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Research Article

CHARACTERIZATION OF POLYPHARMACY IN THE ELDERLY IN THREE UNITS OF HEALTH SERVICES IN PACHUCA, HIDALGO

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ABSTRACT

The aim of this study is to determine the characteristics of poly pharmacy in the elderly in three units of Health Services in the state of Hidalgo, Mexico. A cross-sectional study of 282 patients treated at three units of the Health Services of Hidalgo during July-August 2014. A questionnaire was applied to collect the variables age, gender, diagnosis, drugs (prescription or self-medication) and the presence of adverse drug reactions. Descriptive statistics were performed using SPSS version 18 and the freely available software "Drug Interaction Checker" was used for identifying drug interactions. Mean age was 72 ± 11 years and 74.46 % were women (ratio 3:1); the most frequent illnesses were hypertension (30.1 %) and type 2 diabetes mellitus (17 %); regarding co-morbidities, 43.61 % had two concomitant pathologies followed by 25.9 % who presented three. Of the patients studied, 66 % consumed 3-5 drugs (median 4). The longest administration of a drug was 38 years (glibenclamide). The predominant route of administration was oral (93 %) with tablets (83.8) being the most prescribed pharmaceutical form. The ratio for self-medication was 10:100 with herbal products (57 %) being the most consumed by self-medication. Patients felt unwell after administration of a drug in 22.3 % with the main reaction referred being dyspepsia. Losartan, naproxen and sertraline were the main drugs associated with a suspected adverse reaction. At least one drug interaction was identified in 60 % of patients, with a median of 2 interactions; 63 % were classified as clinically significant, 33.7 % as minor, and 3.3 % as severe. The drug most often involved in an interaction was metformin; however, the most frequent interaction was aspirin-losartan. The characterization of poly pharmacy in the elderly sets the tone for developing interventions aimed at the prevention of drug interactions and promoting the rational use of drugs.

Keywords: Poly pharmacy, elderly, drug interactions, adverse drug reaction.

INTRODUCTION

There is a rapid growth of the adult population aged 60 years and over worldwide and it is estimated that for the Americas in 2010, they comprise 13.1 % of the total population, with an aging index of 53 adults 60 years and over per 100 children less than 15 years.[1] In Mexico, for 2010, a population of approximately 10 million elderly adults (EA) with an aging index of 31 EA per 100 children less than 15 years was calculated and it is estimated that by 2050, the number of EA will rise to 36.5 million. In the State of Hidalgo, the EA ratio with regard to the total population for 2010 was 9.3 %, which is above the national average (8.8 %) and for 2030 it is expected to double, reaching 18.8 %.[2,3] Older adults are a heterogeneous and vulnerable group of patients in which there are often multiple diseases that make them take a large number of prescription drugs; therefore they have become a high drug consumer group, either by prescription or self-medication, with a consequential risk of adverse drug reactions (ADRs) and drug interactions (DIs). The World Health Organization (WHO) considers the term poly pharmacy as the consumption of three or more drugs simultaneously by a patient, thereby increasing the probability of unwanted effects, which result in a situation that can compromise the quality of life of EAs.[4-6] In Latin America, the SABE (Survey on Health, Well-being and Aging) study of the Pan American Health Organization conducted in EA population reports that 80 % of this population receives three or more drugs and 90 % received at least one.[7] Thus, poly pharmacy has become important in the health of the EA patient, positioning it as a common and important geriatric syndrome (the most frequent form of disease in the EA), probably because poly pharmacy, as a clinical entity, behaves as a disease simulator generating symptoms suggestive of any disease state.[8-10] This risk increases with age, due to the physiological changes of aging. These changes are attributable to many factors, such as changes in absorption, the ability to metabolize the drug and the behaviour of receptors. The pharmacokinetic processes that are most altered with aging are metabolism and excretion, which lead to changes in the pharmacokinetic and pharmacodynamic behaviour of drugs, and the influence of diseases, functional problems and social issues. Furthermore, ADRs present on many occasions with nonspecific symptoms such as dyspepsia, confusion, drowsiness and dizziness, making the differential diagnosis and appropriate medical approach difficult.[10-12] Patient safety is a constant concern for public health; however, health professionals only detect a small number of adverse effects especially in outpatient populations. Also, balancing the risk of poly pharmacy with the underutilization of appropriate drugs is an important challenge when defining therapy for an EA patient. Adverse drug reactions in EA ambulatory and residential patients fluctuate between 2.5 and 50 %, with clear clinical, economic, humanistic and health system implications, which can determine the use of additional drugs, disability, a decrease in quality of life and functionality, hospitalization or death. We also known that two-thirds of the adverse reactions are predictable, and a third preventable.[11,13-14] Problems related to drugs (PRM) in EA increase the risk of developing other problems, which lead to more consultations and associated costs to health systems, increased drug consumption, more hospitalization, and ultimately, greater risk of affecting their autonomy due to loss of functionality. In the United States, it has been estimated that the morbidity and mortality associated with PRM ascends to 4 billion dollars a year in institutionalized EA. Because of the consequences of the use of potentially inappropriate drugs, tools have been designed and implemented to help avoid risky drugs.[5,11] Awareness on the part of

