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Original Research

Medications adherence and associated factors among patients with stroke in the Kingdom of Saudi Arabia

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Abstract

Background: Stroke is one of the most significant neurological problems around the world, and is considered a leading cause of death. Due to polypharmacy and multimorbidity, stroke patients are susceptible to have lower levels of adherence to their medications and self-care activities. **Methods:** Patients who have suffered a stroke and had recently been admitted to public hospital were approached for recruitment. Patients' adherence to their medications was examined using a validated questionnaire during an interview between the principal investigator and the patients, where patients' adherence to their self-care activities was assessed using a developed, validated and previously published questionnaire as well. Reasons for lack of adherence was explored from the patients. Verification of patient's details and medications was done via the patient's hospital file. **Results:** The mean age of the participants (n=173) was 53.21 (SD= 8.61) years. Assessing patients' adherence to medications showed that more than half of them stated that they sometimes/often forgot to take their medication/s, while 41.0% sometimes/often stopped their medication/s from time to time. The mean adherence to medications score (out of 28) was 18.39 (SD=2.1), with 83.8% having a low adherence level. It is found that patients who did not take their medications were due to forgetfulness (46.8%) and complications from taking the medications (20.2%). Better adherence was associated with higher educational level, higher number of medical conditions, and higher frequency of glucose monitoring. Adherence to self-care activities showed that majority of patients performed correct self-care activities three times a week. **Conclusion:** Post-stroke patients in Saudi Arabia have indicated low levels of medication adherence, while reporting good adherence to their self-care activities. Better adherence was associated with certain patient characteristics such as higher educational level. These findings can help in focusing the efforts to improve adherence and health outcomes for stroke patients in the future.

Keywords: stoke; adherence; self-care activities; KSA

INTRODUCTION

Stroke is one of the most significant neurological problems around the world, and is considered a leading cause of death, especially among the elderly.[1] Every 4 minutes, a death is reported due to a stroke incident worldwide. The World Health Organization (WHO) reported in 2020 that 15 million individuals globally undergo a stroke; 5 million of them die and 5 million become permanently disabled, which place a burden on their families.[2]

Significant physical disabilities and psychiatric complications arise following a stroke, including depression and anxiety.[3-5] The psychiatric consequence has been reported to lead to decreased compliance to medications, thus negatively affecting the outcomes and quality of life of stroke patients.[6]

There are several risk factors associated with strokes including chronic conditions such as diabetes and hypertension. Diabetic patients are reported to have a triple risk of a stroke compared to others,[7] and the combined presence of hypertension with diabetes is reported to increase the risk drastically.[8] Living with multiple comorbidities is associated with higher number of medications, and hence more possibilities for low adherence, resulting in more treatment-related problems (TRPs).[9] Due to polypharmacy and multimorbidity, stroke patients are reported to have higher number of TRPs, and lower adherence levels.[10,11]

Following a healthy lifestyle and recommended health care self-activities, such as eating a suitable diet and performing regular exercise can lead to improvements of health and decreased complications for stroke patients.[12,13] Adherence to medication regimens determines the level of success of a medical treatment, leading to improved health, lowered TRPs and better manage diseases.[12-14] However, adherence is reported to be suboptimal among stroke patients despite its importance for a better health and prevention of recurring strokes.[12,13] Earlier studies reported an adherence level of less than 50% among stroke patients.[15] As well as, it was found that patients starting antihypertensive medications following strokes were reported to stop taking their medication within one year of onset.[16] Therefore, to develop suitable strategies

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for appropriate management of stroke patients to improve their health outcomes and health-related quality of life, it is crucial to assess their adherence to medications. Assessing patient's adherence to their self- care activities is also crucial for stroke patients to lead a better quality of life.

Healthcare professionals in general, and pharmacists in specific, have crucial roles in identifying the determinants of poor adherence for stroke patients. Their role in helping patients improve their adherence level to medications and self-care activities is vital. Such roles have been shown to improve the care for stroke patients, preventing secondary strokes in Kingdom of Saudi Arabia (KSA).[9,17] Educating patients on the appropriate healthcare activities by healthcare professionals is vital so patients not only get educated on what health care activities they need to follow, but also to be reminded on the importance of adhering to these activities long term.[18]

This study aims to evaluate the adherence level of medications for hospitalized post-stroke patients living in the KSA, examining the relationships between patients' demographic data and their clinical characteristics, as well as the adherence level. The secondary aim includes assessing the self-care activates adopted by stroke patients and their adherence to it.

