Prescription Drug Use Among Elderly Admitted to Medical Wards in a Malaysian Government Hospital

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SUMMARY
A cross-sectional study was conducted to examine the use of prescription drugs among elderly patients ($\geq$ 60 years old) admitted to medical wards in Hospital Kuala Lumpur, Malaysia. A total of 204 elderly (101 men and 103 women) were interviewed. Eighty two percent of the elderly were taking at least one prescription drug, with 39.2% taking $\geq$ 5 drugs. Prescription drugs commonly used were antihypertensives (54.4%), antidiabetics (40.2%), drugs used in haemostasis (36.8%), nitrates (33.3%) and diuretics (32.4%). Factors associated with increased use of prescription drugs were: more number of chronic diseases, self-rated health status as poor, low Barthel score, and Chinese women.

> **KEY WORDS:**
> *Prescription drug, Drug use, Elderly, Polypharmacy, Malaysia*

INTRODUCTION

The world population is aging. With advances in medical technology, improved sanitation, better diets, and the success of socio-economic growth, the demography of the population is changing with the number of elderly expected to rise rapidly in the next few decades[1]. In Malaysia, the elderly population has doubled in 20 years from 765,000 (5.1%) in 1980 to 1.466 million (6.6%) in 2000, and is expected to increase further[2,3].

The aging of the population, together with the resultant higher rates of chronic diseases and the increasing availability of therapeutic agents, have caused an increase in drug use among the elderly. In USA, 32% of the total prescription drugs are dispensed for the elderly, and it is about 45% in UK[4,5]. There are some problems related to the use of drug in the elderly. The altered pharmacokinetics and pharmacodynamics in the elderly due to aging cause them to be more susceptible to adverse drug reactions, and may result in an increase in acute hospital admissions. Besides, by taking higher number of drugs, the elderly are prone to problems related to polypharmacy, that include higher number of unwanted drug-drug interactions, increased risk of adverse drug reactions (ADRs), decreased compliance with drug regimes, iatrogenic illnesses, and increased healthcare costs[6-8].

Numerous studies have been done on drug use in the elderly in Western countries (North America and Europe)[9-15] and also in Australia[16], Hong Kong[17] and Taiwan[18], that described the extent of drug use, therapeutic classes of drugs used, and factors associated with their uses in those populations. However, despite the aging of the population, healthcare of the elderly in developing countries is still under-studied. Little was found during a literature search on drugs and the elderly in developing countries, including Malaysia. It was further proposed that the drug use characteristics might differ between populations of different racial and cultural backgrounds and different healthcare system[17].

This study is therefore aimed at collecting data about the use of prescription drugs among the elderly from a study population in Malaysia, a developing country and with a healthcare system different from those in developed countries. This study will provide the information about the pattern and the extent of drug use among the elderly, and this is useful in the planning of geriatric health service. Factors associated with increased drug use among the elderly are also identified, so that those who are at high risks to problems related to polypharmacy could be identified and measures be taken. It is hoped that this study will provide some baseline data for future research in the field of geriatrics in Malaysia.

MATERIALS AND METHODS

A hospital-based cross-sectional study was carried out for a six week period in two general medical wards (one male and one female) in Hospital Kuala Lumpur, Malaysia. All elderly patients, defined as those aged 60 years and above, admitted to the two wards during the study period were included in the study. However, those in the following categories were excluded from the study: patients who died or being transferred out within 12 hours of admission, and patients who were unconscious or too confused and with no family members around to provide the information.

Data was collected through face-to-face interviews with the patients using a standardized questionnaire, usually within 24 hours of admission. The information obtained included socio-demographic data (patient's age, sex, race, marital status, educational level, current or former occupation, and living arrangement), medical history, medication history, self-rated health status, and functional status. If the patients were unable to answer part or all of the questions, it was then that their family members, preferably their primary caregivers, would be interviewed for the missing information.

"Medication inventory" method was used to obtain information about the use of prescription drugs, as it was found that this method was more reliable in obtaining

accurate data about drug usage as compared to "recall" or "directed recall" methods[11]. Patients were asked to show the interviewer all the prescription drugs they were currently taking just prior to admission. Drugs were identified by their labeling, or by checking against a sample collection of commonly used drugs. If the patients did not bring their medications to the ward, their family members were requested to bring them when they come visiting the patients next time. In this study population, those elderly who attend follow-up regularly in government outpatient clinics kept their own medical records (outpatient cards / case-notes), and this was also used to check against the drugs that they showed to the interviewer.

