Prevalence of chronic diseases and morbidity in primary health care in central Greece: An epidemiological study

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Abstract

Background: In Greece there is lack of large epidemiological studies regarding morbidity and mortality in primary health care. The aim of the present study was to estimate the prevalence and morbidity of the most common diseases in a large population sample from primary health care.

Methods: Four primary health centres were randomly selected. During one year period, 12 visits were performed in each centre, one per month, in random order and all visitors willing to participate in the study were included. Data on morbidity of each subject were recorded after performing an interview with the participant and checking his medical records, medical history and current medication. Diseases were coded using the international classification of primary care (ICPC) system.

Results: In total 20,299 subjects were recorded. The results revealed significant variations in morbidity between genders and age groups. However, in all age groups, diseases of the circulatory system were most prevalent, followed by endocrine, metabolic, musculoskeletal and respiratory diseases. Osteoporosis was significantly more prevalent in females compared to males, whereas skin and eye disorders were more prevalent in subjects below 65 years old. COPD prevalence was very low compared to worldwide data.

Conclusions: The present study revealed great variations in the prevalence of the diseases between genders and age groups. Our data justify the urgent need for the development of electronic health records that may help in the design of new prevention strategies in primary health care.

Background

Epidemiological data can be useful in the design of new prevention strategies, especially in primary health care [1]. There are worldwide data available regarding the prevalence, morbidity and mortality of chronic diseases. Data from the World Health Organization (WHO) indicate that the most important causes of death are currently ischemic heart disease and cerebrovascular disease [2].

The development of electronic health records, especially in primary care, may help in the identification of the burden of several diseases in each region. The use of such records may be of great importance for health systems, considering that the North Shore Hospital System in Long Island, New York, announced recently that it will pay an incentive of up to $40,000 to each physician in its network who adopts its electronic health record, paying 50% of the cost to physicians who install an electronic health record that communicates with the hospital and 85% of the cost if the physician also shares de-identified data on the quality of care [3].

On the other hand, the International Classification of Primary Care (ICPC) recently celebrated its 21 years. This coding system is very easy and very useful in primary health care [4-6]. In a recent epidemiological study conducted in Spain, ICPC was used in conjunction with electronic health records, for the estimation of the prevalence of major diseases in the general population [7].

In Greece, the national health system is designed in three levels. Primary health care centres compose the first level which represents the primary health care system. General practitioners are the key component of the...
primary health care centres. Thus, their role is very important as general practitioners represent the link between public and the national health system. However, the establishment of an integrated primary health care system in Greece is still under development [8].

However, in Greece there is lack of a recording system in primary health care, rendering the design of large epidemiological studies difficult and complex. The aim of this study is to estimate the prevalence and morbidity of ten major chronic diseases in primary health care centres serving a semirural population sample in Thessaly, central Greece. Differences in morbidity between genders as well as between young and elderly were further evaluated.

Methods

Study design

Data collection was performed from January to December 2008. Thessaly is a district in central Greece with four prefectures and seventeen primary health care centres with a total population of 740,115 residents [9] that represents approximately 8% of the total population of Greece. All these primary health care centres are part of the national health system and correspond mainly to rural and semirural population. Four primary health centres were randomly selected to be recorded, one from each prefecture. The primary health care centres selected correspond to a population of 126,843 residents (data derived from local authorities). The study group visited one centre per week in order to visit all selected centres in one month. The centre visited in each of the four weeks of each month was chosen in a random order. Overall, twelve visits were performed in each centre.

Study participants were all subjects over 14 years old who visited primary health care centres for any reason and were willing to participate in the study. A structured questionnaire was completed by the study coordinators upon the arrival of each subject. The study questionnaire included questions about demographics, medical history and current medication for chronic diseases. The study coordinators additionally checked the medical records of each patient, in order to record all chronic diseases in detail.

The chronic diseases of each subject were identified and coded using the ICPC system [4]. Each disease recorded was included in the respective organic system according to ICPC codes (Table 1). The ten most common and burdensome chronic diseases, based on the main causes of death and disease burden in the United States and the most common diagnoses in primary care, were recorded separately [10]. The study was approved by the Ethics committee of the University Hospital of Larissa and all subjects provided informed consent.

