

## ORIGINAL RESEARCH

# Seeking prescribing patterns in rural Crete: a pharmacoepidemiological study from a primary care area

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## ABSTRACT

**Introduction:** Deliberation of drug prescribing patterns is essential in an effort to improve prescribing standards and quality of care. It is vital for pharmaco-epidemiological research. In this study, data from GPs' practices was used to explore variation in the prescribing patterns in a rural area of Crete. This article reports the findings with respect to the patients' age, sex and diagnoses, and discusses them with the broad aim of identifying areas for practice improvement.

**Methods:** One thousand prescriptions, issued during a one-year period, were pre-selected from the area of Anogia Health Centre in Crete, Greece. A copy of each pre-selected prescription was made, and a short pre-tested questionnaire with supplementary information about the prescription was filled. Age, gender, prescription through a third person's intervention, and renewal of an old prescription, were registered on this questionnaire. Drugs were classified according to the International Classification of Primary Care – Drugs, and diagnoses according to the International Classification of Primary Care.

**Results:** The vast majority of prescriptions, namely n = 285 (74.2%) for male and n = 481 (78.1%) for female patients, were prescribed for individuals between the ages of 50 and 89 years. The 10 most commonly recorded diagnoses were found in 54.2% of



the studied prescriptions for the male population, although only 47% for the female. Hypertension, respiratory infections, and ischaemic heart disease were, over all, the most commonly recorded diseases. The drugs commonly recorded for both sexes were paracetamol and furosemide, as well as some antibiotics. Analysis of the prescribing data revealed that more than one in every three prescriptions was prescribed through a third-person contact and 69.8% (n = 698) of the prescriptions were renewal of an older one. For more than 51% of the cases, the patients asked only for a prescription. The diagnosis 'oral contraceptive' was absent in the study, while there was a large consumption of antibiotics.

**Conclusion:** The prescribing patterns illustrated in this study present both similarities with and differences from the registered patterns in other studies. The recognition of these patterns is an essential tool for the GPs who are serving rural areas of Crete, and formulation of practical guidelines on the drugs most often prescribed is anticipated to improve the primary care physicians' performance.

**Key words:** drug utilization, Greece, prescription, primary care.

## Introduction

Drug therapy is the most commonly used method of any disease treatment in general practice. However, the patterns of drug prescribing are often inappropriate<sup>1,2</sup> and the need for registration of these patterns is essential in an effort to improve prescribing standards<sup>3</sup>.

General practice databases have been used as an effective method for pharmacoepidemiological research<sup>4</sup>. Sales statistics also provide useful information, but have some limitations, such as the absence of information for age, sex and the disease of the patient<sup>5</sup>.

There are only a few publications on the subject of the use of drugs available in Greece<sup>6,7</sup>, a country where general practice is seeking academic recognition<sup>8</sup>. Searching the literature, we found only a few publications for studies in rural areas over the last 10 years<sup>9-11</sup>. Differences between rural and urban areas have previously been reported<sup>10,11</sup>. Research on pharmacoepidemiology that helps the development of quality control programs in general practice and makes a substantial contribution to the formulation of guidelines for the proper use of drugs<sup>5,12</sup> seems to be an obvious need and challenge for Greek rural practitioners. Thus, it was important to carry out a study on prescribing patterns in a rural primary health care area in Crete, Greece. This study reports on the

prescribing patterns in a rural Primary Health Care (PHC) area and discusses the findings with the broad aim of identifying areas for practice improvement.

## Methods

### *Setting*

The project, which was known as the Anogia Prescription Study (APS), was carried out in the Anogia Health Centre in rural Crete. The catchment area is a mountainous district consisting of 11 villages with a population of approximately 9000 inhabitants. Children comprised 24.1% of the total population and seniors 19.0%<sup>13</sup>. Eight physicians served the population.

### *Design*

The APS was a prospective study, with a pre-selected sample of 1000 prescriptions. It was initiated in January 1999 and was completed in December 1999.

