

Patterns of drug consumption in relation with the pathologies of elderly Mexican subjects resident in nursing homes

Gabriela Pérez-Guillé, Angelica Camacho-Vieyra, Alejandra Toledo-López, Adrián Guillé-Pérez, Janett Flores-Pérez, Raúl Rodríguez-Pérez

Department of Pharmacology and Toxicology, "Dr. Joaquín Cravioto" Research Tower – SSA, Mexico City

Hugo Juárez-Olguín, Ismael Lares-Asseff

Department of Pharmacology, Faculty of Medicine, National Autonomous University of Mexico and Department of Pharmacology and Toxicology, "Dr. Joaquín Cravioto" Research Tower – SSA, Mexico City

Received February 1st, 2001, Revised July 11th, 2001, Accepted July 12th, 2001

Abstract Purpose: To describe the patterns of drugs consumed by the male and female elderly living in Mexican private and public nursing homes. **Methods:** Three hundred and fifty elderly participants from four nursing homes (2 private and 2 public) were selected for the six month study: 108 subjects were excluded; the remaining 242 were between 65 and 100 years old; 123 were females and 119 males. A complete clinical history was taken and clinical files were reviewed. **Results:** Of the 242 elderly studied, 193 took diverse medications and 28.5% were at risk of some type of drug interaction. The groups of drugs more frequently consumed were vitamins and anti-anemic medications, followed by cardiovascular drugs. Females consumed greater number of drugs. They also consumed more drugs simultaneously. **Conclusions:** There is a need to monitor the elderly for their drugs pattern use.

INTRODUCTION

Misuse of drugs is an important health problem. Rational therapy is defined as the administration of drugs to humans for preventive, diagnostic or curative purposes in a consistent manner and based on the best pharmacokinetic knowledge and available pharmacological clinical concepts (1). Age-related pathophysiological changes may result in altered pharmacokinetic and/or pharmacodynamic changes (2-6).

The pattern of drug prescription also changes as a result of a growing incidence of aging-related diseases,

Corresponding Author: Hugo Juárez-Olguín, Department of Pharmacology, Faculty of Medicine, National Autonomous University of Mexico and Department of Pharmacology and Toxicology, Dr. Joaquín Cravioto Research Tower – SSA, Mexico City. juarez@yahoo.com

multiple nutritional problems and decreased financial resources. This may cause an increase in morbidity instead of an improvement in patients' quality of life. Additionally, adverse reactions and drug interactions may also increase (7-8). It is known that the prevalence of poly-pharmacy increases with age. Over two thirds of the population takes several drugs at a time. The use of drugs is 50% greater in women than in men of the same age (9-11).

Hence, there is a need to monitor pharmacotherapy in the elderly (12-14). Nevertheless a study of nine nursing homes in the Mexican state of Nuevo León indicates a lack of assessment and monitoring leading to repercussions on quality of life and health care cost, as well as an absence of a formal periodical assessment of the medication scheme (15).

Borge and Gomez found that the most frequent diseases in 4628 elderly patients to be hypertension, diabetes mellitus and heart diseases (16). The chronic care of the elderly implies changes, with close vigilance and constant preparation (17, 18).

Currently, in Mexico there are 3.8 million people over 65 years old, corresponding to 4.2% of the general population, with a 3.8% annual growth rate. This rate is expected to remain constant for several years. At this growth rate, this population group will double in 19 years (19). The aging of the population is one of the most marked aspects for future demographic considerations of the Mexican health care system (20).

The aim of this study was to monitor medication use in both male and female elderly population in public and private nursing homes.

MATERIAL AND METHODS

Three hundred and fifty elderly patients from four nursing homes (2 private and 2 public under administration of the Integral Family Development [DIF]) in Mexico City were selected for a six month study. Of the 350 elderly subjects, 108 were excluded because they refused to participate in the study or were being cared for by several physicians. The remaining 242 consented to take part in the study and were only being treated by one physician. These subjects were between 65 and 100 years old; 123 were females and 119 males. A complete clinical history was taken and clinical files were reviewed to corroborate the diagnosis and assess the treatment prescribed by their geriatric physician.

