Original Article

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Chronic illnesses and polypharmacy in elderly patients: A hospital-based study in Northern Sri Lanka

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Abstract

Population aging and multiple pathology among older people have increased medicines use in elderly. Aim of this study was to evaluate chronic illnesses and polypharmacy and to determine factors associated with polypharmacy among hospitalized elderly at Teaching Hospital-Jaffna.

This was a cross sectional, descriptive study. Elderly and polypharmacy were defined as ≥65years and concomitant use of ≥6 medications for ≥1 month respectively. Data were collected from bedhead-tickets of 288 elderly patients using data extraction sheet. Chi-squared and paired t-test were performed to determine the level of significance and unadjusted odd ratios were calculated to determine the association between polypharmacy and common chronic illnesses. A p value <0.05 was set as statistically significance.

Mean age was 72 (SD±6.2) and majority were males (53.5%). Relatively higher proportion, 58.7% (n=169) of patients had polypharmacy. Seven chronic illnesses were prevalent in >10% of the patients. Lipid-modifying (80.9%) and antithombotic agents (76.4%) were the top two subgroups prescribed to elderly. Polypharmacy was substantially increased with increasing number of chronic illnesses ($p<0.05$). Significant association ($p<0.05$) was found between polypharmacy and coronary heart disease, anaemia, heart failure, asthma and diabetes mellitus. Significantly greater number of medications were prescribed on discharge compared to admission ($p<0.05$).

This study concluded that polypharmacy was common among hospitalized elderly and increases with hospitalization. There was increased tendency to prescribe antithrombotic and lipid-modifying agents. These findings indicate the need for medication reconciliation and review in elderly patient. Further studies targeting wider population are needed to determine the appropriateness of polypharmacy in elderly.

Key words

elderly, chronic illness, polypharmacy

Introduction

Sri Lanka is one of the fastest aging countries (1). According to the 2012 census, 7.84% of the population of Sri Lanka is 65 years and above (2). One of the major challenges of population aging is chronic non-communicable diseases which commonly affect adults and elderly. Rapidly growing aging population will increase the demands of health care system and there is a need to address the health issues of older people. Because of multiple co-morbidities, elderly suffer from more symptoms and illnesses than the young which contribute to polypharmacy (3, 4). Increasing tendency to use more than one medication for optimal treatment of a single condition causes further increase in the medicines use in elderly (5).

Polypharmacy is the use of multiple medications and is one of the major and common health-related issues of elderly patients (6, 7). The definition of

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polypharmacy varies according to the population and study setting (8). Though there is no universally accepted formal definition for polypharmacy, it generally refers to the simultaneous use of multiple medications (more than 4-6 medications) (9, 10, 11).

Although elderly patients have the greatest potential to benefit from multiple drug therapy, they are more susceptible to the adverse consequences of polypharmacy than younger people because of age-related physiological changes, decline in organ functions and various pathological changes which affect the pharmacokinetics and pharmacodynamics of drugs (12, 13, 14).

Like many developing countries geriatric health needs are emerging problem in Sri Lanka. This study was carried out with the aim of evaluating the common chronic illnesses and polypharmacy and to determine the factors associated with polypharmacy among elderly patients treated in the medical wards of Teaching Hospital-Jaffna.

Methods

This was a hospital-based, cross sectional, descriptive study conducted among elderly patients (≥65 years) admitted to medical wards of Teaching Hospital-Jaffna which is the largest tertiary care hospital in the Northern Province of Sri Lanka. Ethical approval was obtained from the Ethics Review Committee of Faculty of Medicine, University of Jaffna and administrative approvals were obtained from relevant authorities.

Eligible patients were identified from admission registries of medical wards and recruited consecutively. Data were collected from the bedhead tickets of 288 elderly patients admitted to the medical wards over a period of 3 months using a data extraction sheet. Patients who were transferred to other units or institutes and those died during the hospital stay were excluded. The collected information include age, sex, chronic illnesses, medications on admission and discharge.