METHODS

Study design

This study utilized a cross-sectional design to evaluate patients in the KSA who had a primary or subsequent ischemic or haemorrhagic stroke. The principal investigator (PI) had approached all participants who recently have been admitted to one of the chosen hospitals. All participants had a confirmed diagnosis and approval by their physician (the senior neurologist at the study hospital). A magnetic resonance imaging (MRI) and/or computerized tomography (CT) scanning were used to diagnose the patients. Patients were included in the study if they aged 18 years or older, patients willing to provide written informed consent and complete the study questionnaire. Patients who had a serious life-threatening condition or were diagnosed with one of the following conditions: subarachnoid haemorrhage, reversible neurovascular conditions, mental or psychiatric disorders, a history of psychotropic drug intake, impaired hearing or vision, and speech difficulties were excluded.

Eventually, study patients were recruited from multi-hospitals, equally distributed through the KSA. Data collection took place between April and October 2021.

Ethical approval

Following the ethical approval obtained from the Local Committee of Bioethics (LCBE) committee at Jouf University, approvals were obtained from relevant ethical committees at the selected hospitals. Patients were informed about the study objectives, risks, and outcomes; afterward, they were requested to provide a written informed consent. A code number was assigned for each patient to ensure confidentiality.

Study questionnaire

The study questionnaire which was used during an interview between the PI and the study subjects to collect data was presented in four main sections: the first section included questions aimed at collecting patient's personal and socio-demographic characteristics including: gender, age in years, marital status, educational level, place of living, family income per month, and work status. Patients were also asked whether they had undergone surgery, had high levels of blood sugar or high levels of blood pressure, and whether they were previously diagnosed with any chronic condition/s.

The second section assessed patient's adherence to medications using the previously developed and validated adherence questionnaire.[9,19,20]

The third section assessed patients' adherence to their self-care activities using the previously developed, validated and published questionnaire.[19]

The fourth section was about patient's medical data: medications, drug doses, and therapeutic regimen that the patient was taking before the stroke incident. Data was collected based on patient's reporting and verifications from the hospital files.

The research team contacted the patient's physician if a threat to life was identified during the interview or if essential information related to the patient's health status was required. Details of the patient's physician was provided by the patient or his/her relatives, with a consent to contact the physician once needed.

Study tools

Medication adherence questionnaire

Patient adherence to their medications was assessed depending on patient's memory four weeks prior to the stroke incident and hospitalization. A developed and validated questionnaire that was used previously in similar studies was applied.[9,19,20]

The adherence questionnaire consisted of seven items including: *"Do you forget to take your medication?", "Do you stop your medication from time to time?", "Do you stop your medication when you feel better?", "Do you stop your medication when you feel worse after taking your medication?", "Do you stop your medication due to side effects-you believe is due to taking your" medication?, "Do you fail to follow your pharmacist advice?",* and *"How often a week you do not take your medication (you forget or stop)?"*. The questions were answered by the patients using a scale on five steps (0 'never', to 4 'always'). The adherence score range between zero and 28 with lower scores implying better adherence. Patients were also categorized based on their adherence score as having high adherence level (score = 0), medium adherence level (with a range of 1 to 14), low adherence level (with a range of 15 to 21), or as being non-adherent (with a range of 22 to 28). At the end of the adherence questionnaire, a section was present to investigate study participants' reasons for not taking their

prescriptions as prescribed, if any.

Self-care activities adherence measure

A structured interview using a developed, validated and previously published questionnaire was used to assess patients' adherence to their self-care activities.[19] The questionnaire consisted of five questions: *"On how many days a week did you follow a healthy diet?", "On how many days a week did you eat 5 or more portions of vegetables and/or fruits?", "On how many days a week did you skip eating food that contains high amount of fat (e.g., Full-fat milk and red meat)?", "On how many days a week did you perform continuous exercise for more than 30 minutes?",* and *"On how many a week did you perform special type of sport e.g., walking?"*.

Furthermore, patients with a previous diagnosis of diabetes mellitus were asked to answer three further questions: *"On how many days a week did you measure your blood glucose level?", "On how many days a week did you check your feet?",* and *"On how many days a week did you checked your shoes?"*.[21] The patients responded to the questions on a seven-point Likert scale ranging from one to seven times. Out of 35 points, the self-care adherence score was calculated. Higher ratings indicated higher self-care adherence.

Sample size

The sample size was determined using G*Power 3.1.9.2 software (2014). Using a power of 0.80, a significance level (α) of 0.05, and an effect size for multiple linear regression analysis (f = 0.15). The minimal sample size required was determined to be 135 participants. Calculating for a 20% dropout rate, a minimum of 162 participants was targeted to be recruited into this study.

Statistical analyses

Statistical Package for the Social Sciences (SPSS), Version 25.0, was used to code and enter the collected data into the analytic data sheet (IBM Corp., Armonk, New York, USA). All the assumptions for multiple linear regression were assessed. Categorical variables were analysed using Pearson's Chi-Square test and presented as frequency (%). Statistically significant was defined as p-values of less than 0.05.