The study was conducted concomitantly with an iron and vitamin metabolism study in the elderly to study their nutritional status. The project was approved by the Ethics and Research Committee of the National Science and Technology Institute.

DATA ANALYSIS

Drugs were grouped according to their general indications. Patients were grouped based on their diagnosed disease. In order to assess the significance of the differences in the prescription patterns based on sex and between private and public nursing homes, the Kolmogorov-Smirnov test was used for two or more samples, with a $p < 0.05$ considered as statistically significant.

RESULTS

Of the 242 elderly subjects studied, 193 took some type of medication and 49 took no drugs at all.

Table 1 depicts demographic characteristics of the elderly subjects. One of the private nursing home (MG) only takes female residents. The percentage use of drugs in the 13 groups of drugs divided by gender is shown in Figure 1a. The most frequently used drugs were vitamins and anti-anemic medications. The next in frequency were cardiovascular agents, followed by gastrointestinal drugs, analgesics, anti-rheumatic and anti-inflammatory drugs, and antibiotics. Psychiatric drugs placed sixth, while dermatologic and ophthalmic drugs occupied the last place. Although it is evident that women consume medications more than men, the difference was not statistically significant.

Heart problems were observed in 20.2% in elderly males and 22.7% in females, followed by bone diseases and trauma with 14.4% in males and 16.8% in females. Psychiatric problems placed sixth, in 5.2% in men and 7.2% in women. Dermatologic, oncologic and surgical problems occupied the last positions with very low frequencies. There were no statistically significant differences in the incidence of diseases between sexes (Figure 1b). The group of "other diseases" includes atopy, anemia, malnutrition and chronic alcoholism.

When comparing the number of subjects using drugs in private (SMG and MG) and public nursing homes (VGT and AM), 39 subjects from the private homes used drugs versus 154 from the public homes.

The proportion data of the groups of drugs were divided between private and public homes and shows that vitamins and anti-anemic drugs placed first in both types of homes, followed by cardiovascular drugs and then gastrointestinal medications. Psychiatric drugs occupied sixth place in both types of homes. Although there is a predominating consumption of drugs in the public homes, there are no statistically significant differences between the two types of homes (Figure 1c).

According to the incidence of diseases in the homes, the percentage per group of diseases showed that heart pathologies predominate followed by bone and traumatological pathologies; ophthalmologic diseases placed third and psychiatric conditions occupied sixth place. There are a greater percentage of diseases in public homes than in private homes, but no statistically significant differences were detected (Figure 1d). There is a similar distribution in medication groups and conditions between homes with regard to gender.

Table 2 shows the number of drugs prescribed simultaneously in the elderly subjects studied. In general, most subjects used 1 or 2 drugs. Women consume more drugs simultaneously. They often take five to seven drugs simultaneously, while men take up to four drugs. Of the 89 female and 41 male elderly subjects taking 2 or more drugs simultaneously, we found 26 possible drug interactions in women and 11 possible interactions in men. Of the 130 elderly subjects simultaneously taking 2 or more drugs, 28.5% are at risk of experiencing an interaction between the taken drugs.

Table 1: Demographic characteristics of the elderly subjects.

	Age (yrs)		Weight (kg)		Height (m)	
	Female	Male	Female	Male	Female	Male
Nursing Home	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.
SMG ¹	81.05±5.94	78.77±8.74	53.37±8.01	55.25±8.71	1.50±0.07	1.57±0.07
MG ¹	83.30±6.25	0	49.12±11.37	0	1.43±0.10	0
VGT ²	80.09±6.64	76.88±6.37	52.97±9.86	63.62±9.45	1.45±0.08	1.60±0.07
AM ²	80.47±7.35	80.05±6.92	55.45±11.92	60.02±9.92	1.43±0.12	1.56±0.09

¹Private
²Public

Table 2: Number of drugs prescribed simultaneously in the elderly subjects.