### *Data recorded*

For each prescription, the participating physicians were invited to make a copy and to fill out a pre-tested



questionnaire with supplementary information about the prescription. The selected information included first, information from the prescription (name, diagnosis, date, drugs, dosage) and second, supplementary information from the questionnaire (age, sex, prescription through a third person's intervention, renewal of an old prescription etc). The total number of prescriptions issued in the studied year was approximately 20 000. The first out of twenty consecutive issued prescriptions per physician was pre-selected (total number 1000 prescriptions included). Drugs were classified according to the International Classification of Primary Health Care-drugs (ICPC-drugs)<sup>14</sup>. Diagnoses were coded according to the International Classification of Primary Health Care (ICPC-2)<sup>14</sup>.

## Statistical analysis

The Mann-Whitney-U test was used for comparison of the patients' average age. Because the population's age profile was clearly skewed, the 95% Confidence Interval (CI) was estimated for the median value of patients' ages<sup>15</sup>. Statistical analysis was undertaken using MedCalc, ver. 7.3.0.1 (MedCalc Software; Belgium).

## Results

The sample consisted of 1000 subjects (384 male and 616 female patients; Fig 1). The age distribution of the population of patients was as follows: age group 0-14 years: 5.7%, age group 15-64 years: 30.7% and age group 65+ years: 63.6%. The median age of the patients was 71.0 (95% CI: 70.0-72.0) years. The median age of male patients was 72.0 (95% CI: 69.0-74.0) years, while for female patients the median age was 70.0 (95% CI: 69.0-72.0) years. Male and female patients did not differ statistically significantly in terms of average age ( $p = 0.401$ ).

Table 1 shows the diagnoses related to the prescriptions after coding according to the ICPC-2. The total number of diagnoses was 1095 because some prescriptions had more

than one diagnosis. Diseases of the circulatory, respiratory and musculoskeletal systems were the most commonly recorded, with 605 (55.2% of the total) diagnoses being recorded on the prescriptions of the study. Table 2 shows the ten most commonly recorded diagnoses for male and female patients. These constituted approximately 54.2% of all diagnoses for male and 47% for female patients. Hypertension, infections of the respiratory tract, and ischaemic heart disease were the most commonly recorded diseases for both males and females, which accounted for 32.7% of male and 23.1% of female diagnoses. Table 3 shows the 10 most frequently prescribed substances. Paracetamol, furosemide, and some antibiotics were the most commonly prescribed drugs for both sexes.

Analysis of the questionnaires revealed that, for more than 51% of cases, patients were visiting their physicians only to ask for a prescription. Prescriptions were requested through a third person's intervention in 354 (35.4%) cases. Males were 120 (33.9%) and females 234 (66.1%). The most common diagnoses of these patients were those of cardiovascular system diseases (26.5%), respiratory system diseases (13.1%) and metabolic disorders (11.1%). The average age of patients who requested prescriptions through the intervention of a third person was significantly higher than the patients who requested directly from the health centre, when median values were compared (74.0 with 95% CI 73.0 to 75.0, against 69.0 with 95% CI 67.0 to 71.0,  $p < 0.001$ ).

The number of drugs per prescription was close to 2 (1.96 for males and 2 for females). The distribution of the drugs in 'ICPC-drug' categories is presented (Fig 2). All patients with more than four drugs on a single prescription were older than 50 years. Figure 3 shows an increase of drug numbers per prescription for older patients. This increase concerns the total of the patients and each gender separately. Prescriptions that were a renewal of a previous one were 68.9% of the same total.

