# Original Articles

## Assessment of Frequency of Polypharmacy along with its Relation to Dementia and Drug Adherence among Admitted Geriatric Patients in Medicine Wards of a Tertiary Care Hospital

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**Abstract:**

**Background:** Polypharmacy has been associated with adverse drug reactions, medication errors and non- adherence to prescribe drugs and geriatric population is more prone to this condition. On the other hand, dementia is a major concern among growing chronic diseases in the ageing society and its assessment has not been adequately done in our setting.

**Method:** One hundred subjects aged more ≥60 years were included in this analytical cross-sectional from the Medicine Department of Chattogram Medical College Hospital from November 2018 to April 2019. A structured case record form collected data, and drug adherence were measured by Morisky Medication Adherence Scale-8 (MMAS-8). PP was defined as intake of e"5 drugs. Cognitive impairment was classified as presence or absence of dementia by Mini-cog tool.

**Results:** The average age of individuals was 65.56±6.9 years and 62 were men. The prevalence of polypharmacy, dementia, and drug non-adherence was respectively, 56%, 47%, and 49%. Patients with polypharmacy were more likely to be non-adherent (odds ratio: 2.4; 95% CI: 1.1-5.4; p=0.039) and demented (odds ratio: 3.38; 95% CI: 1.1-11.8; p=0.019) than the elderly patients without polypharmacy.

**Conclusion:** As there is significant association between polypharmacy with dementia and drug non-adherence, judicious use of drugs is mandatory to reduce these risk.

**Key words:** Polypharmacy, Elderly, Non-adherence, Dementia, chronic health conditions.

### Introduction:

The World Health Organization (WHO) classifies the age of the elderly population according to the country's socioeconomic level. In developing countries, people are considered elderly from the age of 60 years, whereas in developed countries, it is from the age of 65 years.[1] In 2012, the world's senior population represented 810 million people, accounting for 11.5% of the global population, and this number is expected to exceed 2 billion by 2050.[2]

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Elderly people have multiple co-morbidities such as hypertension, arthritis, heart disease, cancer, and diabetes mellitus, which require multiple medications for proper treatment.[3] Over the last 20-30 years, problems related to ageing, multimorbidity and polypharmacy have become a prominent issue in global healthcare. Increase in the number of elderly people and the incidence of chronic disease both are linked to polypharmacy which is defined by the WHO as the administration of multiple drugs concurrently or an excessive number of drugs.[4]

One previous study suggested in addition of controlling multiple comorbidities, polypharmacy is associated with a decline in physical and instrumental activities of daily living.[5] PP is also associated with negative consequences, such as increased risk of mortality.[6] Moreover PP increases medical

costs.[7] It has been shown that polypharmacy positively correlates with an increased risk for adverse drug reactions (ADRs), as well as drug-drug and drug-disease interactions. On the other hand, PP can increase the risk for medication non-adherence, which consecutively can cause suboptimal therapeutic efficiency and poor clinical response.[8]

WHO defined medication adherence as the extent to which a person's behavior - taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider. According to WHO definition, the non-adherence describes the patient who does not or only partially follow the treatment arrangements previously agreed with the doctor.[9] Medication adherence (the patient's use of the right drug in the correct dose at the right interval), which is a key factor associated with the effectiveness of all pharmacological therapies is essential in the treatment of the elderly. Increasing adherence may have a bigger effect on health than improvement in specific medical therapy. Identification of non-adherence is challenging and requires specific skills. If not recognized, the non-adherence can lead to a dose augmentation of the initial medication or the addition of a second drug, thereby increasing the risk for ADRs, increased emergency visits, hospitalizations, lower quality of life and increased health care costs.[10] Of all medication-related hospitalizations that occur in the United States of America, between one third and two thirds are the results of poor medication adherence.[11]

Another problem of geriatric people is dementia which is regarded as a growing public health issue that causes a great socioeconomic burden as a result of the high cost of care and the negative impact on quality of life[12] Although the pathogenesis of dementia remains unclear, some epidemiological studies have shown that the ADR account for 2–12% of dementia-like cases.[8] As polypharmacy is a well-known risk factor for ADR in older people it can lead to dementia-like status.[8]

To our knowledge, the clinical association between PP, drug adherence and dementia has not yet been investigated in Bangladeshi geriatric patients adequately. Considering the high prevalence of polypharmacy and its adverse effects on the elderly people, the present study aimed at investigating the status of polypharmacy among the elderly patients admitted in medicine ward of a tertiary care hospital of Bangladesh as well as to investigate the relationship between polypharmacy with dementia and polypharmacy with drug adherence.

