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Prevalence and Predictors of Polypharmacy and Medication Adherence among Elderly Patients in Benghazi - Libya.

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Original Research Article

Abstract

Background: Polypharmacy is the simultaneous use of five or more prescription medications and its global prevalence is estimated to be 37% and even higher among the elderly. Variable factors could lead to polypharmacy; either related to health-care providers or patients. It is often associated with several negative health and economical outcomes, especially among older patients.

Aim: To assess the prevalence and factors associated with polypharmacy and medication adherence among elderly patients in Benghazi, Libya.

Method: It is a descriptive cross-sectional study that was conducted for a period of five months among elderly patients in Benghazi. The data from 100 subjects was collected through a face-to-face interview using a questionnaire that consisted of two main domains; demographic data (e.g. gender, age, nationality) and clinical data (e.g. number of drugs taken regularly, self-medication, level of drug compliance).

Results: Polypharmacy was observed in 32% of the cases and it was associated with some factors such as older age, certain types of marital status, lower education level and recent hospital/emergency admission. Most of the participants scored low (67%) for the Morisky medication adherence scale followed by medium (21%) and high scores (12%), respectively.

Conclusion: Elderly patients in Benghazi frequently used five or more prescription medications at the same time and mostly did not adhere well to their treatment regimens. These problems could be addressed through several strategies such as continuously assessing patients' medication regimens and providing extensive patient education.

Keywords: polypharmacy, medication adherence, elderly, Benghazi, comorbidities.

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Introduction:

Although medications are fundamental in improving patients' health and their quality of life, inappropriate prescribing and the use of multiple drugs may have adverse outcomes [1]. Polypharmacy is currently one of the major prescribing difficulties in general practice [2]. There is no formally accepted definition for polypharmacy but most commonly it is defined as the regular use of 5 or more medications at the same time [3, 4]. However, polypharmacy is not always confined to the use of a certain number of drugs as the administration of more medications than are clinically needed could be also considered as polypharmacy [5].

Polypharmacy is a global issue and its prevalence is estimated to be 37%, but among the elderly, those aged ≥ 65 years, it is believed to be much higher reaching even 44.2–57.7 % [6]. In 2019, the number of people aged 65 years or over worldwide were 703 million and in 2050 this number is projected to double to 1.5 billion, with a more prominent increase in developing countries [1]. Currently, China has the largest elderly population in the world and a recent meta-analysis showed a high prevalence of polypharmacy (48%) among elderly Chinese patients and that polypharmacy was significantly associated with potentially inappropriate medication use [7]. Polypharmacy is a major health concern for particularly elderly patients due to altered drug effects associated with old age. These changes could be attributed to variable factors such as different drug distribution and pharmacokinetics (e.g., decreased lean body mass, reduced liver mass and blood flow, elevated

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body fat percentage and lowered renal function), altered response to drugs (e.g., change in receptor properties, influence of associated diseases, impaired sensitivity of homeostatic mechanisms), in addition to social and economic issues (e.g., multiple drug therapy, financial constraints, non-compliance) [8].

Several factors could be the reason for polypharmacy; attributed to either health-care providers or patients. As regards health-care providers, it has been demonstrated that the number of drugs prescribed to patients increases with the number of physicians seen and the number of pharmacies visited. Furthermore, it has been found that when a physician, pharmacist or nurse reviews a patient's medications, the recommendation to stop taking a drug is the one that is least likely to happen. Each of these elements increases the patient's risk of ineffective polypharmacy [9] together with other possible factors such as careless physician prescribing and failure to follow-up patients [10]. Moreover, the elderly are usually subjected to medication side effects because the information they receive from their physician on proper drug use is less compared to patients 20–64 years of age [3].

Patient demographics also have a significant impact on polypharmacy. For example, having lower education levels, being female, advanced age and living in non-urban areas have been found to increase the likelihood of inappropriate polypharmacy [9].

In addition, due to their multiple morbidities, older patients often require various pharmacological treatments and patients usually pressure their physicians to

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prescribe a medication and/or self-medicate with over-the-counter pharmaceuticals.Medication borrowing from friends and relatives is an additional reason for the high prevalence of polypharmacy especially among the older population [10]. The elderly frequently think that there is "a pill for every ill" [9].

While polypharmacy may be unavoidable in certain situations, for most patients it appears to be inappropriate and unnecessary [11]. Studies have associated polypharmacy with several negative health and economical outcomes and was considered a significant indicator of potentially inappropriate medication use [1]. For example, falls particularly when the medications are related to cardiovascular conditions, drug side effects, an increase in hospital admission rates and mortality are all related to polypharmacy [4]. Polypharmacy has also been linked to an increased risk of adverse medication reactions, drug-drug interactions, and drug-disease interactions in patients [12].