health personnel towards early prevention and identification of adverse events and drug interactions is very important to ensure that EA do not lose their functionality, that costs are reduced for the patients and health services, and that they enjoy a better quality of life.[12,14] This study aims to determine the characteristics of poly pharmacy in the elderly in three units of Health Services in Hidalgo, Mexico, establish the proportion of self-medication, identify major drug interactions and adverse reactions occurring in this age group with the intention of generating interventions aimed at increasing the knowledge and participation of the attending physician regarding the importance of proper prescription and therapeutic monitoring of the patient, especially the identification of potential drug interactions and promoting the rational use of drugs.

MATERIAL AND METHODS

We performed a descriptive, observational, cross-sectional study with Epi Info software version 7 determining a sample size of 245, considering a reliability of 95 %, a prevalence (theoretical) of 80 %, with a relative error of 5 % and with a margin of no response to the sample of 15 %, resulting in a sample size of 282 EA patients. Sampling was performed by strata in three departments of the Health Services of Hidalgo, in the city of Pachuca de Soto, Mexico, in which the influx of EA patients is considerable. According to the number of patients that each department serves, the sample was distributed as follows: State Centre for Integral Geriatric Care, 80 % (228 surveys), Pachuca General Hospital outpatient clinic 11 % (30 surveys), and the outpatient clinic of the "Dr. Jesús del Rosal" Health Centre, 9 % (24 surveys) during the July-August period of 2014. The variables collected in the survey were age, sex, diagnosis, drugs (by prescription and/or self-medication) and the presence of adverse drug reactions. The inclusion criterion was any adult patient 60 years or older, of either sex, who consumes three or more drugs and who can (or his/her companion) provide information on the prescribed drugs (a prescription). A database was created in Microsoft Excel 2013 and the information was exported and analyzed with SPSS version 18 for statistical analysis, producing, for quantitative data, measures of central tendency and dispersion, and for qualitative variables, proportions and ratios. For identification of drug interaction we used the free access software "Drug Interaction Checker", which consists of a matrix in which the generic drug name or the scientific name of the plants are entered (in case the patient was using herbal remedies). For the classification of interactions, the criteria of clinical significance of Hansten and Horn were used.[15] The protocol was approved by the Ethics and Research Committees of the Health Services of Hidalgo and the respective authorities of the Office for the Coordination of Health Research and the a fore mentioned three departments.