The medical records in the ward were used to confirm the patient's medical history. Barthel index was used to measure the functional status of the patients[19]. It is a list of 10 activities of daily living (ADLs), and the patients or their family members have to report what ADLs the patients could perform at two weeks prior to admission. The Barthel score ranged from the lowest 0 to the maximum of 20.

In this study, prescription drugs were defined as the medications that were dispensed with a doctor's prescription, and they were usually used daily for chronic diseases, but also included glyceryl trinitrate (GTN) and meter-dosed inhaler (MDI) for use when necessary. Medications used short term for symptomatic relief of acute morbidity (e.g. paracetamol, cough/cold preparations) or for health promotion (e.g. vitamins), though occasionally also prescribed by doctors, were not included in the definition. Only those prescription drugs used prior to hospitalization were being taken into account, while medications added during hospitalization were not being considered.

Statistical Package for Social Science (SPSS) software was used for statistical analysis. Chi-square (χ^2) test was used to test the relationship between two discrete variables while t-test was used to compare mean between two continuous variables. Non-parametric tests (Mann-Whitney U and Kruskal-Wallis H) were used to examine the relationship between number of prescription drugs and the various factors studied. Spearman's correlation was used to test the relationship between number of prescription drugs used and number of chronic diseases.

RESULTS
A total of 209 elderly fulfilled the inclusion criteria, with 204 of them (101 men and 103 women) participated in this study. They consisted of 74 Malays (36.3%), 74 Chinese (36.3%), 54 Indians (26.4%) and 2 from other races (1.0%). Table I summarizes the socio-demographic characteristics and health and functional status of the elderly. The mean age was 68.18 ± 6.33 years (mean ± SD), and there was no statistically significant difference in the age between gender (t = 0.836, df = 202, p>0.05). However, men have significantly higher educational level as compared to women (χ^2 = 32.449, df = 2, p<0.001). Most of the elderly (81.9%) lived with their family members, but another 18.1% were either living alone, lived with relatives, friends, in institutions or homeless. Barthel score as a measure of the functional status showed that 72.1% of the elderly have full score of 20, which means they were

totally independent in their ADLs, whereas the others need assistance for certain ADLs. Women have poorer functional status (lower Barthel score) as compared to men, and it was statistically significant (χ^2 = 8.435, df = 2, p = 0.015).

Of the 204 elderly, 35 of them (17.2%) have no underlying chronic disease, while 39 of them (19.1%) have one chronic disease, 53 (26.0%) have two chronic diseases, and 77 (37.8%) have three or more chronic diseases. Table II shows the chronic diseases reported among the elderly, and the common diseases being hypertension (54.4%), diabetes mellitus (43.1%), and ischaemic heart disease (40.7%).

Use of Prescription Drugs Among the Elderly
Out of the 204 elderly, 36 (17.6%) were not using any prescription drugs. Forty of them (19.6%) were using 1–2 prescription drugs, 48 (23.5%) were using 3–4 prescription drugs, while another 80 (39.2%) were using five or more prescription drugs.

Table III shows the common therapeutic categories of prescription drugs used among elderly. The most commonly used prescription drugs were antihypertensives, used by 54.4% of the elderly, followed by antidiabetics (40.2%), drugs used in haemostasis (36.8%), nitrates (33.3%), and diuretics (32.4%). The use of central nervous system (CNS) drugs was low (3.4%) in this study population.

Antihypertensives were more commonly used by women than men (χ^2 = 3.825, df = 1, p = 0.050), whereas drugs used in haemostasis were more commonly used in men than in women (χ^2 = 6.633, df = 1, p = 0.010). More elderly in the age group of 60–69 years were using antidiabetics than elderly in the age group of 70+ years (χ^2 = 6.953, df = 1, p = 0.008). While for other therapeutic classes, there was no statistically significant difference between sexes and between age groups.

A total of 111 elderly (54.4%) were using antihypertensives. Of all the antihypertensives recorded (169 items), beta-blockers were most commonly used (39%), followed by calcium-channel blockers (24%), angiotensin converting enzyme (ACE) inhibitors/angiotensin receptor blockers (20%), alpha-blockers (12%), and thiazides (5%). Of the 82 elderly who used antidiabetics, 34 were using sulfonylurea only, six used biguanide only, another six used insulin only, while 32 were using combination therapy of oral agents, and another four used insulin plus oral agents. Of the 33 elderly who were using bronchodilators (both tablets and MDI), 11 (33.3%) were using one bronchodilator, 12 (36.4%) using two bronchodilators, and another 10 (30.3%) using three bronchodilators. β^2-agonists were most commonly used, followed by antimuscarinics and xanthines.