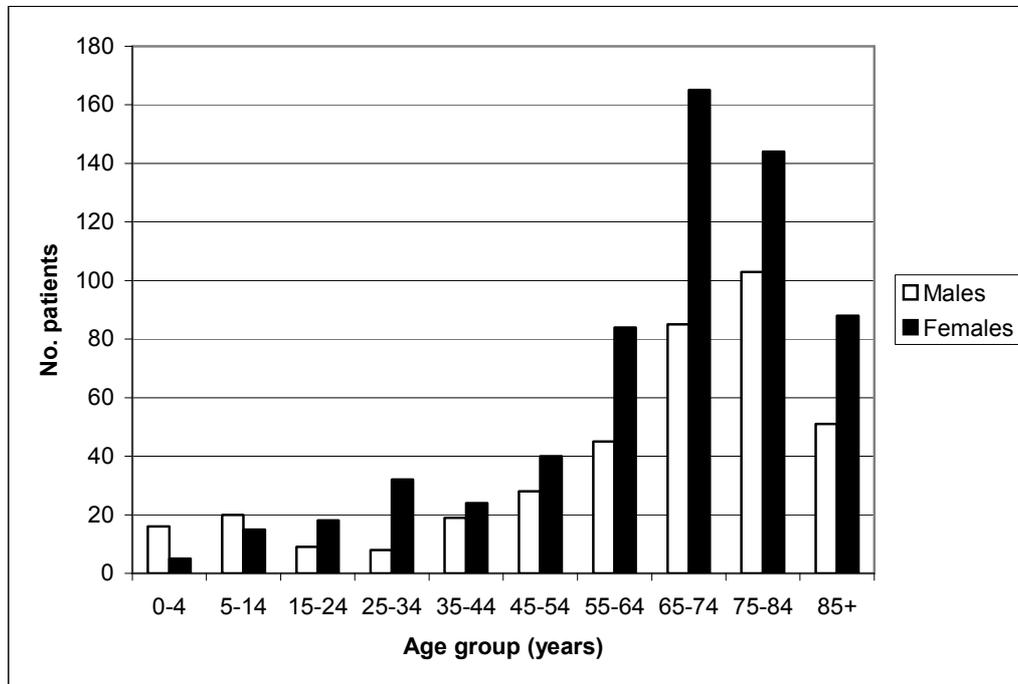


Figure 1: Age and sex distribution of the patients in the Anogia Prescription Study.

Table 1: The registered diagnoses (ICPC-2 coding)

ICPC-2 code	ICPC-2 category	n	%	SE <sup>†</sup> %
K	Circulatory	302	27.6	1.4
R	Respiratory	176	16.1	1.1
L	Musculoskeletal	127	11.6	1.0
T	Endocrine, metabolic and nutritional	88	8.0	0.8
D	Digestive	91	8.3	0.8
P	Psychological	69	6.3	0.7
N	Neurological	62	5.7	0.7
B	Blood, blood-forming organs and immune mechanism	46	4.2	0.6
A	General and unspecified	39	3.6	0.6
U	Urological	24	2.2	0.4
S	Skin	24	2.2	0.4
W	Pregnancy, child-bearing, family planning	17	1.5	0.4
F	Eye	16	1.5	0.4
Y	Male genital	7	0.6	0.2
F	Ear	5	0.5	0.2
X	Female genital	2	0.2	0.1
	Total	1095	100.0	0.0

<sup>†</sup>Standard error of proportions



**Table 2: The 10 most frequently recorded diagnoses for males and females (ICPC-2 coding)**

<b>Males: Diagnoses and ICPC-2 codes</b>	<b>n</b>	<b>%<sup>†</sup></b>	<b>SE<sup>¶</sup> (%)</b>
Respiratory infections (R71 - R83)	55	13.2	1.8
Hypertension (K86, K87)	46	11.1	1.7
Ischaemic heart disease (K74 - K76 )	35	8.4	1.5
Chronic obstructive pulmonary disease & asthma (R95, R96)	28	6.7	1.3
Schizophrenia & affective psychoses & depressive disorders (P72, P73, P76)	26	6.3	1.3
Peptic ulcer & Stomach function disorders (D85 - D87)	12	2.9	0.9
Glaucoma (F93)	10	2.4	0.8
Malignant neoplasm colon/rectum (D75)	5	1.2	0.6
Malignant neoplasm of kidney (U75)	4	1.0	0.5
Low back syndrome with or without radiating pain (L84, L86)	4	1.0	0.5
Total	225	54.2	2.5
<b>Females: Diagnoses and ICPC-2 codes</b>			
Hypertension (K86, K87)	56	8.2	1.2
Ischaemic heart disease (K74 - K76 )	53	7.8	1.1
Respiratory infections (R71 - R83)	48	7.1	1.1
Musculoskeletal: symptoms/complaints (L01 - L29)	42	6.2	1.0
Diabetes insulin & non insulin dependent (T89, T90)	40	5.9	1.0
Schizophrenia & affective psychoses & depressive disorders (P72, P73, P76)	34	5.0	0.9
Chronic obstructive pulmonary disease & asthma (R95, R96)	17	2.5	0.7
Anaemia (B78 -B82)	12	1.8	0.6
Pregnancy (W78)	11	1.6	0.5
Osteoporosis (L95)	6	0.9	0.4
Total	319	47.0	2.0