Due to their comorbidities, hence, complex prescription regimens, failure to drug compliance is common among senior patients compared to younger populations; elderly usually stick to only 3 out of every 4 of their prescription medications[5].

Medication adherence, also known as drug compliance, is the extent to which a person's behavior agrees with the medication regimen from a health care provider, if not practiced optimally as a result of polypharmacy, for example, it could result in frequent physician and hospital visits. This would consequently lead to the deterioration of the patient's medical condition, decrease the therapeutic benefits,

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elevate health care expenditure and even over treat certain medical conditions [13].

Some medications, when used by older adults, have higher risk of adverse effects and their harm may outweigh the clinical advantages leading to drug interactions, adverse drug events, functional and mental decline, unplanned hospitalization, morbidity and mortality. These drugs are known as potentially inappropriate medications [1] and studies have revealed that the use of multiple medications increases the risk of inappropriate prescribing, particularly the risk of these medications, and the risk of dangerous drug interactions that they may cause [5].

The presence of polypharmacy itself, however, is not always associated with inappropriate or incorrect use of medications, because older adults with comorbidities typically require several medications to manage their multiple health conditions. For instance, three medications are usually needed to control blood pressure or manage symptoms of heart failure according to national guidelines, and type 2 diabetic patients often require at least two different medications to effectively control their blood glucose levels [10].

Despite the fact that polypharmacy is a critical health issue, only a limited number of studies have assessed it among older patients in developing countries, including Libya [1]. Therefore, the aim of this study was to assess the prevalence and factors associated with polypharmacy and medication adherence among elderly patients in Benghazi, Libya.

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Method:

Study design and setting:

It is a descriptive cross-sectional study that was conducted for a period of five months (Feb-June 2024) in Benghazi; the second largest city in Libya with an approximate population of 750,000. All elderly patients (≥ 65 years) from both genders and all social backgrounds were recruited to participate in the survey. As there were no official records of the exact number of elderly in Benghazi, only 100 patients from different places including pharmacies, polyclinics and hospitals participated in this study. Prior to collecting the gross data, the questionnaire was pretested using a pilot study with ten participants.

Study tool and data collection:

The data was collected through a face-to-face interview using a questionnaire that was adapted from a number of similar studies previously conducted in other countries [4, 11, 12, 14-17]. The questionnaire was designed in English and the interviewer was present during the entire time of the questionnaire administration for any needed clarification. A thorough explanation of the study's aim was given to the participants prior to data collection in order to obtain their consent. All subjects were informed that their participation is completely voluntary and that their responses will remain confidential and anonyms.

The questionnaire consisted of two main domains that covered the demographic and clinical data of patients. Subjects' demographics included their gender, age, nationality, marital status, level of education (low, medium and high) and work status. The clinical data comprised of questions related

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to their medical conditions, self-medication, prevalence of polypharmacy (taking five or more medications on a regular basis), recent emergency admission and the level of adherence to prescribed medications.

The Morisky medication adherence scale (MMAS-8) was used to measure the level of medication adherence. It consists of 8 questions regarding common medication-taking behaviors leading to the omission of drugs and the circumstances surrounding adherence behavior. A binary scoring system (yes/ no) was used for the first seven questions while a 5-point Likert scale was used for the final item which assessed the frequency patients forget to take their medications (always= 0, usually= 0.25, sometimes= 0.5, once in a while= 0.75 and never= 1). The total score is a summation of all MMAS-8 items and ranges between 0 and 8, with scores of < 6 reflecting low adherence, 6 to < 8 reflecting medium adherence and 8 reflecting high adherence [18, 19].

Statistical analysis:

The data was entered in Excel sheets and then analyzed using Statistical Product and Service Solutions (SPSS, version 21). Descriptive statistics, chi-square and curve estimation using linear regression tests were performed and the results were presented as means, frequencies, percentages and p-values, and then displayed as tables and figures. A p-value of < 0.05 was considered statistically significant.

Results:

Of the 100 elderly subjects surveyed in this study (Table 1), more than half were males (59%) and the majority were Libyan (90%) and aged between 65-74 years (86%). Participants who

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are married predominated the study population (70%) compared to divorced/ widowed (29%) and single (1%) participants. Additionally, almost half of the subjects had medium level of education while more than one-third had low level and only 14% had high level of education. Seniors who are still working had the highest participation in the study (38%) in contrast to retired (32%) and housewife/ never worked (30%) patients. Approximately two-thirds of the subjects regularly visited a hospital for check-ups, and took medicines to help with certain health conditions without consulting a doctor (i.e. self-medicated). In addition, almost one-third of the subjects had been recently admitted to the hospital and also took five or more medications on a regular basis (i.e. polypharmacy). Most of the participants scored less than 6 for the MMAS-8 (67%), followed by medium (21%) and high scores (12%).