Table 1 ICPC codes for selected diseases and organic systems

| A. General          | B. Blood, lymphatics | C. Digestive       |
|---------------------|----------------------|--------------------|
| F. Eye              | H. Ear               | K. Circulatory     |
| Elevated blood pressure | K85, K86, K87      | Coronary heart disease | K74, K75 |
| L. Musculoskeletal  |                      | Osteoarthritis     |
| Osteoporosis        | L83, L84, L89, L90, L91 |
| N. Neurological     |                      | P. Psychological   |
| Depression          | P03, P76, P78       | Anxiety disorders  |
| Asthma              | R06                 |                   |
| COPD                | R79, R95            |                   |
| R. Respiratory      |                      | T. Endocrine, metabolic and nutritional |
| Asthma              | R96                 | Lipid disorder     |
| COPD                | R79, R95            | Diabetes          |
| U. Urology          |                      | T89, T90          |
| X. Genital Female   |                      |                   |
| Y. Genital male     |                      |                   |

Statistical analysis

Demographic data are presented as median (interquartile range) whereas categorical variables are presented as percentages. Normality of data was estimated with the use of D’Agostino-Pearson normality test. Comparison between medians was performed using Mann Whitney U test for skewed data. The prevalence was estimated taking into account the cluster design and based on the cluster sample total [11,12]. The analysis was performed using the proc survey means of SAS v.90 and GraphPad Prism v.5.0. The prevalence of each disease is presented per 10,000 of population.

Results

Demographic data are presented in Table 2. In total, 20,299 subjects were willing to participate in the study (56.4% female). Participants were distributed according to the gender and age group (< 65 years, ≥65 years). According to Table 2, the majority of participants were elderly women. In the age group < 65 years, males were younger than females (48 vs. 51 years old), whereas in the age group ≥65 years old males were older than females (74 vs. 73 years old).
Table 2 and Figure 1 present the distribution of participants according to their number of diseases. In all age groups the majority of participants suffered from a single disease, however with several variations. For example, a significant proportion of people ≥65 years old had two or more diseases. Moreover, women had more commonly 2 or more diseases in both age groups.

The estimated prevalence of each system or disease, expressed per 10000 people, is shown in Table 3. The most prevalent diseases overall were circulatory disorders, including arterial hypertension and coronary heart disease. Other diseases with high prevalence were endocrine, metabolic (especially lipid disorders), musculoskeletal and respiratory diseases. Interestingly, osteoarthritis and asthma, two chronic diseases classified in the two latter organic systems, presented low prevalence. It should be mentioned also that the prevalence of chronic obstructive pulmonary disease (COPD) was considerably low compared to other diseases.

### Differences between genders

The comparison of the estimated prevalence of the diseases revealed significant differences between the two genders, as presented in Table 4. The most prominent difference is the higher prevalence of the diseases of musculoskeletal system in women, being more than 10-fold higher for osteoporosis. Another important difference is the fact that psychological diseases, especially depression, were more prevalent in females. Circulatory diseases were slightly more prevalent in females, with the exception of...
coronary heart disease which was slightly more common in males. Another interesting finding is the higher prevalence of COPD compared to asthma in females.

Differences between age groups
Significant differences in the prevalence of the diseases between the young and the elderly were observed (Table 4). Of great importance were the differences in the general diseases, the diseases of the skin and the respiratory diseases, which were more prevalent in younger patients. In contrast, circulatory disorders were more prevalent in the elderly. Surprisingly, psychological disorders had similar overall prevalence in both genders and in both age groups, whereas anxiety disorders were more prevalent in the younger.

The differences between genders in each age group were not very prominent. In younger patients, circulatory diseases had similar prevalence between males and females, whereas coronary heart disease was significantly more prevalent in males. The same pattern was observed in the elderly, but with a more blunted difference. Musculoskeletal diseases were more prevalent in females in both age groups; however, the difference in the elderly was more prominent. Interestingly, the prevalence of COPD was similar in the two genders of the younger group, whereas it was more prevalent in elderly males compared to females.

Discussion
The results of the present study indicate that circulatory and metabolic diseases represent the most important causes of morbidity in the general population visiting primary health care centres, followed by endocrine, metabolic, musculoskeletal and respiratory diseases. Significant variations in the prevalence of diseases between genders and age groups were observed. Our results support the fact that in Greece there is an unmet need for the development of a recording system in primary health care, in order the pattern of diseases in specific areas and age groups to be identified and effective strategies for the prevention and management of individual patients to be implemented.