<sup>†</sup> Percent of the total of the diagnoses for male or female

<sup>¶</sup> Standard error of proportions (to the total population of males or females)

## Discussion

Some methodological considerations should be discussed prior to the interpretation of the findings. Potentially, a selection bias may have been introduced. However, the selection was made from the whole area of the health center and from the general population. We may assume that the study sample reflects the prescribing patterns in the area, because it was selected from the total of all prescriptions from that year<sup>16</sup>. The structure of the studied population

differed from the rural population of Greece. The aging ratio (the ratio of the population 65+ to 0-14 population) in Anogia region was lower than in Greece as a total (0.97 against 1.10) and even lower than the aging rate in rural Greece (0.97 against 1.39)<sup>13</sup>. Therefore, some of our findings, for example prescribing through the intervention of a third person, may possibly be different from other Greek areas.



**Table 3: The 10 most frequently prescribed drugs for males and females**

<b>Males: Name of drug</b>	<b>n</b>	<b>%<sup>†</sup></b>	<b>SE<sup>¶</sup> (%)</b>
Amoxicillin & clavulanic acid	25	3.3	1.3
Paracetamol	18	2.4	1.1
Furosemide	16	2.1	1.0
Salbutamol	15	1.2	1.0
Clarithromycin	14	1.9	1.0
Acetylsalicylic acid (for heart disease prevention)	14	1.9	1.0
Allopurinol	14	1.9	1.0
Cefaclor	13	1.7	0.9
Paracetamol & codeine	12	1.6	0.9
Ranitidine	12	1.6	0.9
Total	153	20.3	2.5
<b>Females: Name of drug</b>			
Paracetamol	34	2.6	0.9
Paracetamol & codeine	27	2.1	0.8
Clarithromycin	25	1.9	0.8
Ranitidine	23	1.8	0.8
Furosemide	22	1.7	0.7
Glibenclamide	21	1.6	0.7
Acetylsalicylic acid (for heart disease prevention)	21	1.6	0.7
Enalapril	18	1.4	0.7
Amoxicillin	17	1.3	0.7
Diphenhydramine	17	1.3	0.7
Total	225	17.5	1.9

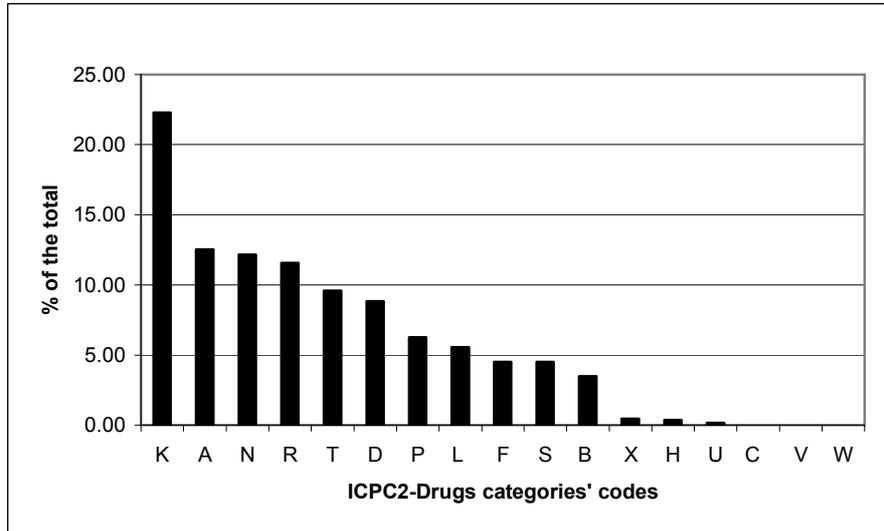
† Percent of the total of the diagnoses for male or female

¶ Standard error of proportions (to the total population of males or females)