Number of drugs prescribed simultaneously	Female	Male
0	23	26
1	37	26
2	37	23
3	29	13
4	12	5
5	7	0
6	3	0
7	1	0

The group of drugs more frequently consumed were vitamins and anti-anemic drugs including vitamin A, B complex, vitamins C and D, calcium caseinate, ferrous fumarate and folic acid. Prescription pattern for cardiovascular agents was compared in male and female. Following vitamins and anti-anemics, isosorbide dinitrate is the most used (20 elderly subjects, 14 women and 6 men), followed by nifedipine (20 elderly subjects, 12 women and 8 men). Buphenine hydrochloride placed third, taken by 19 elderly subjects (10 women and 9 men).

In order of frequency, the next were the gastrointestinal agents, psyllium preparations was the most used, by 14 elderly subjects (9 women and 5 men), followed by cimetidine, also consumed by 13 subjects (7 women and 6 men), and aluminum magnesium hydroxide gel was consumed by 11 elderly (8 women and 3 men).

The next group were the analgesics, anti-inflammatory and anti-rheumatic drugs. The most frequently consumed from this group is naproxen. It was used by 31

subjects (20 women and 11 men), followed by acetyl salicylic acid by 10 subjects (7 women and 3 men) and acetaminophen in 6 elderly volunteers (5 women and 1 man). Psychiatric drugs occupied sixth place. The consumption of haloperidol predominated, consumed by 5 patients (3 women and 2 men), followed by amitriptyline hydrochloride consumed by 3 women and thioridazine hydrochloride used by 3 subjects (2 women and 1 male) (Table 3).

With respect to 10 most frequent disease incidence the cardiovascular diseases placed first, the most frequent condition being peripheral vascular disease seen in 114 elderly subjects (68 females and 46 males), followed by hypertension in 68 (50 women and 18 men), and atherosclerous cardiopathy in 19 (9 women and 10 males).

Bone diseases and trauma placed second, with a predominance of degenerative joint diseases present in 82 elderly subjects (50 women and 32 males), rheumatoid arthritis in 44 subjects (35 women and 9 men) and dorsal xiphosis in 14 patients (8 women and 6 men). The

third group of diseases was ophthalmologic diseases; cataracts predominated in 65 elderly subjects (44 women and 21 men); presbycusis in 62 (39 women and 23 males) and blindness in 22 (10 women and 12 men) subjects.

Table 3: Distribution of the ten most frequent drugs of four groups prescribed to the elderly