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Table.(1): Distribution of the study population based on socio-demographic factors, polypharmacy, and related factors.

Variables	Categories	N	%
Gender	Male	59	59
	Female	41	41
Age	65-74 years	86	86
	75-84 years	10	10
	≥ 85 years	4	4
Nationality	Libyan	90	90
	Non-Libyan	10	10
Marital status	Married	70	70
	Divorced/widowed	29	29
	Single	1	1
Education level	Low	35	35
	Medium	51	51
	High	14	14
Work status	Working	38	38
	Retired	32	32
	Housewife/never worked	30	30
Regular hospital check-ups	Yes	63	63
	No	37	37
Self-medication	Yes	64	64
	No	36	36
Recent hospital/emergency admission	Yes	32	32
	No	68	68
Polypharmacy	None	68	68
	Polypharmacy	32	32
MMAS-8 score	Low (< 6)	67	67
	Medium (6 to < 8)	21	21
	High (8)	12	12

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Continuous Variables			Mean
Number of chronic conditions			3.08
Number of drugs taken regularly			3.79
MMAS-8 score			4.56

As illustrated in table (2), polypharmacy was observed in women slightly more than men but mostly among seniors aged between 75-84 years. Unlike the nationality, which had no influence on polypharmacy (p-value > 0.05), the patient's marital status had a significant effect (p-value < 0.05); divorced/ widowed elderly patients who took ≥ 5 medicines were more than double of that of married subjects. Additionally, polypharmacy was significantly influenced by the patients' level of education (p-value < 0.05); over than 3/4 of subjects with higher education did not practice polypharmacy. Retirees and housewives/never worked participants were exposed to polypharmacy far more than the working participants. Self-medication had no effect on the use of polypharmacy (p-value 0.497). However, there was a significant association between polypharmacy and recent hospital/ emergency admission (p-value < 0.05); almost double the subjects who practiced polypharmacy had been recently admitted to a hospital.

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Table.(2): Association between polypharmacy and some related factors.

Variables	Categories	No polypharmacy	Polypharmacy	P-value
Gender	Male	41 (69.5%)	18 (30.5%)	0.701
	Female	27 (65.9%)	14 (34.1%)	
Age	65-74 years	61 (71%)	25 (29%)	0.012
	75-84 years	3 (30%)	7 (70%)	
	≥ 85 years	4 (100%)	0	
Nationality	Libyan	61 (67.80%)	29 (32.20%)	0.886
	Non-Libyan	7 (70%)	3 (30%)	
Marital status	Married	54 (77.1%)	16 (22.9%)	0.006
	Divorced/widowed	13 (44.8%)	16 (55.2%)	
	Single	1 (100%)	0	
Education level	Low	17 (48.60%)	18 (51.40%)	0.008
	Medium	39 (76.5%)	12 (23.5%)	
	High	12 (85.70%)	2 (14.30%)	
Work status	Working	31 (81.60%)	7 (18.40%)	0.062
	Retired	18 (56.30%)	14 (43.80%)	
	Housewife/ never worked	19 (63.30%)	11(36.70%)	
Regular hospital check-ups	Yes	43 (68.25%)	20 (31.75%)	0.943
	No	25 (67.57%)	12 (32.43%)	
Self-medication	Yes	42 (65.60%)	22 (34.40%)	0.497
	No	26 (72.20%)	10 (27.80%)	
Recent hospital/ emergency admission	Yes	17 (53.10%)	15 (46.90%)	0.029
	No	51 (75%)	17 (25%)	

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Table (3) displays the study participant's distribution based on MMAS-8 scores. Subjects from both genders generally scored low on the MMAS-8 with only 15% and 7% of males and females, respectively, scoring high. Age had no influence on drug compliance (p-value > 0.05) but the nationality had a strong impact (p-value < 0.05). Additionally, the level of dug compliance varied with the patients' marital status as married subjects had generally better MMAS-8 scores compared to widowed/ divorced subjects. A lower level of education caused a significant drop in compliance (<6) whereas a medium score adherence (6 to < 8) was achieved by half of those with advanced education. The level of medication adherence was generally low for all subjects of different marital status, however, the poorest adherence was observed among housewives and subjects that never worked before. Most of the subjects who self-medicated had a low MMAS-8 score as well as those who were recently admitted to a hospital/emergency room.