Factors Associated with Increased Use of Prescription Drugs
Table IV shows the relationships between the socio-demographic characteristics studied and the use of prescription drugs. There was no statistically significant gender difference in the use of prescription drugs, though with a female preponderance of using more drugs. However, when only the Chinese population was considered, the gender difference was found (p<0.05), with the Chinese women using more drugs than Chinese men. There was a

Table I: Summary of the Socio-Demographic Characteristics and Health and Functional Status of the Elderly

Characteristics	Men (N = 101) n (%)	Women (N=103) n (%)	Total (N = 204) n (%)
Age (years) [mean ± SD]	67.80 ± 6.42	68.54 ± 6.25	68.18 ± 6.33
Marital Status			
Single	6 (5.9%)	5 (4.9%)	11 (5.4%)
Married	80 (79.2%)	36 (35.0%)	116 (56.9%)
Widowed	9 (8.9%)	61 (59.2%)	70 (34.3%)
Divorced / Separated	6 (5.9%)	1 (1.0%)	7 (3.4%)
Educational Level			
None	13 (12.9%)	51 (49.5%)	64 (31.4%)
Primary	62 (61.4%)	40 (38.8%)	102 (50.0%)
Secondary	26 (25.7%)	12 (11.7%)	38 (18.6%)
Current / Former Occupation			
Skilled / Semi-Skilled	84 (83.2%)	32 (31.1%)	116 (56.9%)
Unskilled / Unemployed	17 (16.8%)	71 (68.9%)	88 (43.1%)
Living Arrangement			
With Family Members	84 (83.2%)	83 (80.6%)	167 (81.9%)
Others	17 (16.8%)	20 (19.4%)	37 (18.1%)
Self-Rated Health Status[1]			
Good	44 (44.4%)	39 (43.8%)	83 (44.1%)
Average	33 (33.3%)	29 (32.6%)	62 (33.0%)
Poor	22 (22.2%)	21 (23.6%)	43 (22.9%)
Barthel Score			
20	82 (81.2%)	65 (63.1%)	147 (72.1%)
15 – 19	13 (12.9%)	28 (27.2%)	41 (20.1%)
< 15	6 (5.9%)	10 (9.7%)	16 (7.8%)

[1] Data about self-rated health status was not available in 16 elderly

Table II: Chronic Diseases Reported Among the Elderly

Chronic Disease	Men (N = 101) n (%)	Women (N=103) n (%)	Total (N = 204) n (%)
Hypertension	48 (47.5%)	63 (61.2%)	111 (54.4%)
Diabetes Mellitus	41 (40.6%)	47 (45.6%)	88 (43.1%)
Ischaemic Heart Disease	39 (38.6%)	44 (42.7%)	83 (40.7%)
Chronic Obstructive Pulmonary Disease / Bronchial Asthma	17 (16.8%)	19 (18.4%)	36 (17.6%)
Heart Failure	13 (12.9%)	14 (13.6%)	27 (13.2%)
Renal Disease	12 (11.9%)	6 (5.8%)	18 (8.8%)
Cerebrovascular Disease	5 (5.0%)	8 (7.8%)	13 (6.4%)
Others (Include Chronic Liver Disease, Gastrointestinal Disease, Thyroid Disease)	16 (15.8%)	15 (14.6%)	31 (15.2%)

Table III: Distribution of Use of Prescription Drugs by Therapeutic Categories

Therapeutic Category	Men (n = 101)	Women (n = 103)	Total (n = 204)
Antihypertensives *	48 (47.5%)	63 (61.2%)	111 (54.4%)
Antidiabetics	37 (36.6%)	45 (43.7%)	82 (40.2%)
Drugs used in Haemostasis[1] *	46 (45.5%)	29 (28.2%)	75 (36.8%)
Nitrates	38 (37.6%)	30 (29.1%)	68 (33.3%)
Diuretics	33 (32.7%)	33 (32.0%)	66 (32.4%)
Bronchodilators	15 (14.9%)	18 (17.5%)	33 (16.2%)
Hypolipidemic Drugs	15 (14.9%)	16 (15.5%)	31 (15.2%)
Gastrointestinal Drugs	14 (13.9%)	12 (11.7%)	26 (12.7%)
Potassium Chloride (KCl)	14 (13.9%)	11 (10.7%)	25 (12.3%)
Corticosteroids	4 (4.0%)	9 (8.7%)	13 (6.4%)
Cardiac Glycosides	1 (1.0%)	8 (7.8%)	9 (4.4%)
Folate / Iron / Minerals	4 (4.0%)	4 (3.9%)	8 (3.9%)
CNS Drugs	2 (2.0%)	5 (4.9%)	7 (3.4%)