**Materials and Methods:**
An analytical cross-sectional study was conducted at Medicine Department of Chattogram Medical College Hospital Chattogram, Bangladesh from 01/11/2018 to 30/04/

2019. Ethical clearance was taken from ethical review committee of Chattogram Medical College and informed consent was obtained from each participants.

Patients aged e"60 years admitted in different medicine wards, who were able to self- report of their consumed medications and/or having prescriptions and/or drug samples available with them were selected consecutively. Patients or relatives who did not give informed written consent or critically ill patients who needs HDU and ICU facility were excluded.

Data regarding age, sex, residence, education, marital status, Chronic health conditions, and number of consumed drugs were collected by using a pretested structured case record form. Polypharmacy was defined as intake of 5 or more drugs.[13] Only the drugs which were consumed for more than one month and/or advised by the physician to take on continuous basis for chronic health conditions were considered. Over the counter drugs, drugs used for concurrent illness were excluded.[13] Each participant/caregiver respondent were asked to report if the individual have ever been diagnosed by a doctor/ relevant health professional with one or more of 20 chronic health conditions mentioned in Charlson Comorbidity Index scoring system. Cognitive impairment was classified as presence or absence of dementia by Mini-cog tool.[14] Drug adherence was assessed by Morisky Medication Adherence Scale-8 (MMAS-8).[15] which is a generic self-reported, medication-taking behavior scale used for a wide variety of medical conditions. Patients were considered adherent if the MMAS - 8 score was d" 2 and non-adherent if the MMAS - 8 score was > 2.

**Data Processing and Analysis:**
Continuous variables were reported as the means ± SD and categorical variables were reported as frequency (percentages). Data were analyzed by using SPSS for Windows version 23.0 software and after running different tests including Chi-square test, independent sample t-test, binary- logistic regression. Logistic regression model is used to investigate affective variables on dementia, polypharmacy, and drug non-adherence. Variables which have p value ≤0.10 in univariate analyses, were entered into the logistic regression model. Results were expressed as Odds ratios (OR) and respective 95% confidence intervals (CIs) for OR. A p value <0.05 were considered statistically significant.

**Results:**
Out of 100 participants, respectively 56, 49, 47 had polypharmacy, drug non-adherence, and dementia (Figure 1).

The mean age of participants was 65.56 ± 6.9 years with male to female ratio of 1.6:1. Majority (84%) were Muslim and 23% were widowed/widower. Majority of them were illiterate (65%), only 11 participants were engaged in vocational activity (Table 1).
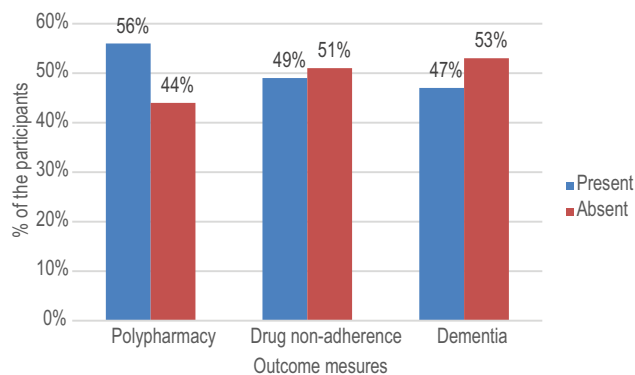
**Figure 1.** *Frequency of polypharmacy, drug-non-adherence, and dementia*

Among the chronic comorbidities, diabetes mellitus, hypertension, chronic obstructive pulmonary disease, and heart diseases were the most prevalent diseases among the participants (Figure 2). Five patients had no history of comorbidity. Majority of then (52%) had 1-2 comorbid conditions and 43% had 3 or more chronic health conditions.
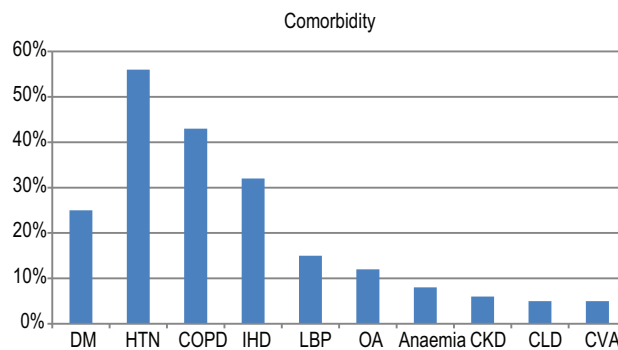