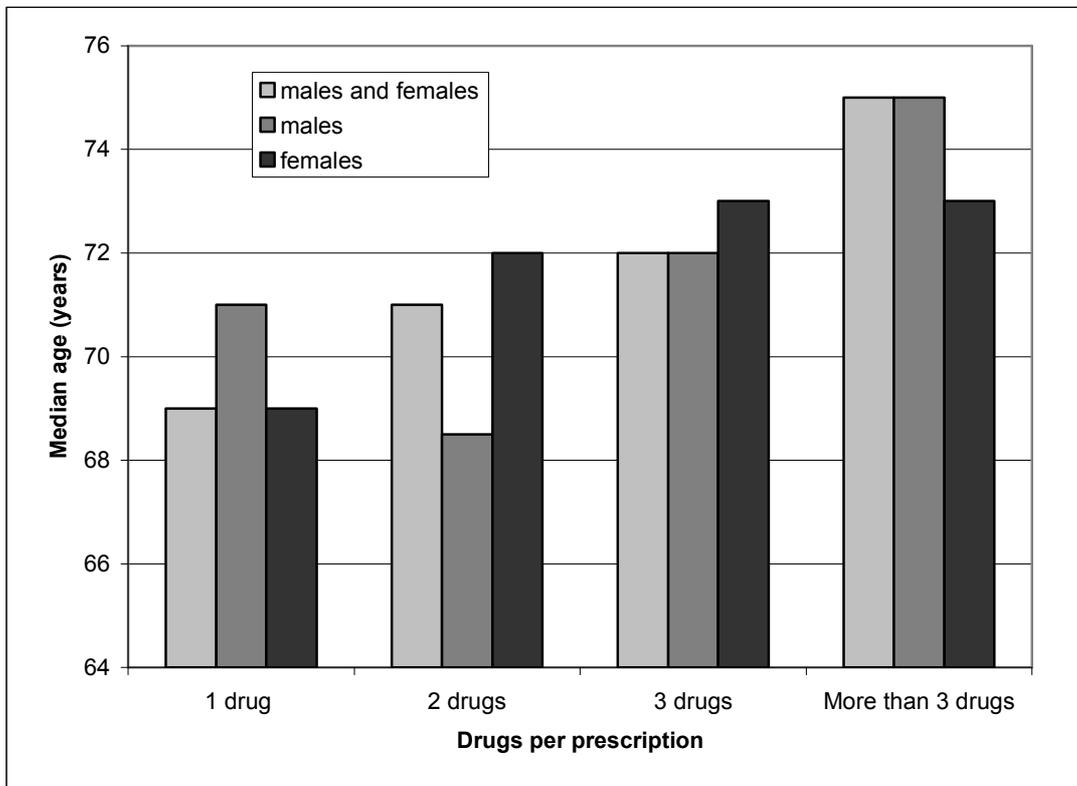
Some findings of this study may offer new information when researchers look for evidence in explaining national and regional differences in prescribing and drugs consumption. An important finding of the study is the high number of drugs per prescription. It was higher than others previously reported<sup>5,17</sup>. The advanced age of our study sample may explain this finding, while different attitudes towards drug therapy, both among doctors and patients, may contribute to it. The high prevalence of prescribing for the elderly and particularly among females is in agreement with the findings of other authors<sup>5,17,18</sup>. The possible reason for such findings may well reside in the fact that the female population visits their GP more frequently than the male<sup>18,19</sup>. The fact that the

number of drugs per single prescription has increased proportionally with each age group corresponds well with the findings of previous reports<sup>20,21</sup>. It can be ascribed to multiple morbidity and the severity of disease, more than to irresponsible prescribing<sup>22</sup>.

The finding that the half of the subjects were visiting their physician only for a prescription has been reported in other Greek studies and it deserves further discussion<sup>23</sup> when quality of care is at the top of health authorities' agenda<sup>24</sup>.