Case definitions

In this study polypharmacy was defined as simultaneous use of six or more medications for the duration of one month or more. Chronic illness that were prevalent in 10% or more of the study population and medications prescribed to 10% or more of the study population were considered as common chronic illnesses and commonly prescribed medications respectively. Medications are classified at level 3 of the Anatomical Therapeutic Chemical (ATC) classification (15).

Data analysis

Analysis of medications was done with medications prescribed on discharge except the analysis between admission and discharge where medications prescribed on admission and discharge were taken for comparison. Descriptive statistics such as frequencies, percentage mean, median and range were used to present the results. Chi-square test was used to determine the association between polypharmacy and age, sex and number of illness. Paired t-test was used to determine the level of significance between the number of medications prescribed on admission and on discharge and unadjusted odd ratio (OR) was used to identify the common chronic illnesses that were associated with polypharmacy. Data were analyzed using 95% confidence interval (CI) and a p value less the 0.05 was considered significant.

Results

Data from 288 elderly patients were anaylsed. The mean age of the study population was 72 years (SD±6.2), ranging from 65 to 90 years and males were slightly higher (53.5%) than females (46.5%). Table 1 shows the distribution of polypharmacy

among different age groups and sex. Majority of the patients (58.7%) had polypharmacy. There was no significant association between polypharmacy and age group or sex.

Table 1. Distribution of polypharmacy among different age groups and sex

Demographic factor	Patients not exposed to polypharmacy n (%)	Patients exposed to polypharmacy n (%)
Age (years)		
65 – 69	43 (37.4)	72 (62.6)
70 – 74	33 (41.2)	47 (58.8)
75 – 79	24 (44.4)	30 (55.6)
80 – 84	11 (42.3)	15 (57.7)
≥ 85	08 (61.5)	05 (38.5)
Sex		
Male	65 (42.2)	89 (57.8)
Female	54 (40.3)	80 (59.7)
Total	**119 (41.3)**	**169 (58.7)**

Among the 48 chronic illnesses that were prevalent in 288 elderly patients, 7 occurred in more than 10% of patients. Hypertension was the most prevalent chronic illness, seen in 53.1% patients followed by coronary heart disease (48.6%) diabetes mellitus (41.7%), asthma (22.6%), cerebrovascular disease (12.8%), anaemia (11.8%) and heart failure (11.5%). Peptic ulcer disease, chronic kidney diseases, dyslipidaemia, valvular heart illness, hypothyroidism, osteoarthritis and chronic obstructive pulmonary disease were observed in more than 5% of the patients. On average, all the patients with common chronic illnesses had three or more chronic illnesses and prescribed with more than 5 medications (ranging from 5.4 to 7.4).

Table 2 shows the distribution of common chronic illnesses among different age groups and sex and Table 3 shows the distribution of comorbidities among common chronic illnesses. Hypertension was the predominant chronic illness in all age groups except the age group 70-74years. The most

Table 2. Distribution of common chronic illnesses among different age groups and sex

Demographic factors	Common chronic illnesses						
	Hypertension n (%)	Coronary heart disease n (%)	Diabetes mellitus n (%)	Asthma n (%)	Cerebrovascular disease n (%)	Anaemia n (%)	Heart failure n (%)
Age (years) n (%)							
65 – 69	60 (52.2)	48 (41.7)	52 (45.2)	26 (22.6)	10 (8.7)	15 (13.0)	10 (8.7)
70 – 74	43 (53.8)	45 (56.3)	31 (38.8)	17 (21.3)	10 (12.5)	11 (13.8)	9 (11.3)
75 – 79	31 (57.4)	29 (53.7)	23 (42.6)	15 (27.8)	10 (18.5)	3 (5.6)	7 (13.0)
80 – 84	13 (50.0)	12 (46.2)	11 (42.3)	5 (19.2)	6 (23.1)	5 (19.2)	7 (26.9)
≥ 85	6 (46.2)	6 (46.2)	3 (23.1)	2 (15.4)	1 (7.7)	0 (0.0)	0 (0.0)
Sex n (%)							
Male	69 (44.8)	77 (50.0)	63 (40.9)	36 (23.4)	17 (11.0)	14 (9.1)	21 (13.6)
Female	84 (62.7)	63 (47.0)	57 (42.5)	29 (21.6)	20 (14.9)	20 (14.9)	12 (9.0)