The dependent variables in this study were the adherence to medications score, and self-care adherence score, while the independent variables included the demographics and clinical outcomes data. To determine the predictors of the dependent variables (adherence to medications score, and self-care adherence score), two multiple linear regression analyses were performed. Associations between the dependent variable, adherence to medications score (Model A), and self-care adherence score (Model B) were analysed against the independent variables: age, gender (female, and male), marital status (single, married, divorced, and widowed), place of residence (city, and rural), educational status (intermediate, secondary, diploma, bachelor's degree, and postgraduate degree), monthly family income (low income (less than 5000 SAR), intermediate income (5000-10000 SAR), high income (more than 10000 SAR)), smoking status (smoking, and not smoking), working status (working, and not working), and living status (living alone, with family, or with husband's family).

RESULTS

Demographics and clinical characteristics

The sample size was composed from 173 patients. Their mean age was 53.21 (SD= 8.61) years, with 52.1% males. Around 75.0% of the patients were married, 86.7% lived in cities, with the majority residing with their families (89.6%). Most of the participants (79.2%) had an intermediate income (5000-10000 SAR) and more than half of them (55.5%) reported to have a job. A variation was noticed in patients' educational level, as the majority either completed their secondary education, acquired a diploma or a bachelor's degree. Of the study patients, 22.5% were smokers; of the smokers (n=39), 30 patients (76.9%) were smoking cigarettes and nine (23.1%) were smoking Shisha. Among the shisha smokers, seven patients were smoking every day and two patients were smoking weekly.

With regards to the medical history, almost 85.0% of the patients had a history of high blood pressure, 23.1% of them had undergone a surgery previously, and 22.5% of them had diabetes, while 6.4% reported to have other chronic diseases. Around 76.0% of the patients did not perform a recent assessment of their blood sugar level (Table 1).

Table 1. Characteristics of the participants (n=173)

Parameter	Mean (SD)	n (%)
Age (mean ± SD)	53.21 (8.61)	
Gender, n (%)		
Female		83 (47.9)
Male		90 (52.1)
Marital status, n (%)		
Single		16 (9.2)
Married		128 (74.0)
Divorced		13 (7.5)
Widowed		16 (9.3)
Place of residence, n (%)		
City (urban areas)		150 (86.7)
Rural areas		23 (13.3)
Living status, n (%)		
Alone		7 (4.0)
With family		155 (89.6)
With husband's family		11 (6.4)
Monthly family income (SAR)*, n (%)		
Low income (less than 5000 SAR)		8 (4.6)
Intermediate income (5000-10000 SAR)		137 (79.2)
High income (more than 10000 SAR)		28 (16.2)
Educational level, n (%)		
Intermediate		6 (3.6)
Secondary		57 (32.9)
Diploma		62 (35.8)
Bachelor's degree		38 (21.9)
Postgraduate degree (Master's or Ph.D.)		10 (5.8)
Working status, n (%)		
Yes		96 (55.5)
No		77 (44.5)

History of having surgery, n (%) Yes No		 40 (23.1) 133 (76.9)
History of having high blood pressure, n (%) Yes No		147 (84.9) 26 (15.1)
History of having diabetes, n (%) Yes No		 39 (22.5) 134 (77.5)
Previous blood sugar assessment, n (%) Was not performed recently Performed recently		 131 (75.7) 42 (24.3)
History of having other chronic diseases, n (%) Yes No		11 (6.4) 162 (93.6)
Smoking status, n (%) Yes No		 39 (22.5) 134 (77.5)

*SAR is Saudi Riyal, 1 SAR = 0.267 United States Dollar (USD)

Blood sugar test results for those who performed it recently showed that only one patient had normal readings (within the normal range of 80-120 milligrams per decilitre), while 23 out of 43 (54.8%) patients had a high reading (121-160 milligrams per decilitre), and 14 (32.6%) patients had a very high reading (more than 160 milligrams per decilitre). Patients suffering from arterial hypertension have had the condition for many years, ranging from one to 21 years, with a mean of 9.77 years (SD= 4.95).

Assessment of patient's adherence to medications

Assessing patients' adherence to medications showed that more than half of patients (52.0%) informed to sometimes/often forgot taking their medication, while 41.0% sometimes/often stopped taking their medication from time to time. Looking further into patients' answers, it was reported that 56.1% sometimes/often stop taking their medication when they felt better, 57.8% sometimes/often stop taking their medication when they felt worse after taking it, and 83.8% sometime/often/always stop their medication when side effects appeared after taking their medication.

Many patients reported failure to follow the advice of their pharmacist (67.6%), while only 32.4% reported that they never/rarely failed to do that. When patients were asked "*How often a week you do not take your medication (you forget or stop taking your medication)",* about half of them (45.1%) reported that they sometimes/often forgot or stopped their medication (Table 2).

