, the vaccination prevents from the infection and so there is an inverse relationship between them. The number of vaccinated people in the current g.p.'s praxis is shown on the Fig. 3.

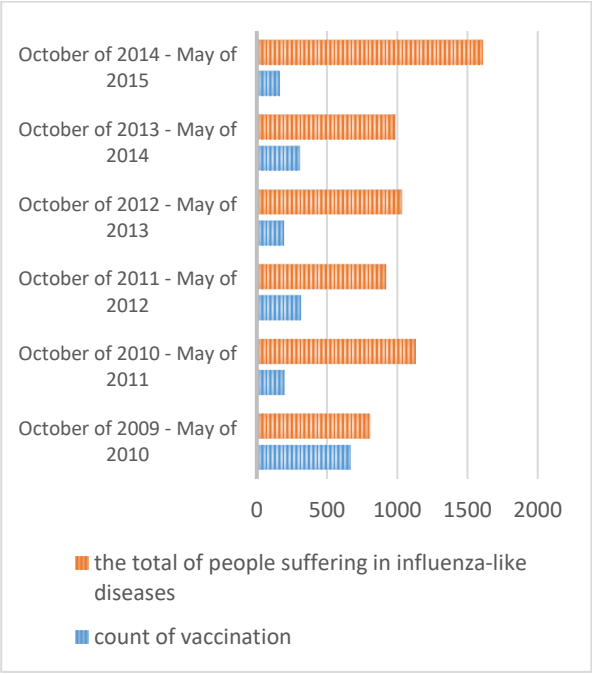

Figure 2. The amount of vaccinated patients and case numbers caused by influenza-like diseases in the praxis

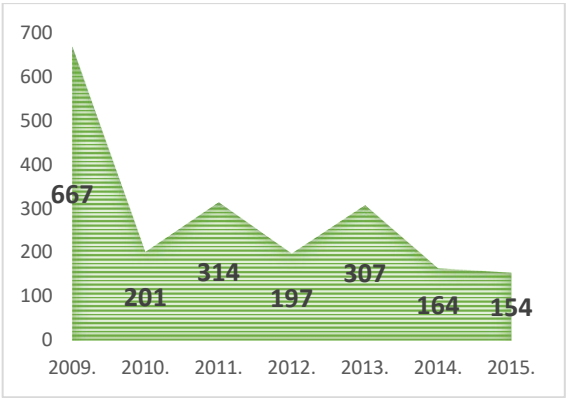

Figure 3. The number of vaccinated people between 2009 and 2015

There was written a study in the United States in the year 2010, where the researcher got interesting results. 90 percent of the vaccinated people in the age group over 65 years should be vaccinated, and 60% of the high risk adults in the age group between 18 and 64 years. [5] But these results can be reached only in the dreams of the doctors.

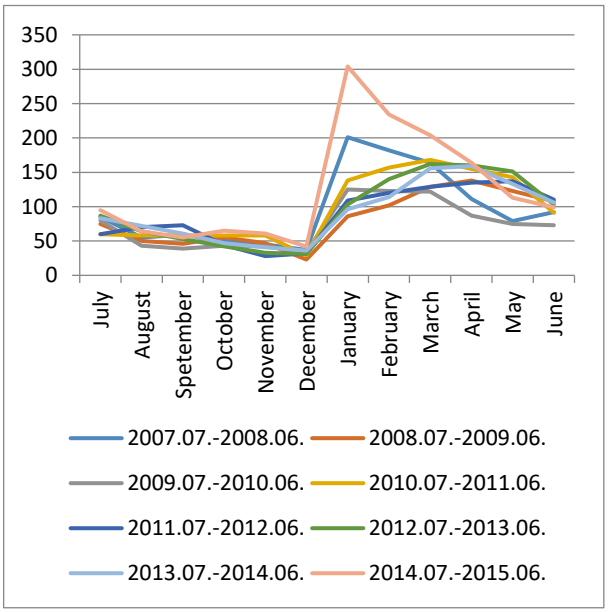

Figure 4: The number of different patients infected by influenza-like viruses

Analyzing the data on Fig. 4. and 5., we can conclude very interesting things. In every December the amount of morbidity is very small, but the count of causes highly increases in January.

There can be found a few different reasons for this phenomenon. In first of all, on the last week of December there are no surgery hours. The ill people are provided by the Emergency Centre and not by the g.p.

Secondly the people on Christmas holiday won't go to the doctor, and are trying to solve their medical problems at home.