Table 3. Distribution of comorbidities among common chronic illnesses

Common chronic illness	Comorbidities							
	Hypertension n (%)	Coronary heart disease n (%)	Diabetes mellitus n (%)	Asthma n (%)	Cerebro-vascular disease n (%)	Anaemia n (%)	Heart failure n (%)	Others n (%)
Hypertension	153 (100.0)	72 (47.1)	62 (40.5)	32 (20.9)	27 (17.6)	17 (11.1)	15 (9.8)	65 (42.5)
Coronary heart disease	70 (50.0)	140 (100.0)	51 (36.4)	33 (23.6)	15 (10.7)	13 (9.3)	23 (16.4)	55 (39.3)
Diabetes mellitus	49 (40.8)	61 (50.8)	120 (100.0)	19 (15.8)	11 (9.2)	17 (14.2)	13 (10.8)	47 (39.2)
Asthma	31 (47.7)	32 (49.2)	19 (29.2)	65 (100.0)	1 (1.5)	7 (10.8)	7 (10.8)	27 (41.5)
Cerebrovascular disease	25 (67.6)	17 (45.9)	11 (29.7)	1 (2.7)	37 (100.0)	3 (8.1)	4 (10.8)	14 (37.8)
Anaemia	17 (50.0)	14 (41.2)	17 (50.0)	3 (8.8)	3 (8.8)	34 (100.0)	6 (17.6)	19 (55.9)
Heart failure	15 (45.5)	22 (66.7)	13 (39.4)	7 (21.2)	3 (9.1)	6 (18.2)	33 (100.0)	15 (45.5)

common chronic illness in males was coronary heart disease while hypertension was the most common chronic illness among females. The top three commodities were hypertension (40.8% – 67.6%), coronary heart disease (41.2 – 66.7%) and diabetes mellitus (29.2 – 50%).

Out of 57 pharmacological subgroups (level 3 ATC classification) of medications prescribed for the elderly, 20 subgroups were prescribed to more than 10% of the patients (Table 4).

Table 4. Commonly prescribed medications for elderly

ATC code	Description	Patients exposed to the medications	
		n	%
C10A	Lipid-modifying agents, plain	233	80.9
B01A	Antithrombotic agents	220	76.4
C09A	Angiotensin converting enzyme inhibitors, plain	98	34.0
A10B	Blood glucose lowering drugs, excluding insulins	96	33.3
C01D	Vasodilators used in cardiac diseases	86	29.9
C03C	High-ceiling diuretics	81	28.1
C09C	Angiotensin ii receptor blockers, plain	79	27.4
A02B	Drugs for peptic ulcer and gastro-oesophageal reflux disease	70	24.3
R03A	Adrenergics, inhalants	70	24.3
R03B	Other drugs for obstructive airway diseases, inhalants	62	21.5
C03D	Potassium-sparing agents	56	19.4
C07A	Beta blocking agents	51	17.7
N02B	Other analgesics and antipyretics	52	18.1
C08C	Selective calcium channel blockers with mainly vascular effects	50	17.4
A11E	Vitamin B-complex, including combinations	48	16.7
C08D	Selective calcium channel blockers with direct cardiac effects	42	14.58
C03A	Low-ceiling diuretics, thiazides	38	13.2
A10A	Insulins and analogues	35	12.2
B03A	Iron preparations	32	11.1
B03B	Vitamin B12 and folic acid	32	11.1

The top two subgroups of medications were lipid-modifying (80.9 %) and antithrombotic agents (76.4%). Lipid-modifying agents were prescribed to 233 patients and atorvastatin was prescribed to all (n=233) patients. Only a few (n=3) were on more than one lipid-modifying agent. Total of 300 antithrombotic agents were prescribed to 220 patients. Among the patients prescribed with antithrombotic agents prescribed one third (n=71) of patients received more than one antithrombotic agent. Aspirin, clopidogrel, dipyridamole and warfarin were the antithrombotic agents prescribed in this study and were prescribed to 56% (n=163), 37.9% (n=103), 5.9% (n=17) and 3.8% (n=11) of patients respectively.