**Figure 2.** *Prevalence of different comorbidities in the studied patients* (DM: Diabetes, HTN: Hypertension, COPD: Chronic obstructive pulmonary disease, LBP: Low back pain, IHD: Ischemic heart disease, OA: Osteoarthritis, CKD: Chronic kidney disease, CLD: Chronic liver disease, CVA: Cerebrovascular accidents)

Table 1 shows that age, marital status, and polypharmacy were associated with dementia. Participants with dementia had higher mean age, more likely to be widowed/widower, and had polypharmacy than the participants without dementia (p<0.05).

**Table 1.** *Univariate analysis for dementia*

| Variables | | Total | Dementia | | P value |
|---|---|---|---|---|---|
| | | (n=100) | Present (n=47) | Absent (n=53) | |
| Age, years | | 65.56±6.9 | 68.5±7.7 | 64.9±5.8 | 0.009‡ |
| Sex | Male | 62 (62.0) | 25 (53.2) | 37 (69.8) | 0.087* |
| | Female | 38 (38.0) | 22 (46.8) | 16 (30.2) | |
| Religion | Muslim | 84 (84.0) | 43 (91.5) | 41 (77.4) | 0.054* |
| | Others | 16 (16.0) | 4 (8.5) | 12 (22.6) | |
| Marital status | Married | 77 (77.0) | 31 (66.0) | 46 (86.8) | 0.013* |
| | Widow/widower | 23 (23.0) | 16 (34.0) | 7 (13.2) | |
| Educational status | No formal education | 65 (65.0) | 34 (72.3) | 31 (58.5) | 0.147* |
| | Have formal education | 35 (35.0) | 13 (27.7) | 22 (41.1) | |
| Vocational status | Unemployed | 89 (89.0) | 44 (93.6) | 45 (84.9) | 0.165* |
| | Employed | 11 (11.0) | 3 (6.4) | 8 (15.1) | |
| Number of comorbidity | ≤One | 34 (34.0) | 14 (29.8) | 20 (37.7) | 0.681* |
| | Two | 23 (23.0) | 12 (25.5) | 11 (20.8) | |
| | Three or more | 43 (43.0) | 21 (44.7) | 22 (41.5) | |
| Polypharmacy | No | 44 (44.0) | 15 (31.9) | 29 (54.7) | 0.022* |
| | Yes | 56 (56.0) | 32 (68.1) | 24 (45.3) | |
| Drug adherence | Adherent | 51 (51.0) | 23 (48.9) | 28 (52.8) | 0.697* |
| | Non-adherent | 49 (49.0) | 24 (51.1) | 25 (47.2) | |

Data were expressed as frequency (%) or mean ±SD. ‡Independent sample t test, *Chi-square test, Significant values were in bold face.

Table 2 shows that in univariate analysis, number of comorbidity and drug non-adherence were found to have significant association with polypharmacy (p<0.05).