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Table.(3): Distribution of the study population based on their characteristics and medication adherence scores.

Variables	Categories	MMAS-8 score			P-value
		Low (< 6)	Medium (6 to < 8)	High (8)	
Gender	Male	35 (59%)	15 (25%)	9 (15%)	0.144
	Female	32 (78%)	6 (15%)	3 (7%)	
Age	65-74 years	56 (65.11%)	21 (24.42%)	9 (10.46%)	0.285
	75-84 years	8 (80%)	0	2 (20%)	
	≥ 85 years	3 (75%)	0	1 (25%)	
Nationality	Libyan	62 (68.9%)	16 (17.8%)	12 (13.3%)	0.044
	Non-Libyan	5 (50%)	5 (50%)	0	
Marital status	Married	42 (60%)	19 (27.1%)	9 (12.9%)	0.185
	Divorced/ widowed	24 (82.8%)	2 (6.9%)	3 (10.3%)	
	Single	1 (100%)	0	0	
Education level	Low	31 (88.6%)	2 (5.7%)	2 (5.7%)	0.001
	Medium	32 (62.7%)	12 (23.5%)	7 (13.7%)	
	High	4 (28.57%)	7 (50%)	3 (21.43%)	
Work status	Working	20 (52.6%)	13 (34.2%)	5 (13.2%)	0.066
	Retired	22 (68.8%)	5 (15.6%)	5 (15.6%)	
	House-wife/never worked	25 (83.3%)	3 (10%)	2 (6.7%)	
Regular hospital check-ups	Yes	42 (66.66%)	14 (22.22%)	7 (11.11%)	0.889
	No	25 (67.57%)	7 (18.92%)	5 (13.51%)	

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Self-medication	Yes	46 (71.90%)	11 (17.2%)	7 (10.9%)	0.363
	No	21 (58.30%)	10 (27.80%)	5 (13.9%)	
Recent hospital/ emergency admission	Yes	27 (84.40%)	2 (6.3%)	3 (9.4%)	0.026
	No	40 (58.80%)	19 (27.90%)	9 (13.20%)	

Figure (1) shows the relation between medication adherence and polypharmacy. A significant drop in the MMAS-8 score of study participants was associated with an increase in the number of prescription medications taken on regular basis.

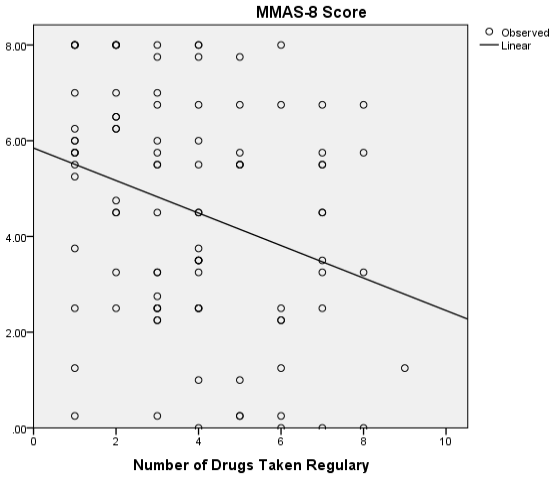

Figure. (1): The correlation between polypharmacy and drug compliance.

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Discussion:

The prevalence of polypharmacy in this study was 32%, which is comparable to the findings of previous research carried out in Iran (23.1%) [20] and Canada (27%) [3]. However, other studies conducted in India [1], China [4] and Egypt [16] reported much higher figures 49%, 50.14% and 85.3%, respectively.

Although our study did not reveal a possible link between polypharmacy and gender (p-value > 0.05), other studies showed a positive correlation. A research conducted by Hosseini et al. demonstrated that women in Iran who were reported taking five or more medications on a regular basis were far more than men [20]. In contrast, a study carried out by Maxwell et al. showed that the prevalence of polypharmacy generally declined among Canadian women, especially younger women with fewer chronic conditions, while it increased across all ages and multimorbidity levels among men [14].

Furthermore, the marital status of participants had a significant impact (p-value < 0.05) on polypharmacy in this study, as widowed/divorced patients used polypharmacy far more than married subjects and this could be justified by the fact that the psychological health of widowed/ divorced patients is likely to have worsened as a result of their social situation. On the other hand, being married was associated with higher polypharmacy levels in another study [20].