Type Of Drug	Males		Females	
	Frequency	Percentage %	Frequency	Percentage %
Cardiovascular Agents				
Isosorbide Dinitrate	6	17.1	14	18.4
Nifedipine	8	22.8	12	15.8
Buphenine Hydrochloride	9	25.7	10	13.2
Alpha-Methyldopa	1	2.8	12	15.8
Digoxin	2	5.7	11	14.5
Dipyridamole	5	14.2	5	6.6
Metoprolol Tartrate	0	0	1	1.3
Papaverine Hydrochloride	0	0	1	1.3
Prazosin Hydrochloride	0	0	1	1.3
Dihydroergotamine Mesylate	0	0	1	1.3
Gastrointestinal Agents				
Psyllium Preparations	5	22.7	9	17.0
Cimetidine	6	27.3	7	13.2
Aluminum Magnesium Hydroxide Gel	3	13.6	8	15.1
Propantheline Bromide	1	4.5	5	9.4
Butilioscina	2	9.1	3	5.7
Senna Concentrates	1	4.5	3	5.7
Dimethicone	1	4.5	3	5.7
Metoclopramide Hydrochloride	1	4.5	2	3.8
Kaolin Pectin	0	0	3	5.7
Chlordiazepoxide	0	0	2	3.8
Analgesics, anti-inflammatory and antirheumatic Agents				
Naproxen	11	57.9	20	42.6
Acetylsalicylic Acid	3	15.8	7	14.9
Acetaminophen	1	5.3	5	10.6
Dextropropoxyphene	0	0	5	10.6
Piroxicam	0	0	3	6.4
Flurbiprofen	1	5.3	1	2.1
Diclofenac Sodium	0	0	2	4.3
Dihydroergotamine Mesylate	1	5.3	0	0
Ketoprofen	1	5.3	0	0
Indomethacin	0	0	1	2.1
Psychiatric Agents				
Haloperidol	2	33.3	3	15.8
Amitriptyline Hydrochloride	0	0	3	15.8
Thioridazine Hydrochloride	1	16.7	2	10.5
Phenobarbital	0	0	2	10.5
Diazepam	0	0	2	10.5
Mianserin Hydrochloride	0	0	2	10.5
Bromazepam	0	0	1	5.3
Perphenazine	0	0	1	5.3
Ginkgo Biloba	1	16.7	0	0
Clonazepam	0	0	1	5.3

Table 4: Distribution of the ten most frequent diseases of four groups in elderly patients

Type Of Disease	Males		Females	
	Frequency	Percentage %	Frequency	Percentage %
<i>Cardiovascular Disease</i>				
Peripheral vascular disease	46	48.9	68	38.0
Hypertension	18	19.1	50	27.9
Atherosclerous cardiopathy	10	10.6	9	5.0
Heart failure	3	3.2	10	5.6
Ischaemia	2	2.1	8	4.5
Arrhythmia	2	2.1	5	2.8
Heart-block	3	3.2	3	1.7
Hypertensive cardiopathy	1	1.1	5	2.8
Cor pulmonale	2	2.1	4	2.2
Varicose ulcer	2	1.1	4	2.2
<i>Traumatology and Bone Diseases</i>				
Degenerative joint disease	32	47.8	50	37.6
Rheumatoid Arthritis	9	13.4	35	26.3
Xyphosis	6	9.0	8	6.0
Fractures	5	7.5	8	6.0
Hallus valgus	0	0	12	9.0
Traumatisms	1	1.5	5	3.8
Rectum diastasis	3	4.5	2	1.5
Ankylose	0	0	4	3.0
Reduce Leg	2	3.0	1	0.8
Amputations	2	3.0	1	0.8
<i>Ophthalmologic Diseases</i>				
Cataracts	21	28.4	44	36.7
Presbycusis	23	31.1	39	32.5
Blindness	12	16.2	10	8.3
Chronic conjunctivitis	4	5.4	8	6.7
Glaucoma	4	5.4	6	5.0
Pterygium	4	5.4	4	3.3
Aphakia	2	2.7	3	2.5
Strabismus	0	0	2	1.7
Iridectomy	1	1.4	1	0.8
Retinitis	1	1.4	1	0.8
<i>Gastrointestinal Diseases</i>				
Gastritis	6	11.8	12	16.9
Haemorrhoid	9	17.6	9	12.7
Chronic constipation	5	9.8	10	14.1
Colitis	4	7.8	9	12.7
Dyspepsia	3	5.9	7	9.9
Umbilical hernia	5	9.8	4	5.6
Inguinal hernia	6	11.8	2	2.8
Hiatal hernia	4	7.8	3	4.2
Rodent ulcer	2	3.9	5	7.0
Hepatic diseases	1	2.0	4	5.6

The fourth group of diseases was related to digestive tract. Gastritis placed first with 18 elderly subjects (12 women and 6 men), followed by haemorrhoids in 18 (9 women and 9 men) and chronic constipation in 15 (10 women and 5 men) participants (Table 4). In the studied population of elderly subjects, psychiatric conditions placed sixth. Senile dementia predominated in 26 subjects (18 women and 8 men), depression in 24 (19 women and 5 men) and third place was occupied by non-specific psychiatric disorders in 23 (16 women and 7 men) subjects.