**Table 2.** *Univariate analysis for polypharmacy and drug non-adherence*

| Variables | | Polypharmacy | | P value | Drug non-adherence | | P value |
|---|---|---|---|---|---|---|---|
| | | Yes | No | | Yes | No | |
| Age, years | | 66.3±6.8 | 67.0±7.3 | 0.620[‡] | 67.5±6.9 | 65.3±7.0 | 0.195[‡] |
| Sex | Male | 36(64.3) | 26(59.1) | 0.595[*] | 30(58.8) | 32(65.3) | 0.504[*] |
| | Female | 20(35.7) | 18(40.9) | | 21(41.2) | 17(34.7) | |
| Religion | Muslim | 48(85.7) | 36(81.8) | 0.598[*] | 45(88.2) | 39(79.6) | 0.231[*] |
| | Others | 8(14.3) | 8(18.2) | | 6(11.8) | 10(20.4) | |
| Marital status | Married | 43(76.8) | 34(77.3) | 0.954[*] | 36(70.6) | 41(83.7) | 0.120[*] |
| | Widow/widower | 13(23.2) | 10(22.7) | | 15(29.4) | 8(16.3) | |
| Educational status | No formal education | 34(60.7) | 31(70.5) | 0.311[*] | 31(60.8) | 34(69.4) | 0.367[*] |
| | Formal education | 22(39.3) | 13(29.5) | | 20(39.2) | 15(30.6) | |
| Vocational status | Employed | 8(14.3) | 3(6.8) | 0.236[*] | 3(5.9) | 8(16.3) | 0.095[*] |
| | Unemployed | 48(85.7) | 41(93.2) | | 48(94.1) | 41(83.7) | |
| Number of comorbidity | ≤ One | 8(14.3) | 26(59.1) | <0.001[*] | 22(43.1) | 12(24.5) | 0.123[*] |
| | Two | 12(21.4) | 11(25.0) | | 9(17.6) | 14(28.6) | |
| | Three or more | 36(64.3) | 7(15.9) | | 20(39.2) | 23(46.9) | |
| Drug adherence | Adherent | 23(41.1) | 28(63.6) | **0.025[*]** | | | |
| | Non-adherent | 33(58.9) | 16(36.4) | | | | |

Data were expressed as frequency (%) or mean ±SD. ‡Independent sample t test, *Chi-square test, Significant values were in bold face.

On logistic regression analysis, total number of comorbidity was revealed as an independent predictor of polypharmacy. Patients with two comorbid conditions were 3.5 times (OR: 3.5, 95% CI: 1.1-11.1) and with three or more comorbid conditions were 16.7 times (OR: 16.7, 95% CI: 5.4-51.9) more likely to have polypharmacy compared to the patients who had one or no comorbid conditions. Polypharmacy was the only independent predictor for dementia [OR: 3.83, 95% CI: 1.13-11.81], and drug non-adherence [OR: 2.4, 95% CI: 1.1-5.4] in the present study (Table 3).

**Table 3.** *Binary logistic regression analysis to determine independent factors associated with dementia, polypharmacy, and drug non-adherence*

| Variables | | Dementia OR (95% CI) | P value OR (95% CI) | Polypharmacy | P value OR (95% CI) | Non-adherence | P value |
|---|---|---|---|---|---|---|---|
| Age, years | | 1.07(0.99-1.15) | 0.056 | | | | |
| Sex | Male | Reference | | | | | |
| | Female | 1.34(0.37-4.88) | 0.650 | | | | |
| Religion | Muslim | Reference | | | | | |
| | Others | 0.41(0.11-1.56) | 0.190 | | | | |
| Marital status | Married | Reference | | | | | |
| | Widow/widower | 2.67(0.57-12.58) | 0.214 | | | | |
| Vocational status | Employed | | | | | Reference | |
| | Unemployed | | | | | 2.8(0.7-11.4) | 0.160 |
| No. of comorbidity | ≤ One | Reference | | | Reference | | |
| | Two | 0.69(0.19-2.34) | 0.528 | | 3.5(1.1-11.1) | 0.029 | |
| | Three or more | 1.11(0.31-4.03) | 0.87 | | 16.7(5.4-51.9) | <0.001 | |
| Polypharmacy | No | Reference | | | | Reference | |
| | Yes | 3.83(1.13-11.81) | 0.019 | | | 2.4(1.1-5.4) | 0.039 |
| Drug adherence | Adherent | | | | | | |
| | Non-adherent | | | | | | |

OR: Odds ratio; CI: Confidence interval; Significant values were in bold face.

**Table 4.** *Association between dementia and polypharmacy*

| Poly pharmacy | Dementia present | Dementia absent | P value |
|---|---|---|---|
| No | 15 (31.9) | 29 (54.7) | 0.022* |
| Yes | 32 (68.1) | 24 (45.3) | |

*Chi-square test.

**Table 5.** *Association between polypharmacy with dementia and drug compliance*

| Poly pharmacy with dementia | Drug compliance good (n=51) | Drug compliance bad (49) | P value |
|---|---|---|---|
| Yes | 12 (23.5) | 20 (40.8) | 0.064* |
| No | 39 (76.5) | 29 (59.2) | |

*Chi-square test.