The primary health care facilities of the National Health System in Greece are located mainly in rural

Table 3 Estimated prevalence of the recorded diseases

| Disease Category                  | N     | Estimated prevalence (per 10,000 residents) | 95% CI          |
|----------------------------------|-------|---------------------------------------------|-----------------|
| A. General                       | 1099  | 552.0 (471.0 - 633.0)                       |                 |
| B. Blood, lymphatics             | 486   | 240.6 (175.0 - 306.2)                       |                 |
| C. Digestive                     | 1688  | 844.6 (673.2 - 1016.1)                      |                 |
| D. Eye                           | 451   | 222.8 (167.1 - 278.6)                       |                 |
| E. Ear                           | 207   | 104.8 (45.5 - 164.1)                        |                 |
| F. Circulatory                   | 7026  | 3409.2 (2959.4 - 3860.3)                    |                 |
| G. Coronary heart disease        | 3719  | 1813.2 (1505.2 - 2121.1)                    |                 |
| H. Musculoskeletal               | 3150  | 1551.4 (1448.1 - 1654.7)                    |                 |
| I. Osteoarthritis                | 684   | 340.0 (249.6 - 430.4)                       |                 |
| J. Osteoporosis                  | 1047  | 500.7 (403.3 - 598.0)                       |                 |
| K. Neurological                  | 975   | 489.0 (420.4 - 557.6)                       |                 |
| L. Psychological                 | 1968  | 949.9 (669.8 - 1230.0)                      |                 |
| M. Depression                    | 580   | 269.1 (79.9 - 458.2)                        |                 |
| N. Anxiety disorders             | 376   | 191.4 (132.4 - 250.4)                       |                 |
| O. Respiratory                   | 3122  | 1548.3 (1353.7 - 1742.9)                    |                 |
| P. Asthma                        | 3122  | 1548.3 (1353.7 - 1742.9)                    |                 |
| Q. COPD                          | 3122  | 1548.3 (1353.7 - 1742.9)                    |                 |
| R. Skin                          | 927   | 452.7 (381.9 - 523.6)                       |                 |
| S. Endocrine, metabolic and nutritional | 4058 | 1945.1 (1641.7 - 2248.5)                    |                 |
| T. Lipid disorder                | 2026  | 960.4 (741.4 - 1179.4)                      |                 |
| U. Diabetes                      | 1472  | 714.6 (646.9 - 782.4)                       |                 |
| V. Urology                       | 545   | 268.8 (193.6 - 344.0)                       |                 |
| W. Genital Female                | 242   | 120.7 (99.4 - 142.1)                        |                 |
| X. Genital male                  | 302   | 147.5 (114.7 - 180.3)                       |                 |

CI: confidence intervals
Table 4 Estimated prevalence for each disease according to gender and age group