DISCUSSION

There is evidence showing that the elderly consume more drugs than younger people and certainly the number of drugs prescribed to elderly patients' increases with age (21). There is also an increase in the incidence of adverse reactions with a greater number of drug prescriptions (22).

Our results agree with reports from other authors who found an increase in the incidence of adverse reactions with the number of drugs administered to the patients (23). The data presented by Carbonin et al (24), after using a multivariate logistic model, confirmed previous suggestions stating that aging per se may not be a risk factor for adverse reactions, but other variables frequently associated with aging, such as the number of drugs prescribed, days of hospital stay and the number of additional conditions, can be risk factors. Our study found that 28.5% of the population consuming 2 or more drugs simultaneously is at risk of experiencing some type of adverse reaction due to drug interactions.

Hale et al (25) carried out a study on obtaining information on the use of drugs (Dunedin Program) in an ambulatory geriatric population. It was found that the participants used 3.2 drugs on the average, and half were administered without prescription. Women used more drugs than men, using 3.5 drugs in average, compared with 2.8 drugs used in average by men. The use of both prescribed and non-prescribed drugs was significantly higher in women than in men.

Results gathered in the present study show similarities with other reported studies. Women take more drugs simultaneously than men (in average 3.5 drugs), in fact women use up to five to seven medications at a time.

Men only take 4 drugs simultaneously (in average 2.0 drugs). Our results do not show significant statistical differences among sexes, but it is evident that women tend to consume more drugs than men.

When comparing our results with those from the Dunedin Program (25), it is worth noting that the prescription patterns described by these authors are somewhat different from ours. They found that the drugs most used were antihypertensive medications, vitamins, heart drugs, cardiovascular dilators, laxatives and tranquilizers. Our prescription patterns showed vitamins and anti-anemic drugs to occupy first place, followed by cardiovascular drugs, gastrointestinal medication, anti-inflammatory and anti-rheumatic drugs, antibiotics, etc.

When analyzing the results concerning the consumption of drugs in private and public homes, we found that the prescription patterns for the elderly are similar in the two types of homes. The patterns of drug consumed in nursing homes are very similar to the consumption patterns we gathered when comparing sexes, with a predominance of the vitamin and anti-anemic, cardiovascular and gastrointestinal groups.

It should be noted that when comparing the presence of certain conditions like sex and among nursing homes, the first place are cardiovascular diseases, corresponding to the second group of drugs most consumed by the elderly (cardiovascular agents). This may be due to the fact that the first group of drugs includes vitamins and anti-anemic medications, very frequently prescribed to this type of subjects. Bone diseases and traumas placed second in frequency. The group of analgesics, anti-inflammatory and anti-rheumatic drugs occupies fourth place.

While gastrointestinal diseases placed fourth, drugs used for their treatment placed third in consumption frequency. There is not much relation between the frequency of consumption of certain groups of drugs and the frequency of the presence of pathologies.

The consumption pattern of the elderly Mexican patients needs to be followed regardless of gender and the type of nursing home since they take multiple drugs and hence are at the risk of drug interactions and adverse affects.