Values shown are n (%); CNS = central nervous system
[1] Drugs used in haemostasis include aspirin, ticlopidine, dipyridamole, warfarin
A small number of other therapeutic categories with usage of < 3% were not shown
Significant difference between sexes by χ^2 test: * $p < 0.05$

Table IV: Relationships between Socio-demographic Characteristics and the Use of Prescription Drugs

	n	Number of Prescription Drugs			Statistical Test	p Value
		Mean ± SD	Median	Mean Rank		
Sex						
Males	101	3.51 ± 2.73	3.00	98.36	Mann-Whitney	0.317
Females	103	3.84 ± 2.55	4.00	106.56		
Sex (Chinese)						
Males	36	2.69 ± 2.57	2.00	31.35	Mann-Whitney	0.016*
Females	38	4.06 ± 2.63	4.00	43.33		
Age Group						
60 – 69	127	3.88 ± 2.70	4.00	106.96	Mann-Whitney	0.163
70+	77	3.35 ± 2.53	3.00	95.14		
Marital Status						
Married	116	3.49 ± 2.73	3.00	98.07	Kruskal-Wallis	0.083
Widowed	70	4.20 ± 2.45	4.00	114.21	H = 4.974, df = 2	
Others	18	2.89 ± 2.54	3.00	85.50		
Education						
None	64	3.28 ± 2.50	3.00	94.59	Kruskal-Wallis	0.412
Primary	102	3.84 ± 2.74	3.50	105.32	H = 1.771, df = 2	
Secondary	38	3.92 ± 2.59	4.00	108.25		
Living Arrangement						
With Family	180	3.63 ± 2.68	3.00	102.25	Mann-Whitney	0.869
Others	24	3.59 ± 2.52	3.50	104.35		

(* Significant at p < 0.05)

Table V: Relationships between Health and Functional Status Indicators and the Use of Prescription Drugs

	n	Number of Prescription Drugs			Statistical Test	p Value
		Mean ± SD	Median	Mean Rank		
Number of Chronic Diseases	204	-	-	-	Spearman's correlation ρ = 0.835	<0.001**
Self-Rated Health Status[1]						
Good	83	2.43 ± 2.35	2.00	71.66	Kruskal-Wallis	<0.001**
Average	62	4.03 ± 2.52	4.00	104.97	H = 29.612, df = 2	
Poor	43	4.98 ± 2.48	5.00	123.49		
Barthel Score						
20	147	3.46 ± 2.64	3.00	97.66	Kruskal-Wallis	0.048*
15 – 19	41	3.85 ± 2.45	4.00	107.33	H = 6.074, df = 2	
< 15	16	5.25 ± 2.70	5.00	134.56		

(* Significant at p < 0.05; ** Significant at p < 0.001)
[1] Data about self-rated health status was not available in 16 elderly

non-significant decrease in the use of prescription drugs with increasing age, with the elderly in the age group of 70+ years using less drugs than elderly in the age group of 60–69 years. Other socio-demographic characteristics studied (marital status, educational level, and living arrangement) were not significant factors.

Table V shows the relationships between health and functional status indicators studied and the use of prescription drugs. Elderly with more number of chronic diseases were using more number of drugs (Spearman's p = 0.835, p<0.001). Self-rated health status was a very significant factor (p<0.001), with elderly who rated their health status as poor were using more drugs than those who rated their health as good or average. Elderly with lower Barthel score were also significantly using more drugs (p<0.05).

DISCUSSION

Comparison of drug usage between studies must take into considerations the population characteristics, the healthcare systems in different countries, and also the methodological differences, including definition and classification of prescription drugs. The other difficulty was that most investigators have conducted their studies among community-dwelling or ambulatory elderly, whereas for the present study, it was conducted among an elderly population in a hospital setting. Nonetheless, to avoid over-reporting of the drug usage, only those drugs used prior to hospitalization were taken into account, so that the condition was more similar to that of community-dwelling elderly.

The elderly in this study were mostly living in urban or suburban area, generally from lower socio-economic class, with low educational level, and with most of them utilized government outpatient clinics rather than private clinics for their illnesses. About 80% of them who were having chronic diseases have their regular follow-ups at government outpatient clinics.