RESULTS

The mean age of EA patients was 72 ± 11 years with a median of 71 years; a bimodal distribution of 60 and 72 years was present, with the five-year group of 70-74 years being the most frequent with 24 % (Table 1). Of the total, 74.46 % were women with a female : male ratio of 3:1; i.e. for every man there were three women. A total of 657 illnesses were recorded, with circulatory system diseases (ICD-10 I00-I99) and endocrine, nutritional, and metabolic diseases (ICD-10 E00-E90) being the most frequent, accounting for 35.62 % and 28.92 %, respectively (Table 2). The 15 most frequent conditions are listed in Table 3, with hypertension (ICD-10 I10) and type 2 diabetes mellitus (ICD-10 E11) being the most frequent with 30.1 % and 17 %, respectively. Regarding co-morbidities, 43 % had two concomitant diseases with type 2 diabetes mellitus and hypertension being the two pathologies that present concomitantly more often, followed by the presence of three pathologies in 25.9 % (Table 4). The total pharmaceutical products consumed were 1226 with 66 % of patients consuming 3 to 5 drugs with a median of 4 (Table 5). Regarding duration of treatment, the longest time reported was 38 years with the oral hypoglycaemic drug, glibenclamide; however, the three most used drugs were: the oral hypoglycaemic, metformin, the anti hypertensive drug, losartan and the analgesic/antiplatelet drug, acetylsalicylic acid in 7.3 %, 6 %, and 4.3 %, respectively (Table 6). The predominant route of administration was oral in 93 % (Table 7) and the dosage form most used in 83.8 % was the tablet (Table 8). Ten of 100 patients admitted self-medication with one and up to 3 pharmaceuticals, with herbal medicine being the most used representing 59.4 % of the pharmaceuticals consumed by self-medication (Table 9). Of the 282 patients, 22.3 % reported feeling unwell after administration of a drug, with dyspepsia being the main reaction reported. There were 63 suspected adverse reactions, of which 68.3 % were of the gastrointestinal system, 15.8 % of the central nervous system, 7.9 % of the respiratory system and 3.2 % of the cardiovascular system (Table 10). In these 63 adverse reactions, patients identified 23 suspicious drugs that could have caused the problem. It is note-worthy that in 8 cases of ADR, patients could not identify which drug had caused the adverse effect (Table 11). At least one drug interaction was identified in 171 (60 %) of the 282 EA patients surveyed with a maximum of 8 interactions per patient and a median of interactions of 2 (Table 12). There were a total of 884 different drugs involved in interactions; the most frequent was metformin, followed by acetylsalicylic acid (Table 13). A total of 356 drug interactions occurred, which according to their clinical significance were: significant in 224 (63 %), minor in 120 (33.7 %), and severe in 12 (3.3 %) (Table 13)

DISCUSSION

Older adults have a greater risk of suffering chronic degenerative diseases and therefore consume a large number of drugs. Several characteristics of aging and geriatric medicine affect drug prescription of the elderly. Therefore, proper selection of pharmacotherapy for this population is complex and challenging. These factors and metabolic changes predispose these patients to more frequent drug interactions and adverse effects.[16] The prevalence of poly pharmacy has been reported by several authors between 29.9 %[17] and 86.4 %[18], but beyond these percentages, there are a number of complications in this vulnerable population, and the challenge of reducing consumption and proposing actions for effective management. Our results are in agreement with the mean age (between 60 and 70 years) and the number of drugs prescribed to these patients (five), and the presence of metabolic syndrome and other co-morbidities.[18]

Table 1: Distribution by age group

Age Group	Frequency	Percentage
60 - 64	61	22
65 - 69	59	21
70 - 74	71	24
75 - 79	33	12
80 - 84	35	13
85 - 89	11	4
90 and more	12	4
Total	282	100