**Figure 2: The distribution of the prescribing drugs of APS (ICPC-Drug coding). K: Cardiovascular system; A: general anti-infectives systemic; N: central nervous system; R: respiratory system; T: metabolism; D: alimentary tract; P: psychopharmaceuticals; L: musculoskeletal system; F: ophthalmologicals; S: dermatologicals; B: blood and blood-forming organs; X: gynaecological and sex hormones (excl. contraceptives: W1); H: otologicals; U: urologicals; C: antitumoral therapy; V: various; W: contraceptives and sex hormones.**



**Figure 3. Patients' ages and drugs per prescription**



Hypertension was the most common diagnosis for drug prescribing for females, and the second most common diagnosis in males. This is in agreement with the reports of other studies that have shown that the most common diseases in PHC in Europe are similar to those in the APS<sup>14</sup>. Insomnia was not included in the ten most frequently recorded diagnoses of our study, while it is reported that insomnia is the most common diagnosis for drug prescribing in Norway<sup>5,25</sup>. The cause for this may be the difference in climates. It also may be the use of simple guidelines for the management of the insomnia in the Anogia's area. Studies with similar methodology are not available in the literature, thus we were not able to discuss these findings within the southern European setting. However, it seems that the prevalence of insomnia in Italy is also lower in comparison with Scandinavian countries<sup>26</sup>.

Hypertension, respiratory infections, ischaemic heart disease, chronic obstructive pulmonary disease, asthma, and mental disorders were the most common recorded diagnoses in both the APS and a Norwegian study<sup>5</sup>. We would like to point out that diabetes mellitus was the fifth most common diagnosis in APS and a high prevalence of diabetes mellitus has been previously reported in rural Crete<sup>27</sup>. In the APS, the diagnoses 'pregnancy' was very common (Table 2), in contrast with the Norwegian study in which this diagnosis was absent<sup>5</sup>. In addition, the diagnosis 'oral contraceptive' was absent from the APS, but in Norway, the Netherlands, and Belgium these drugs were of the most commonly prescribed<sup>14</sup>. The finding of the high prevalence of the diagnoses 'pregnancy' may be explained by the high birthrate of the Anogia Health Centre area<sup>13</sup>. The absence of oral contraceptives from APS may be due to the fact that only a small number of women in Greece use contraceptive drugs<sup>28</sup>, and because the prescribing is performed by gynecologists and not by GPs.

Another interesting finding of our study was that benzodiazepines were absent from the ten most frequently prescribed drugs for males and females, while diazepam was found to be the most common drug prescribed for females,

and the third highest for males in the Norwegian study<sup>5</sup>. The lower prevalence of the diagnoses of anxiety, depression, and insomnia in prescriptions of the APS, may have an impact on the absence of benzodiazepine prescribing from the commonly used drugs in this study.

The large consumption of antibiotics in Greece is a well known public health problem<sup>29</sup>, and the results of this have already been highlighted<sup>30</sup>. Amoxicillin with clavulanic acid, and clarithromycin were used very frequently in the Anogia Health Centre area (Table 3). Most Mediterranean countries report similar patterns for antibiotic prescribing, and it is supported that the number of daily doses strongly influences the prescription of these medications<sup>31</sup>.

Our study findings may help in identifying some areas of potentially non-rationally prescribed drugs. Furosemide is a good example. Furosemide was in the 10 most frequently prescribed drugs in the APS and in the top 20 most frequently prescribed drugs of the Norwegian study<sup>5</sup>. We found that in most prescriptions for furosemide (92.4%) the diagnosis was, indeed, heart failure. Further study of these patients' medical histories showed that, in some cases, the use of furosemide was not necessary (first stage of heart failure, oedema from venous insufficiency etc). An algorithm for the use of furosemide in our area may be helpful.

Another finding was the high proportion of patients who sought a prescription through the intervention of a third person (usually their neighbour or the receptionist of the health center). In the APS, more than one in every three prescriptions was prescribed through third-person contact. In another Norwegian study, 48.1% of contacts with GPs for prescriptions were made by a third party on behalf of the patient<sup>32</sup>. This unusual finding certainly needs further investigation. Although aging and geographical remoteness may partly explain this, it is uncertain, based on the results of this study, to what extent cultural and sub-cultural characteristics have a potential impact on patient's behavior. We found that patients who were requesting prescriptions



through a third person were older in comparison with patients who were presenting directly to the Anogia Health Centre.

## Conclusion

This is the first published study of prescribing patterns in this rural region of Greece. Although there were some similarities with other studies, the differences showed that region-specific data is crucial for practitioners and policy-makers in rural health services. In conjunction with the permanent registration of the prescription patterns, the formulation of practical guidelines on the drugs most often prescribed, and the use of medical audit procedures, are anticipated to improve the primary-care physicians' practices and quality of care in rural primary care.

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