Table 5 shows the relationship between number of chronic illnesses and number of medications prescribed. On average six medications were prescribed per patient, ranging from 1 to 12. There was statistically significant association between number of chronic illnesses and number of medications ($p < 0.001$).

Table 5. Number of chronic illness and number of medications

Number of chronic illnesses	Patients not exposed to polypharmacy n (%)	Patients exposed to polypharmacy n (%)	Mean (SD)	Range
1	41 (87.2)	06 (12.8)	3.5 (±1.76)	1 – 7
2	43 (50.0)	43 (50.0)	5.4 (±1.88)	1 – 11
3	23 (27.4)	61 (72.6)	6.8 (±2.07)	3 – 12
4	10 (21.7)	36 (78.3)	6.8 (±1.79)	4 – 12
≥ 5	02 (8.0)	23 (92.0)	8.6 (±2.21)	5 – 12
Total	**119 (41.3)**	**169 (58.7)**	**6.0 (±2.39)**	**1 – 12**

* $p < 0.05$

Distribution of polypharmacy among common chronic illnesses was shown in Table 6.

Table 6. Distribution of polypharmacy among common chronic illnesses

Chronic illness	Patients not exposed to polypharmacy n (%)	Patients exposed to polypharmacy n (%)	Odds ratio (95% CI)
Hypertension	58 (37.9)	95 (62.1)	1.35 (0.84 to 2.16)
Coronary heart disease	42 (30)	98 (70)	2.53 (1.52 to 4.23)*
Diabetes mellitus	39 (32.5)	81 (67.5)	1.89 (1.13 to 3.17)*
Asthma	18 (27.7)	47 (72.3)	2.16 (1.14 to 4.20)*
Cerebrovascular disease	19 (51.4)	18 (48.6)	0.75 (0.35 to 1.58)
Anaemia	8 (23.5)	26 (76.5)	2.52 (1.05 to 6.68)*
Heart failure	8 (24.2)	25 (75.8)	2.41(1.00 to 6.41)*

* $p < 0.05$

Using less than six medication as referent, polypharmacy was associated with all common chronic illnesses except cerebrovascular disease (OR 0.75; 95% CI: 0.35 – 1.58). Likelihood of having polypharmacy in descending order was coronary heart disease (OR 2.53; 95% CI: 1.52 – 4.23), anaemia (OR 2.52; 95% CI: 1.05 – 6.68) and heart failure (OR 2.41; 95% CI: 1.00 – 6.41), asthma (OR 2.16; 95% CI: 1.14 – 4.20), diabetes mellitus (OR 1.89; 95% CI: 1.13 – 3.17) and hypertension (OR 1.35; 0.84 – 2.16). Statistically significant association was found between polypharmacy and coronary heart diseases, diabetes mellitus, asthma, anaemia and heart failure ($p < 0.05$).

Mean number of medications prescribed on admission and discharge were 4.3 (range 0 – 14) and 6.0 (range 1-12) respectively (Table 7).

Table 7. Number of medications prescribed on admission and on discharge

Encounter	Patients not exposed to polypharmacy n (%)	Patients exposed to polypharmacy n (%)	Mean (SD) *	Range
Admission	169 (58.7)	119 (41.3)	4.3 (±3.36)	0 - 14
Discharge	119 (41.3)	169 (58.7)	6.0 (±2.39)	1 - 12

* $t = 10.25$; $p < 0.05$

Polypharmacy was noticed in 41.3% patients on admission and in 58.7% on discharge. On average about 2 medications were added after each admission. When compared to admission, significantly greater number of medications were prescribed on discharge ($p < 0.001$).

Discussion

The three main findings of this cross-sectional study among hospitalized elderly in medical wards of Teaching Hospital-Jaffna are; 1) polypharmacy was common among hospitalized elderly and increases with hospitalization; 2) significant association between polypharmacy and number and types of chronic illnesses was observed; 3) there was a tendency to prescribe antithrombotic and lipid-modifying agents.