Table 2: Frequency of diseases

ICD10 code	Disease	Frequency	Percentage
I00-I99	Diseases of the circulatory system	234	35.62
E00-E90	Endocrine, nutritional and metabolic diseases	190	28.92
M00-M99	Diseases of the musculoskeletal system and connective tissue	78	11.87
K00-K93	Diseases of the digestive system	46	7.00
F00-F99	Mental and behavioral disorders	29	4.41
H00-H59	Diseases of the eye and adnexa	19	2.89
G00-G99	Diseases of the nervous system	18	2.74
A00-B99	Infectious diseases	14	2.13
N00-N99	Diseases of the genitourinary system	9	1.37
J00-J99	Diseases of the respiratory system	6	0.91
D50-D89	Diseases of the blood and blood-forming organs	4	0.61
C00-D48	Neoplasms	3	0.46
H60-H95	Diseases of the ear and mastoid process	3	0.46
S00-T98	Trauma	3	0.46
L00-L99	Diseases of the skin and subcutaneous tissue	1	0.15
	Total	**657**	**100**

Table 3: The main 15 diseases identified

Illness	Frequency	Percentage
Hypertension	198	30.1
Type 2 diabetes mellitus	112	17.0
Hyperlipidemia	37	5.6
Osteoarthritis	21	3.2
Gastritis	18	2.7
Rheumatoid arthritis	17	2.6
Varicose veins	14	2.1
Arthralgia	12	1.8
Depression	11	1.7
Osteoporosis	11	1.7
Cataracts	10	1.5
Hypothyroidism	9	1.4
Lumbalgia	9	1.4
Cognitive impairment	7	1.1
Hyperuricemia	7	1.1
Other	164	25
Total	**657**	**100**

Table 4: Frequency of co-morbidities

Number of concomitant pathologies	Individuals	Percentage
1	50	17.73
2	123	43.61
3	73	25.90
4	26	9.22
5	10	3.54
Total	**282**	**100**

Table 5: Number of drugs used per patient

Number of drugs used	Patients	Percentage
>2	39	14
3-5	185	66
6-8	45	15.5
9- 11	13	4.5
Total	**282**	**100**

Table 6: The 15 most used drugs

Drug	Frequency	Percentage
Metformin	90	7.3
Losartan	74	6.0
Aspirin	57	4.6
Complex B	42	3.4
Glibenclamide	42	3.4
Enalapril	36	2.9
Omeprazole	36	2.9
Captopril	31	2.5
Hydrochlorothiazide	27	2.2
Gabapentin	25	2.0
Meloxicam	25	2.0
Metoprolol	24	2.0
Multivitamin	24	2.0
Paracetamol	24	2.0
Pravastatin	24	2.0
Others	645	53.6
Total	**1226**	**100**

Table 7: Frequency of route of administration

Route of administration	Frequency	Percentage
Oral	1141	93
Subcutaneous	31	2.5
Intramuscular	19	1.6
Ophthalmic	18	1.5
Topical	10	0.9
Inhalation	4	0.3
Other	3	0.2
Total	**1126**	**100**

Table 8: Reported frequency of dosage forms

Pharmaceutical presentation	Frequency	Percentage
Tablets	1028	83.8
Capsules	46	3.7
Injectable solution	32	2.6
Powder	28	2.3
Oral solution	21	1.8
Eye drops	16	1.4
Suspension for injection	12	1
Dragees	9	0.7
Oral drops	8	0.6
Oral suspension	7	0.5
Aerosols	6	0.5
Other	13	1.1
Total	**1226**	**100**

Table 9: Frequency of self-medicated drugs

Drugs consumed by self-medication	Frequency	Percentage
Teas, herbal teas and herbal medicine	19	57
Allopathic medicines	8	25
Multivitamin	5	18
Total	**32**	**100**

Table 10: Reported adverse reactions

Adverse reaction	Frequency	Percentage
Dyspepsia	20	31.7
Nausea	16	25.4
Headache	7	11.1
Sleepiness	4	6.3
Dry cough	4	6.3
Diarrhea	3	4.8
Hypotension	2	3.2
Anorexia	1	1.6
Weakness	1	1.6
Abdominal distension	1	1.6
Epistaxis	1	1.6
Constipation	1	1.6
Nocturnal polyuria	1	1.6
Blurred vision	1	1.6
Total	**63**	**100.0**