Our study has also shown that the lower the level of education, the greater the likelihood of polypharmacy (p-value < 0.05). These results were similar to the findings of a study carried out by

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Sarwar et al. in Pakistan [15] but contradictory to the findings of another study conducted by Eltaher and Araby in Egypt which related polypharmacy to other significant predictors such as sex, residence, monthly income and co-morbidity [16]. It could be explained that patients with a higher level of education often have better access to pharmacological information, hence, they are involved more in patient-physician communication and their awareness of polypharmacy is greater. This would subsequently lead to more frequent medication reviews by the physician and a more successful negotiation process of physician-patient drug treatment.

Although there was no association between polypharmacy and the subjects' work status in this study (p-value > 0.05), polypharmacy was least observed among the working participants compared to retirees and housewives and this finding was similar to the results of a study carried out by Kutsal and her colleagues. [17]. Rosa et al. addressed the possible effect of being a housewife or a retiree on polypharmacy and suggested that these patients are almost 8 times more likely to present with chronic diseases, hence, they are more prone to using five and more medications at the same time [21]. A previous study investigating polypharmacy among Canadian seniors revealed that the number of prescription medications was associated with higher rates of hospital/emergency department admission [3] and this was in line with our findings (p-value < 0.05). The concurrent use of multiple medications, hence, the increased risk of drug-drug interactions and adverse drug reactions, coupled with impaired drug compliance and poor quality of life, all together

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could explain the correlation between polypharmacy and the high rates of hospital/emergency room admission observed in this study.

The issue of medication non-adherence is a growing concern and the World Health Organization (WHO) considers it an additional burden to diseases [22]. In this study, adherence to prescribed medications was generally poor with the level of compliance being 67% low, 21% medium and 12% high. Although this study did not explore the reasons behind this poor adherence, it could be due to multifactorial reasons either intentional or non-intentional. Intentional non-compliance occurs when patients decide not to adhere correctly to their prescribed treatment regimen because they weigh the benefits and risks of the treatment against any adverse effects. On the other hand, unintentional non-adherence occurs due to the forgetfulness or carelessness of the patient about adhering to their prescribed medications [23]. Data from a previous study showed that 49.6% of patients mentioned forgetfulness as one of the major non-intentional reasons for non-compliance [24]. Additionally, elderly patients have specific problems that are age related for non-adherence such as psychosocial issues (e.g., cognitive incapacity) and physical inability (e.g., poor eyesight) [25]. An Indian study carried out by Punnapurath et al. assessed drug compliance among elderly patients with chronic illnesses in two visits and showed better results than our findings; the level of compliance in the first assessment was low in 2%, medium in 16% and high in 82% while in the second assessment it was low in 1%,

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medium in 25% and high in 74% of the subjects [26].

In line with our findings, an Italian study carried out by Pasina et al. revealed that medication compliance was particularly low among patients receiving a high number of medications but found no association between adherence and demographic variables such as age, sex and marital status [27]. Another study, however, conducted by Jin et al. in South Korea linked drug compliance of elderly patients with a number of factors such as the dosing frequency, education level and the presence of health-related problems, but no association was found with other factors such as age [25].

Conclusion:

Our study revealed that polypharmacy was frequently practiced by the elderly population of Benghazi, Libya. Age, marital status, level of education and recent hospital/ emergency admission were all important indicators for polypharmacy. Additionally, adherence to prescription medications was generally low and it was linked to a number of risk factors such as patient's nationality, education level and recent hospital/emergency admission.

Recommendations:

Polypharmacy and its negative consequences such as medication non-adherence, especially in the elderly, could be addressed through several strategies. During regular check-ups, for example, physicians should consider deprescribing; lowering the dose or stopping medications that are unnecessary or possibly harmful. Furthermore, pharmacists should have a more significant role in reducing unnecessary

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polypharmacy and optimizing patient care by assessing medication regimens, providing extensive education and working as a link between patients and physicians. Moreover, strengthening patient-physician communication and enhancing physician-physician communication and inter-professional collaboration could also help in minimizing polypharmacy.Finally, appropriate patient follow-ups should be scheduled to measure medication adherence by various methods (e.g., smart pill bottles) and to determine any possible obstacles related to it.

Limitationsl:

This study has a number of potential limitations. Firstly, it was conducted in a short period of time and the sample size was small, resulting in some characteristics such as the nationality and gender failing to produce clear results. Secondly, the reasons behind polypharmacy and medication non-adherence were not explored, hence, further studies are needed to address these health issues. Finally, since this study was not carried out in a hospital setting, the results obtained via the questionnaire could be subjective to the patients' perceptions.

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