In the present study, 82.4% of the elderly were taking at least one prescription drug of long-term use for their chronic

diseases. This was higher than the 60% reported in Hong Kong[17], and just slightly higher than the roughly three-quarters reported in USA[9,11,14], Sweden[13], and Australia[16]. However, it was lower than the 93% reported in Italy that only studied elderly aged 75 years and above[15]. This could be due to the present study population was drawn from hospitalized patients, who could have been more ill and were more likely to have chronic diseases. Nevertheless, it was quite consistent with the finding by Hoffman *et al.* that more than 70% of the elderly have more than one chronic disease and thus require long-term pharmacotherapy[20].

In this study, antihypertensives were the most commonly used prescription drugs. This was consistent with the findings reported by Woo *et al.*[17] and Stewart *et al.*[21] With many elderly people being affected by cardiovascular diseases, it was not surprising that cardiovascular drugs topped the list of prescription drugs usage in all the studies conducted[9,10,13,15,22]. This was also true in the present study, for if the use of antihypertensives, nitrates, diuretics, and cardiac glycosides was combined, these cardiovascular drugs formed the largest group of drugs used. The use of antidiabetics was high in this study (40%) as compared to others who reported the use ranging from 8-16%[13,17,18]. This could be due to diabetic patients were more likely to get admitted to hospital for their diabetic complications, thus increasing their proportion in this study population. The use of diuretics varied between studies in different countries. The use by nearly one-third of the elderly in this study was similar to that reported in Sweden[13], but differed from other studies that reported a low use of 10–15%[14,17].

The use of CNS drugs such as hypnotics, anxiolytics, and antidepressants was surprisingly low in this study, only used by 3.4% of the elderly. The CNS drugs were ranked as the second most commonly used prescription drugs in many studies, with the use ranged from 12–33%[9,13,15,22]. Nevertheless, Woo *et al.* reported a low use of 5.6% in Hong Kong[17], and Lassila *et al.* also reported a low use of < 5% in their rural, economically depressed study population in Pennsylvania, USA[14]. The reasons for the low usage of CNS drugs in this study could be that some minor psychiatric problems (e.g. insomnia and mild depression) were not seriously treated or attended to in this population, and most of these drugs were not easily available in government outpatient clinics. The patients too were also less likely to get them from private clinics as they were from lower socio-economic group.

Polypharmacy was common among the elderly. This study revealed a high usage of prescription drugs, with 39.2% of the elderly taking $\geq$ 5 drugs. This percentage was certainly high when compared to the 15% reported by Psaty *et al.* in USA[11] and the 24% in men and 35% in women reported by Nobili *et al.* in Italy[15]. It could be a possibility that the high number of drugs used was partially responsible for the hospitalization of these elderly patients, since a high number of drug usage might lead to the consequences of polypharmacy that include: higher number of unwanted drug-drug interactions, higher risk of inappropriate prescribing, higher risk of ADRs, and non-compliance, which can cause therapeutic failure[6-8].

As differed from most studies, the present study did not find any statistically significant gender difference in the number of drugs used. However, when only the Chinese population was considered, it was found that Chinese women were using more drugs than Chinese men. This was consistent with the study done on Chinese population in Hong Kong[17].

While most studies found a significant increase in the use of prescription drugs with age[14,16], the present study found a non-significant decrease in the use of prescription drugs with age, with elderly in the age group of 70+ years using less drugs than elderly in the age group of 60–69 years. Kotzan *et al.* in USA reported that the use of prescription drugs peaked at 70 to 80 years of age, and after that the use decreased[23]. It was logical in our population, as the life expectancy in Malaysia is around 70+ years, the use of drugs should have decreased by then, with those who can live up over the life expectancy age being generally healthier.

The health and functional status indicators were most accurate in predicting the use of prescription drugs, and the findings in this study were consistent with that reported in other studies[12,15,17,24]. It was logical and understandable that those with more number of chronic diseases were generally taking more drugs. Self-rated health status as poor, and low Barthel score being the other significant indicators.

This study population was drawn from elderly medical in-patients in a hospital setting. Thus, the findings should not be extrapolated to the community-dwelling elderly populations in Malaysia. Further study in a large-scale community setting is much needed.

CONCLUSION

This study has described the use of prescription drugs in an elderly population in a hospital setting, including data of common therapeutic categories of drugs used. It has also documented that a high proportion of the elderly in this study population were consuming a high number of drugs. Factors associated with increased use of prescription drugs were identified. This would enable the clinicians to identify the groups of elderly who were likely to use high number of drugs, and to be aware of the problems related to polypharmacy that could have troubled these elderly. Lastly, since the types of commonly-used drugs and the average numbers of drugs used by the elderly were known, this might be useful in providing a rough estimate for the drug-related expenditure in the planning of geriatric health service.

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