Table 11: Drugs suspected of causing an adverse reaction

Suspected drug	Frequency	Percentage	Suspected adverse reaction
Serious			
Losartan	5	9.1	Nausea, dyspepsia, dry cough, epistaxis
Naproxen	5	9.1	Blurred vision, dyspepsia, weakness
Sertraline	5	9.1	Hypotension, nausea, dyspepsia, drowsiness
Aspirin	4	7.3	Dyspepsia
Captopril	4	7.3	Headache, dry cough
Metformin	4	7.3	Headache, abdominal distension, dyspepsia, diarrhea
Chlorthalidone	3	5.5	Constipation, dyspepsia
Enalapril	3	5.5	Dry cough, dyspepsia, nausea
Pentoxifylline	3	5.5	Nausea, dyspepsia
Pravastatin	3	5.5	Dyspepsia, nausea
Other	2	3.6	Nausea, diarrhea
Gabapentin	2	3.6	Nausea, dyspepsia
Levothyroxin	2	3.6	Nausea, headache
Allopurinol	1	1.8	Sleepiness
Amlodipine	1	1.8	Headache
Hydrochlorothiazide	1	1.8	Nocturnal polyuria
Iron	1	1.8	Dyspepsia
Insulin	1	1.8	Headache
Metoprolol	1	1.8	Dyspepsia
Paracetamol	1	1.8	Dyspepsia
Paracetamol/tramadol	1	1.8	Dyspepsia
Prazosin	1	1.8	Sleepiness
Verapamil	1	1.8	Nausea
Total	**55**	**100**	

Table 12: Number of interactions by EA

Number of interactions	Frequency of individuals with an interaction	Percentage
1	75	43.8
2	50	29.3
3	25	14.7
4	9	5.3
5	7	4
6	2	1.1
7	1	0.7
8	2	1.1
Total Patients	**171**	**100**

Table 13: Main interactions identified

Interaction	Effect	Frequency	Percentage
Serious			
allopurinol - enalapril	Concomitant use is associated with increased risk of hypersensitivity reactions.	4	33.3
allopurinol - captopril	Concomitant use is associated with increased risk of hypersensitivity reactions.	3	25.0
Carbamazepine - hydrochlorothiazide	Possible potentiation of toxicity of carbamazepine with development of hyponatremia.	1	8.3
celecoxib - methotrexate	Celecoxib increasesmethotrexate levels byreducing renal clearance, thereby increasing its blood and gastrointestinal toxicity.	1	8.3
cisapride - levofloxacin	Concomitant administration increases the likelihood of QT prolongation.	1	8.3
losartan - captopril	Due to blockade of the renin-angiotensin system increases the risk of hypotension and hyperkalemia	1	8.3
omeprazole - cilostazol	Omeprazole causes hepatic inhibition of cilostazol levels and increases anticoagulant effect	1	8.3
Total		**12**	**100**
Significant			
Interaction	**Effect**	**Frequency**	**Percentage**
Acetylsalicylic acid - losartan	Increase in serum potassium	18	8.0
omeprazole - losartan	Omeprazole increases losartan levels, increasing its hypotensive effect.	12	5.4
Acetylsalicylic acid - glibenclamide	Acetylsalicylic acid increases the effect of gyibburide increasing its hypoglycemic effect.	8	3.6
bezafibrate - pravastatin	Concomitant use associated with increased risk of rhabdomyolysis.	6	2.7
captopril - glibenclamide	Captopril increases the effects of gliburide increasing its hypoglycemic effect.	6	2.7
enalapril - insulin	Enalapril increases the effects of insulin, increasing its hypoglycemic effect.	6	2.7
losartan - meloxicam	Increased serum potassium and risk of hyperkalemia	6	2.7
metoprolol - losartan	Increased serum potassium and risk of hyperkalemia	6	2.7
Naproxen - acetylsalicylic Acid	Both increase anticoagulation	5	2.2
glibenclamide - omeprazole	Omeprazole increases levels of glibenclamide, decreasing its liver metabolism, and increasing its hypoglycemic effect.	5	2.2
Other		52	63.4
Total		**224**	**100**
Mild			
Interaction	**Effect**	**Frequency**	**Percentage**
Aspirin - vitamin B 12	Aspirin reduces the absorption of vitamin B12, affecting its effectiveness.	11	9.2
metformin - vitamin B 12	Metformin decreases absorption of vitamin B12, affecting its effectiveness.	10	8.3
Aspirin - hydrochlorothiazide	Hydrochlorothiazide decreases the elimination of acetylsalicylic acid, affecting its efficacy.	9	7.5
Aspirin - insulin	Aspirin increases the effects of insulin increasing its hypoglycemic effect.	9	7.5
Gabapentin - vitamin B 12	Gabapentin decreases the absorption of vitamin B12, affecting its effectiveness.	6	5.0
metformin - hydrochlorothiazide	Hydrochlorothiazide inhibits renal elimination of metformin, increasing its levels and hypoglycemic effect	5	4.2
hydrochlorothiazide - insulin	Hydrochlorothiazide reduces the effect of insulin.	4	3.3
chlorthalidone - metformin	Chlorthalidone reduces the effect of metformin.	4	3.3
gabapentin - paracetamol	Gabapentin decreases paracetamol levels by increasing its metabolism, affecting its effectiveness.	3	2.5
omeprazole - vitamin B12	Omeprazol reduces the absorption of vitamin B12, affecting its effectiveness.	3	2.5
Other		56	47
Total		**120**	**100**