| Disease                        | Male <65 years | Male ≥65 years | Male Total | Female <65 years | Female ≥65 years | Female Total | Total |
|-------------------------------|----------------|----------------|------------|------------------|------------------|--------------|--------|
| A.General                     | 460 (1262.5 - 1417.9) | 183 (358.2 - 465.9) | 643 (738.0 - 859.0) | 278 (591.8 - 661.5) | 178 (275.4 - 336.2) | 456 (4070.3 - 460.0) | 1099 |
| B.Blood, lymphatics           | 31 (85.8 - 111.1)  | 119 (246.7 - 350.3) | 150 (173.1 - 213.8) | 124 (256.4 - 339.8) | 212 (322.2 - 429.5) | 336 (292.9 - 386.0) | 486 |
| C.Digestive                   | 341 (937.8 - 1071.2) | 431 (822.9 - 1060.7) | 772 (867.6 - 1052.3) | 398 (859.1 - 1010.8) | 518 (788.5 - 950.6) | 916 (8204.0 - 998.2) | 1688 |
| F.Eye                         | 89 (238.8 - 320.0)  | 117 (231.1 - 292.7) | 206 (231.1 - 292.7) | 56 (119.0 - 123.1)  | 189 (282.0 - 375.3) | 245 (215.2 - 275.3) | 451 |
| H.Ear                         | 58 (155.5 - 220.7)  | 31 (66.6 (3.3 - 109.4) | 89 (105.0 - 159.1)  | 78 (158.4 - 260.0)  | 40 (61.9 - 111.0)  | 118 (104.7 - 178.2) | 207 |
| K.Circulatory                 | 715 (1940.0 - 2149.9) | 2445 (4700.9 - 4916.4) | 3160 (3532.6 - 3879.1) | 890 (1892.2 - 2289.6) | 2976 (43442.9 - 4729.2) | 3866 (33117.7 - 38481.1) | 7026 |
| B.Elevated blood pressure     | 389 (1062.6 - 1256.1) | 1096 (2105.5 - 2467.5) | 1485 (1665.3 - 1968.5) | 589 (1251.2 - 1496.0) | 1645 (24227.0 - 2758.2) | 2234 (19268.5 - 23584.4) | 3719 |
| L.Coronary heart disease      | 225 (608.7 - 864.7)  | 959 (1817.3 - 2282.6) | 1184 (13089.9 - 1727.2) | 179 (380.8 - 613.6)  | 958 (1534.4 - 1762.5) | 1137 (9493.6 - 13362.4) | 2321 |
| L.Musculoskeletal             | 416 (1122.3 - 1947.0) | 457 (866.8 - 947.8)  | 873 (988.0 - 1049.6)  | 795 (1696.8 - 1902.6) | 1482 (22167.0 - 2415.6) | 2277 (19904.7 - 21853.3) | 3130 |
| Osteoarthritis                | 60 (163.3 - 194.7)   | 121 (234.5 - 297.0)  | 181 (203.1 - 247.7)  | 145 (315.4 - 392.5)  | 358 (577.6 - 705.8)  | 503 (4472.6 - 577.6)  | 684 |
| Osteoporosis                  | 11 (27.6 - 55.7)     | 37 (688.6 - 1013.1)  | 48 (510.0 - 817.8)   | 300 (629.3 - 753.9)  | 699 (1044.9 - 1117.1) | 999 (8503.1 - 987.8)  | 1047 |
| N.Neurological                | 122 (328.9 - 372.3)  | 278 (545.2 - 664.5)  | 400 (466.1 - 518.9)  | 216 (466.6 - 5420)   | 359 (5606.2 - 638.7) | 575 (5154.3 - 596.4)  | 975 |
| P.Phychological               | 321 (873.9 - 1031.1) | 396 (733.3 - 994.1)  | 717 (792.3 - 1031.1) | 498 (10741.7 - 1241.7) | 753 (10786.6 - 1399.0) | 1251 (1075.5 - 1398.5) | 1968 |
| P.Depression                  | 42 (1113.2 - 201.3)  | 115 (201.2 - 362.6)  | 157 (165.0 - 2997.7) | 141 (305.2 - 505.7)  | 282 (3794.2 - 628.9) | 423 (3499.1 - 582.2)  | 580 |
| P.Anxiety disorders           | 77 (212.1 - 290.6)   | 68 (128.5 - 179.3)   | 145 (168.5 - 216.9)  | 115 (248.5 - 334.2)  | 116 (1797.0 - 236.5) | 231 (2091.0 - 281.2) | 376 |
| R.Respiratory                 | 717 (1887.6 - 2245.9) | 780 (15480.0 - 1779.4) | 1497 (1623.2 - 1881.7) | 937 (1969.7 - 2292.6) | 688 (10290.0 - 1061.6) | 1625 (14364.3 - 16383.4) | 3122 |
| R.Asthma                      | 15 (406.0 - 60.8)    | 14 (296.0 - 55.2)    | 29 (33.9 - 51.7)     | 40 (87.4 - 116.1)    | 34 (574.0 - 90.9)     | 74 (694.1 - 97.6)     | 103 |
| R.COPD                        | 71 (188.3 - 232.5)   | 326 (640.6 - 735.4)  | 397 (451.9 - 511.0)  | 79 (172.7 - 224.7)   | 230 (332.3 - 452.5)   | 309 (2694.1 - 354.5)   | 706 |
| R.Skin                        | 286 (779.3 - 887.2)  | 158 (294.2 - 380.2)  | 444 (491.7 - 564.7)  | 290 (612.7 - 698.7)  | 193 (2732.7 - 367.8)  | 483 (4180.0 - 505.7)  | 927 |
| T.Endocrine, metabolic and nutritional | 413 (1065.6 - 1251.5) | 1188 (2286.8 - 2518.3) | 1596 (1770.2 - 1988.3) | 712 (14760.0 - 1827.3) | 1750 (25250.0 - 2834.5) | 2462 (20804.0 - 2464.2) | 4058 |
areas. However, recently the first urban primary health
centre was introduced in the Greek health care system,
and Mariolis et al. showed that there are variations
between urban and rural primary health centres [13].
The primary health centres selected for this study cor-
respond to a rural and semirural population, since
there are no urban primary health care centres in
Thessaly.

The distribution of the diseases estimated in this
study is similar with worldwide data. Data from WHO
indicate that cardiovascular disease and diabetes mel-
litus are important causes for morbidity and mortality
worldwide [2] and cardiovascular diseases are the lead-
ing cause of death worldwide, especially in women. In
low and middle income countries of Europe in the age
group of 15-59 years old, two thirds of all deaths are
associated with cardiovascular diseases, cancer and
other non-communicable diseases [2]. It is estimated
that the global cardiovascular deaths will increase to
11.8 million in 2030 [2]. Data from the present study
are in accordance with these data, since the results of
this study indicate that the diseases of the circulatory
system are the most prevalent in all age groups, both
in males and females.