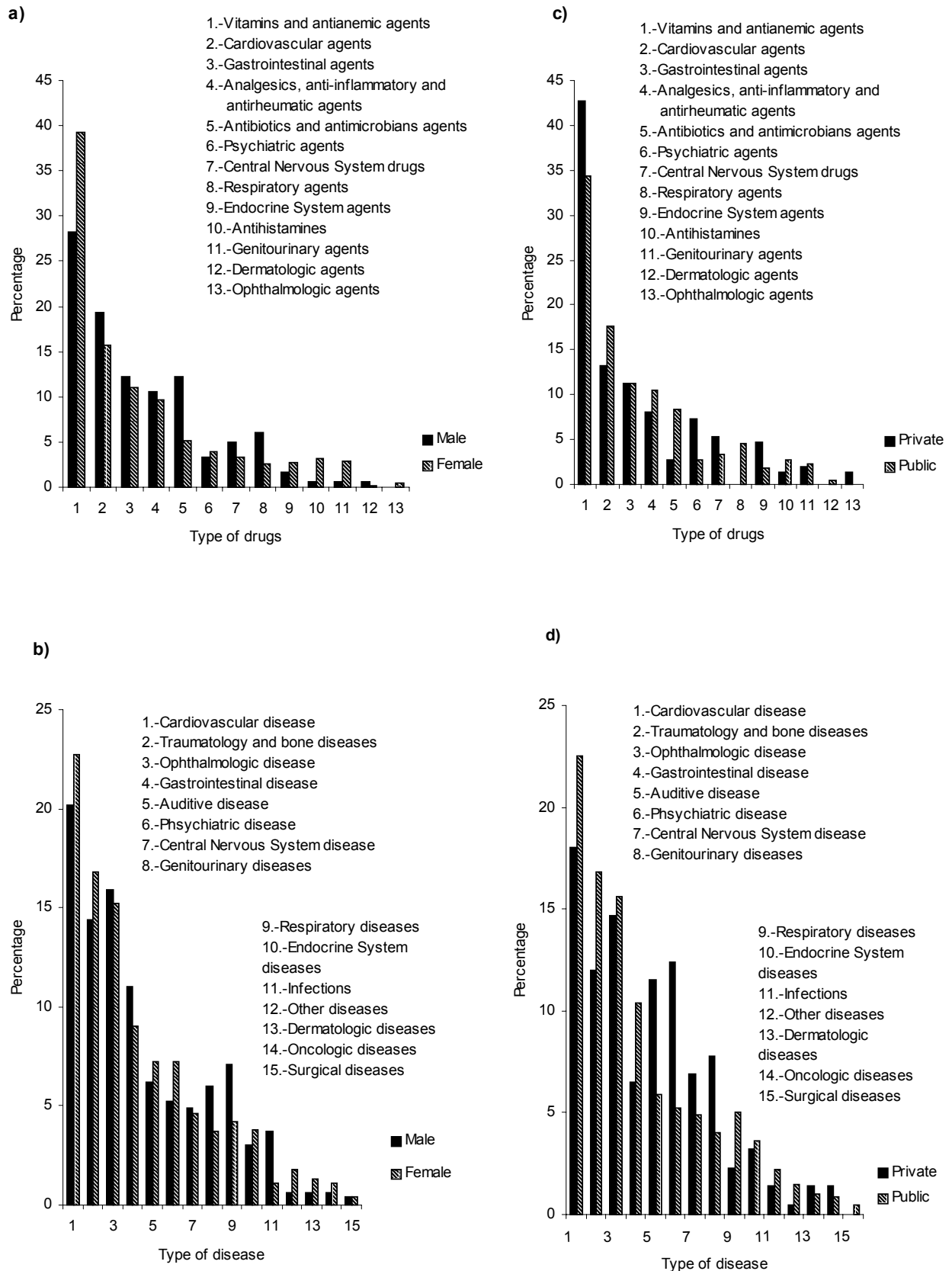


Figure 1: Differences between groups of drugs and diseases for gender and nursing homes.