Poly pharmacy is a major concern in the care of older adults. We know that the population over 65 years, not only often has multiple medical conditions, but can also present other complications such as cancer, which involves other drugs besides those needed according to their age. The use of several drugs increases the risk of drug-drug interactions, a lack of adherence to treatment, a loss of independence, multiple physical and cognitive problems (delirium), an increased risk of falls, and adverse reactions due to the use of five or more drugs; however, these drugs are necessary to maintain a better quality of life.[19,20] The problem has increased so much that some authors describe "poly pharmacy" as the use of six or more drugs, "major poly pharmacy" when 11 or more drugs are used, and "excessive poly pharmacy" when 21 or more drugs are used.[18] Although our study did not determine the socio-educational level of our population, it has been seen in other studies that when it is low, it becomes an influential factor especially in drug errors, which can cause a consequential increase in interactions and adverse effects.[17] Now that the problem has been identified, it is necessary to also identify actions and interventions to improve prescriptions for the benefit of the elderly. It is necessary to consider improving educational approaches, geriatric medicine services, prescription practices using available software directed at these needs, including the participation of a healthcare team formed by physicians, pharmacists, nurses, patients and their family.[16] The physician must take into account the general condition of the patient and be aware of all the medications he/she is taking, because the patient may go to consultation with another specialist, who can gives him/her a prescription unknown to the family physician. Therefore, it is advisable that at each visit the list of drugs being used should be reviewed. Also, a process of selection of truly necessary drugs should be started. One of the barriers to try to reduce prescriptions is the lack of information that physicians have about the problem of drug interactions and adverse reactions, therefore it is necessary to also educate the healthcare team.

CONCLUSION

The physiological changes of aging in elderly adults, such as less body water and decreased liver and kidney function, favour altered pharmacokinetics and pharmacodynamics, predisposing individuals to adverse effects that may not occur in adult patients; this plus the fact that EA often present more pathology increases the number of prescribed medications. Both prescription drugs and self-medication of allopathic or herbal products increase the possibility of adverse reactions and drug interactions, making it necessary to carefully assess the drugs and dosages in the EA patient, otherwise their quality of life will be affected causing unwanted effects and a lack of adherence, which impairs optimal control of their illnesses. The characterization of poly pharmacy in the elderly adult sets the tone for the development of interventions aimed at preventing drug interactions and adverse events, and promoting rational use of drugs.

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