Polypharmacy was more common among the patients with dementia, than the patients without dementia (68.1% vs. 45.3%) and the difference was significant statistically (p=0.022) (Table 4).

Drug compliance was comparatively bad among geriatric patients who had both polypharmacy and dementia compared to their counterpart, but the difference failed to reach statistical significance (p=0.064) (Table 5).

**Discussions:**
The frequency of polypharmacy in the present study was 56%. A previous study showed the frequency of polypharmacy ranging from 20 to 60%, which may be due to different criteria in the selection of patients and collection of medication data.[16] In the REPOSI (Registro Politerapie SIMI) study, a registry based on an Italian network of 38 internal medicine wards, 52% of patients aged 65 years or older were taking five or more drugs at hospital admission. This had risen to 67% at discharge.[17] The proportion of older adults in Sweden exposed to polypharmacy was 44%.[18] However, contrasting findings are also available. For example, a study from Brazil show prevalence to be 18.1% in patients more than 65 years.[19] The reasons for increased frequency of polypharmacy in our study could be multiple. Firstly, ours being a tertiary referral center the patients included in the study had been taking multiple medications for different chronic health conditions. Here most patients are referred because of complicated diseases or multiple morbidity. Other reasons for polypharmacy might be absence of medication understanding practices by the physicians and addition of drugs due to multiple medical visits which might have resulted in drug duplications and prescription of inappropriate medications. It is to be noted here that, only the drugs which were consumed for more than one month and/or advised by the physician to take on continuous basis for chronic health conditions were considered. Over the counter drugs, drugs used for concurrent illness were excluded from the present study.

In the study, 43% of aged patients suffered from more than two chronic diseases. Among the chronic comorbidities, diabetes mellitus, hypertension, chronic obstructive pulmonary disease and heart diseases were the most prevalent diseases. Moreover, polypharmacy increased significantly with the presence of multiple co-morbidities. Similar findings were observed by other studies.[20] In the current study, the most widely consumed group of medications in both genders was the cardiovascular hypertension group which is similar to Nobili et al.'s study16, and Hosseini et al.'s study.[21]

The prevalence of non-adherence in elderly patients receiving polypharmacy ranged from 6 to 55%. Medication adherence was negatively associated with greater number of drugs.[22] In the present study, majority of the patients with polypharmacy (49%) were non-adherent to their drugs, in comparison to 36.4% of the patients without polypharmacy.

In the present study we have observed a significant association between polypharmacy and dementia in elderly patients. The patients with polypharmacy were 3.8 times more likely to have dementia than their counterpart. In a study conducted in Taiwan, the risk of dementia increases steadily with the increased number of medications used and age in older people. Cerebrovascular disease, diabetes mellitus, chronic kidney disease and hypertension also correlated with the risk of dementia in that study.[23] Another

study conducted in South Korea also identified a significant association between polypharmacy and the incidence of dementia among elderly.[20]

Polypharmacy was the only independent predictor for drug non-adherence [OR: 2.4, 95% CI: 1.1-5.4] in the present study. Reviewing literature, Pasina and colleagues report that polypharmacy is very common among older adults and is significantly contributes to poor adherence to therapies.[24]

This study found out that polypharmacy is a common problem in the elderly. However, there were some limitations in this study. The sample size was relatively small and selection of the patients from a single hospital would inevitably result in biases, affecting the generalizability of the results. The disease load might have been under estimated since skin, ear or eye diseases were not counted. Finally, due to the cross-sectional design temporal association between the outcome variables could not be determined.

**Conclusion:**

In conclusion, the frequency of polypharmacy was high among elderly people admitted in medicine wards of a tertiary level hospital of Bangladesh. Medication non-adherence and dementia were also common. Polypharmacy significantly contributes to dementia and drug non-adherence. Health care professionals (doctor, Pharmacist, Nurse) should be aware of the risks and fully evaluate all medications at each geriatric patient visit to prevent Polypharmacy from occurring.

**Competing interests:**
The authors declare that they have no competing interests.

**Authors' contributions:**
The Principle Investigator, Dr. Ummay Fatema Khatun, oversaw all activities related to the conduct of the study and contributed to the study idea and writing of the manuscript. Dr. Subrata Dey contributed to the study idea, data collection, and literature review. All authors accepted the final version. All authors read and approved the final manuscript.

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