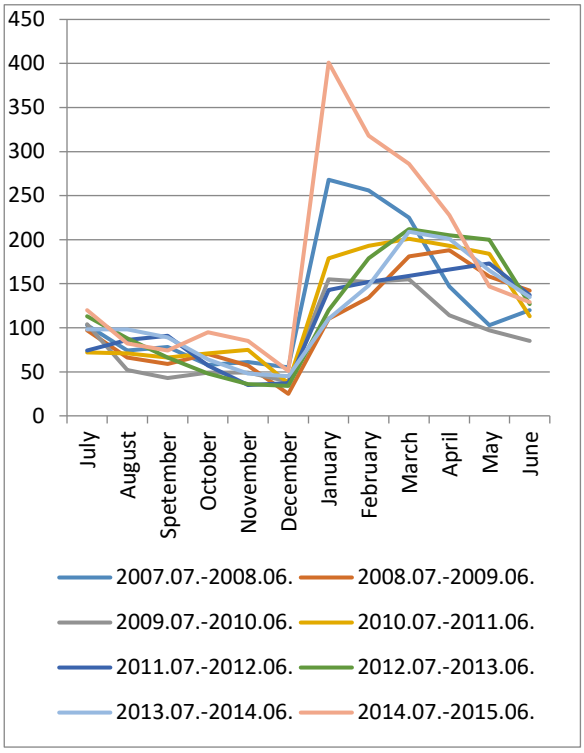

Figure 5: The total case number

Thirdly elementary school-children and children from kindergarten age are spending the most of time at home in these days and only a few time in the community. They can easily infect the family members but hard to get infection from their age range. It can change the infection patterns.

The g.p. is visited by patients only in January in most of cases. The most typical reason is that the patients want to get sickness benefit at this time. At the end of December, the local factories aren't working. Ill people doesn't need to get to the g.p. In the other group are people, who don't get better during the Christmas-holiday, and are still ill in January.

Usually people are infected by influenza-like diseases in the period of February-March, because vitamin-resources of the human body are exhausted at that time. At spring the outside temperature is ideal for virus-propagation. Furthermore, to the end of winter people are weaken.

It's interesting to analyze the data of the year 2015. In the vaccinating period before January only a little part of patients was vaccinated. In this January there was an explosion among the people infected by influenza-like disease. The missing vaccination process led to a heavy epidemic.

It seems, if the vaccinated part of population is not reached a threshold, then the next year occurs a big enhancement in the virus propagation.

In addition, some other relationships have been identified. If the amount of cases presented in September and October is low than at the beginning of the next year befalls an enhancement. If the infected number of people is higher in the autumn than the case number will show a decreasing tendency in the next year.

We weren't satisfied with the current data-analysis explanations of January 2015 therefore we were looked after other reasons. The ambulant patient scale was investigated (See Fig. 6.).

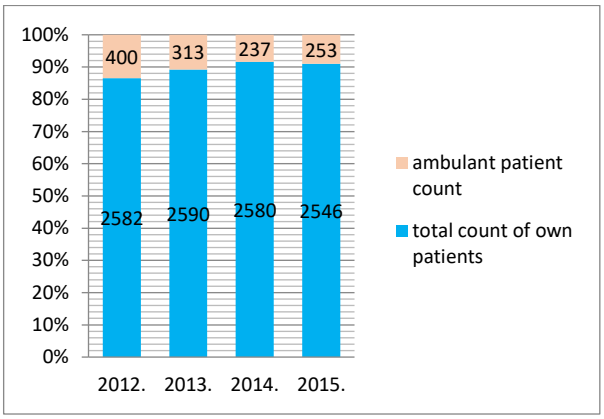

Figure 6. The number of patients from the own praxis and ambulant patients between 2012 and 2015

Firstly, it can be seen that only 10% of the patient visits was made by the ambulant people. Secondly, the total amount of patients was not significantly changed during the last years.

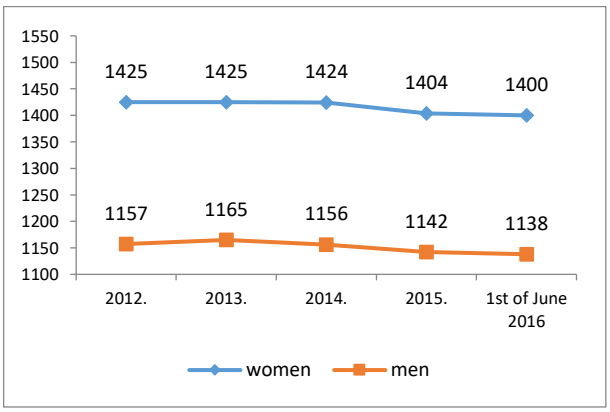

Figure 7. The rate of men and women in the last four years in the praxis

Thirdly, the gender rate of praxis wasn't changed in the last years. (See Fig. 7.)

III. Conclusions

In this paper the influenza and influenza-like diseases data of a g.p. database were investigated. The number of patients in gender groups, the vaccination data were collected between 2007 and 2015. The general trends

were analyzed. It was shown that global data are matching to the references and supports the generally accepted infection models. However, some local patterns can be observed according to temporal changes of the infection and to the vaccination efficiency. It was raised that only quite large number of vaccination can prevent the infection. In the future it is important to find the lower bound of vaccinated patients amount to moderate the epidemic's propagation.

Further questions will be planned by our survey. It can be very interesting to monitor the vaccinated patients, and watch the scale of influenza-infected amount of them.

Our data are coherent from the aspect of medical experts and geographically because the origin of data is a small city. The consequence of that, our data are useful for local model creation and testing.

REFERENCES

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[3] The webpage of Epidemical Center of Hungary – Questions and answers about Influenza http://www.oek.hu/oek.web?to=1667&nid=1057&pid=1&lang=hun

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