Prevalence of polypharmacy varies widely because of the differences in defining polypharmacy and criteria for patient selection. A review on multiple diseases and polypharmacy in the elderly reported that the prevalence of polypharmacy among hospitalized elderly varied from 20% to 60%. (16) In the present study prevalence of polypharmacy (59%) was at the higher end of the above range. Mean number of medications prescribed for elderly in the present study was 6.03 and similar finding was reported in a study conducted among elderly in an outpatient setting in United States (11). A higher mean number of medications (8.7) was reported in a study conducted among community-dwelling elderly in Australia (17). Findings of this study showed that significantly greater number of medications were prescribed on discharge, compared to admission (mean number of medications on admission vs on discharge = 4.4 vs 6.03). Similar findings were reported in studies conducted among hospitalized elderly in Australia and Italy (18, 19).

Unlike most of the other studies, the present study did not show significant association between polypharmacy and age or sex (11, 17, 20). Two studies that were conducted in primary care elderly patients in Germany and hospitalized elderly patients in Italy support the above findings of this study (19, 21).

The present study found that there was significant association between number and types (coronary heart disease, diabetes mellitus, asthma, anaemia and heart failure) of chronic illnesses and previous studies that investigated the factors associated with polypharmacy supported these findings (20-22). It is not surprising that number of chronic illnesses is associated with polypharmacy as patients with multiple illnesses require multiple medications. Since optimal treatment of chronic illnesses that are associated polypharmacy in this study require multiple medications, it is expected that patients with these chronic illnesses may exceed the threshold for polypharmacy. However, it is difficult to decide the appropriateness of polypharmacy based on number of medications alone. An interesting finding of this study was that a lower risk of exposure to polypharcmy in cerebrovascular diseases. Discontinuation of antithrombotic agents

in patients with haemorrhagic stroke could be the reason for this observation.

Cardiovascular diseases were the predominant chronic illnesses in this study, which was followed by diabetes mellitus, asthma and anaemia. These findings were similar to the distribution of non-communicable diseases in Sri Lanka except neoplasm (23, 24). Most of the cancer patients are treated in the specialized cancer units which could explain the lower prevalence (1%) of neoplasm in this study population. Results of studies conducted among elderly in other countries also showed that cardiovascular diseases were the most common chronic condition in elderly (6, 10, 17, 25).

A tendency to prescribe antithrombotic and lipid-modifying agents was observed in the present study. Proportion of elderly patients prescribed with lipid-modifying (81%) and antithrombotic (76%) agents in this study was higher when compared to other studies (37-64% and 50-70% respectively) (11, 25). In this study many patients (25% of the study population) received more than one antithrombotic agent. Among this study population 82% had cardiovascular disease (one or more) and this could be the reason for higher prescription rates for lipid-modifying and antithrombotic agents. However, further evaluation in this regard is needed to comment on the appropriateness of this prescribing tendency.

Limitations

This study was conducted in hospitalized elderly. Findings of this study may not reflect the prevalence of chronic illnesses and polypharmacy among elderly in the community. Further, only elderly patients admitted to medical wards were included in this study which may not represent all hospitalized elderly. Most of the other studies on polypharmacy used 5 medications as cut-off point for polypharmacy. Since elderly are the largest consumers of medications, we chose a higher cut-off point for this study. In this study exposure to polypharmacy was analyzed based on the number of medications prescribed which is not adequate to determine the appropriateness.

Conclusion

Substantial proportion of hospitalized elderly were exposed to polypharmacy and received more medications on discharge than admission which may increase the risk of adverse events in elderly patients. There was a tendancy to prescribe lipid-modifying and antithrombotic agents to elderly patients. Medication reconciliation on admission and discharge regular medication review at follow up need to be facilitated to reduce the exposure to polypharmacy which in turn reduce the medication-related harm in elderly. However, polypaharmacy is not always inappropriate. Further studies covering larger and diverse population are needed to explore the appropriateness of polypharmacy in elderly patients.

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Conflict of interest

The authors have no direct or indirect conflicts of interest.

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