REFERENCES

- [1] Thompson, JF., McGhan, WF., Ruffalo, RL., Cohen, DA., Adamcik, MB., Segal, JL., Clinical pharmacists prescribing drug therapy in a geriatric setting: Outcome of a trial. *J Am Geriatr Soc*, 32:154-159, 1984.
- [2] Mariño, HE., *Farmacocinética en el anciano. Geriátrica*, 4:47-55, 1988.
- [3] Katzung, BG., *Farmacología básica y clínica 7a. edición. Manual Moderno, México D.F., México*, 1999.
- [4] Bressler, R., Adverse drug reactions. In *drug therapy for the elderly*. Mosby, St.Louis, USA, 1982.
- [5] Vargas, CE., Moreno, GA., *Anciano y fármacos. Medicine*, 46:9-19, 1992.
- [6] Carbonin, PU., Antonelli, IR., Bernabei, R., *Clinical pharmacology and geriatrics. Lancet*, 2:742-747, 1987.
- [7] Nolan, L. and O'Malley, K., Prescribing for the elderly. Part I: Sensitivity of the elderly to adverse drug reactions. *J Am Geriatr Soc*, 36:142-149, 1988.
- [8] Nolan, L. and O'Malley, K., Prescribing for the elderly. Part II: Prescribing patterns: differences due to age. *JAGS*, 36:245-254, 1988.
- [9] Freer, C., Old myths. *Lancet*, 1:268, 1985.
- [10] Bjerrum, L., Hallas, J., Kragstrup, J., Polypharmacy: correlations with sex, age and drug regimen. A prescription data base study. *Eur J Clin Pharmacol*, 54:197-202, 1998.
- [11] Wallsten, SM., Sullivan, R., Hanlon, JT., Blazer, DG., Tyrey, M., Westlund, R., Medication taking behaviors in the high-and low-functioning elderly: MacArthur field studies of successful aging. *Ann Pharmacother*, 29:359-364, 1995.
- [12] Briant, RH., Drug treatment in the elderly: Problems and prescribing roles. *Drugs*, 13:225-229, 1977.
- [13] Tumar, N., Scarpace, PJ., Lowenthal, DT., *Geriatric pharmacology: Basic and clinical considerations. Annu Rev Pharmacol Toxicol*, 32:271-302, 1992.
- [14] Banda, AJ., Salinas, MR., Problemas identificados mediante la evaluación gerátrica en un asilo. *Salud Pública Mex*, 34:546-553, 1992.
- [15] Salinas, MR. and Banda, AJ., Asilos de ancianos en el Estado de Nuevo León, México. *Salud Pública Mex*, 33:56-69, 1991.
- [16] Borges, SA. and Gómez DH., Uso de los servicios de salud por la población de 60 años y más en México. *Salud Pública Mex*, 40:13-23, 1998.
- [17] Lamy, PD. and Michock, RJ., Medication management. *Clin Geriatr Med*, 3:623-638, 1988.
- [18] Gambert, SR., Duthie, EH., Wiltzius, SF., The value of the yearly medical evaluation in a nursing home. *J Chron Dis*, 35:65-68, 1982.
- [19] Poder Ejecutivo Federal. Plan Nacional de Desarrollo 1995-2000. Hacienda y Crédito Público, D.F., México, 1995.
- [20] Grundy, E., *Textbook of geriatric medicine and gerontology*. Churchill Livingstone, Edinburgh, Scotland, 1992.
- [21] Everitt, DE. and Avorn, J., Drug prescribing for the elderly. *Arch Intern Med*, 146:2393-2396, 1986.
- [22] Williamson, J. and Chopin, JM., Adverse reactions to prescribed drugs in the elderly; a multicenter investigation. *Ageing*, 9:73-80, 1989.
- [23] Montamat, SC. and Cusack, B., Overcoming problems with polypharmacy and drug misuse in the elderly. *Clin Geriatr Med*, 8:143-158, 1992.
- [24] Carbonin, PU., Pahor, M., Bernabei, R., Sgadari, A., Is age an independent risk factor of adverse drug reactions in hospitalized medical patients?. *J Am Geriatr Soc*, 39:1093-1099, 1991.
- [25] Hale, WE., Marks, RG., Stewart, RB., Drug use in geriatric population. *J Am Geriatr Soc*, 27:374-377, 1979.