Another important group of diseases of high preva-
ence in the Greek population are neuropsychiatric dis-
orders. Mental disorders are an important source of
lost years of healthy life among women 15 to 44 years
old [2]. Moreover, neuropsychiatric disorders have been
observed also in the 16.5% of a representative sample of
South African adults [14]. Our data indicate that the
prevalence of depression is higher in women compared
to men, in accordance with previous studies.

Recent data from a Spanish population have shown
that the prevalence of chronic health problems in gen-
eral practice was higher in women and increased with
age [7], a finding similar to the present study. Arterial
hypertension was the most prevalent disease in the
Spanish study [7], and this was also the case in two
other studies from Italy and Sweden [15,16]. It is
important to be noticed that these studies were per-
formed in primary care, since data from secondary and
tertiary care are additionally needed for the correct
estimation of the disease prevalence [16]. A previous
study in a random nationwide sample of adult Greek
population has also indicated that self-reported arterial
hypertension represents a significant public health pro-
blem [17].

One important difference between the present and
the Spanish study is that COPD is more prevalent in
Spain compared to our sample of Greek population [7].

### Table 4: Estimated prevalence for each disease according to gender and age group (Continued)

| Disease        | Male | CI Low  | CI High |
|----------------|------|---------|---------|
| Diabetes       | 225  | 173.0   | 287.0   |
| Lipid disorder | 233  | 164.0   | 302.0   |
| Urology        | 227  | 158.2   | 359.8   |
| X.Genital Male | 50   | 96.8    | 183.7   |
| X.Genital Female| 122  | 230.2   | 348.8   |

CI: Confidence interval. Estimated prevalence corresponds to each gender and age group and is expressed per 10000 residents.
COPD in non-smokers [19]. There is a high prevalence of smoking in urban areas of Greece [20], which is lower in rural areas [21]. The fact that smoking rates are lower in the rural areas recorded in the present study, in combination with the underdiagnosis of COPD in Greece [22] may account for this discrepancy.

Several regions worldwide present a totally different pattern of diseases compared to our findings. For example, data from African studies indicate that the major causes of death in sub Saharan regions were communicable, maternal and perinatal conditions [23]. Despite the fact that in these regions the pattern of morbidity and mortality is entirely different, a rise in non communicable, maternal and perinatal conditions [23]. Despite the fact that in these regions the pattern of morbidity and mortality is entirely different, a rise in non communicable diseases has been recently observed [14].

Epidemiologic data depend on the presence of recording systems. Several studies have emphasized the usefulness of electronic health records in physicians’ practice. The development of a new pan-Canadian network for primary health care has been recently announced [24]. However, there is not adequate adoption of these records, even in US hospitals [25], and the proportion of physicians that use them remains very low, even in primary care settings [3]. The absence of epidemiologic data on many chronic diseases in Greece renders the conduction of large epidemiologic studies in general population imperative, in order to design new strategies in primary care.

Despite the large number of participants, the present study presents several limitations. Firstly, due to geographic reasons, our sample may present significant differences compared to the general population. Data from Eurostat indicate that in Greece the proportion of the population aged > 65 years old is 18.6% [26], whereas in this study patients ≥65 years old represent over 50% of our sample. On the other hand the selected primary health care centres correspond to rural and semirural areas, with possible differences in the distribution of the population compared to urban areas. However, it should be mentioned that our study population represents approximately 16% of the population of the area that corresponds to the health care centres involved. Another possible bias is that the participation in the study was voluntary after invitation. Although there are no data on the morbidity of the subjects that were not willing to participate, the large number of participants, as well as the large number and the random order of visits in each health centre may minimize this factor. The additional evaluation of the patients’ health records may have further diminished the inaccurate recording of chronic diseases.

Conclusions
In conclusion, the burden of chronic diseases in Greece seems to be similar with the burden observed in Europe, and especially in the middle and high income countries. Arterial hypertension, diabetes mellitus, diseases of the circulatory system and depression seem to be the most prevalent diseases. The present study revealed great variations in the prevalence of the diseases between genders and age groups. Our data justify the urgent need for the development of electronic health records that may help in the design of new prevention strategies in primary health care.

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Competing interests

The authors declare that they have no competing interests.

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