The mean adherence to medications score (out of 28) was 18.39 (SD=2.1), with a range of 12 to 25. Some patients (15.6%) had medium adherence level (range of 0 to 14), while 83.8% had a low adherence level (range of 15 to 21). Only 0.6% were found non-adherent (range of 22 to 28).

There are many reasons that prevented the study participants from taking their medication as scheduled, leading to low or non-adherence to their medications. These reasons included forgetfulness (46.8%), complications from taking the medications (20.2%), medication dislike (14.5%), ineffective medication (8.1%), time of taking the medication being not suitable or easy to follow (7.5%) and taking a high number of medications (polypharmacy) simultaneously (2.9%).

Atorvast® and Zocor® (Atorvastatin and Simvastatin, respectively, HMG CoA reductase inhibitors used to reduce low-density lipoprotein (LDL) in blood, raise high-density lipoprotein (HDL), and lower triglycerides), Aspirin® (Acetylsalicylic acid; an antiplatelet agent), Plavix® (Clopidogrel; a platelet inhibitor), Inderal® (Propranolol hydrochloride; an antihypertensive nonselective beta-adrenergic blocker), Isoptin® (Verapamil hydrochloride; an antihypertensive calcium antagonist), Capoten® (Captopril; an antihypertension medication that is angiotensin converting enzyme inhibitor), Valsartan® (an antihypertensive medication that blocks the actions of angiotensin II), Concor® (Bisoprolol; an antihypertensive medication that is a beta-blocker that affects the heart and circulation), Micardis® (Telmisartan; an antihypertensive medication that is an angiotensin II receptor antagonist), Norvasc® (Amlodipine besylate; an antihypertensive medication that is a calcium channel), Lasix® (Furosemide; an antihypertensive medication that is a potent loop diuretic), and Glucophage® (Metformin; an oral antidiabetic medication), were the most often taken medications among study participants. The reasons for taking the previous-mentioned medication/s were mainly to reduce patient's blood pressure,

Table 2. Patient self-reported adherence to their medication/s (n =173)

Question	Never (0) n (%)	Rarely (1) n (%)	Sometimes (2) n (%)	Often (3) n (%)	Always (4) n (%)
1. "Do you forget to take your medication?"	16 (9.2)	67 (38.7)	86 (49.7)	4 (2.3)	-
2. "Do you stop your medication from time to time?"	28 (16.2)	74 (42.8)	68 (39.3)	3 (1.7)	-
3. "Do you stop your medication when you feel better?"	16 (9.2)	60 (34.7)	84 (48.6)	13 (7.5)	-
4. "Do you stop your medication when you feel worse after taking your medication?"	11 (6.4)	61 (35.3)	86 (49.7)	14 (8.1)	1 (0.6)
5. "Do you stop your medication due to side affects you believe is due to taking your medication?"	1 (0.6)	28 (16.2)	89 (51.4)	33 (19.1)	22 (12.7)
6. "Do you fail to follow your pharmacist advice?"	11 (6.4)	45 (26.0)	78 (45.1)	26 (15.0)	13 (7.5)
7. "How often a week you do not take your medication (you forget or stop)?"	23 (13.3)	72 (41.6)	76 (43.9)	2 (1.2)	-

reduce cholesterol levels, reduce blood sugar and prevent clotting.

Regarding the most common side effects reported by the patients accompanied with taking these medications and reducing their adherence level, these included headache, dizziness, cough, and abdominal/stomach pain.

Patients were asked whether they agree to be visited at home following hospital discharge by a clinical pharmacist who can perform a medication management review service for them (a complete review of their medications and therapeutic regimen followed). Majority of patients (89.7%) answered with *"Yes".*

No correlation was found between patients' adherence to medications and having a history of high blood pressure. On the other hand, we found a significant correlation between adherence to medications and having a history of diabetes (p= 0.043). In addition, patients who did not assess their blood sugar levels recently had a significantly lower level of adherence (p= 0.026). Patients who had high glucose levels also had a significantly lower level of adherence (p= 0.01) compared to those who had normal sugar levels.

Assessing the correlation between adherence and demographic characteristics of patients showed statistically significant correlation between adherence and gender (p= 0.026), in that females had better adherence compared to males. A significant correlation between adherence and the patient's place of residence was also shown (p= 0.036), as patients living in the city reported better adherence than those living in rural areas.

Patient's educational level also showed a significant correlation with adherence (p= 0.023), as patients with higher educational status reported better adherence to their medications. However, no significant correlations were found between adherence and marital status (p=0.086), working status (p=0.453), monthly family income (p=0.980), or with patients' living status (p= 0.996).

Assessment of patients' adherence to self-care activities

Assessment of patients' adherence to their self-care activities showed that the majority of patients performed the following self-care activities three times a week: *"On how many days a week did you follow a healthy diet",* 30.6% answered with *"Three days a week".* Second question was *"On how many days a week did you eat 5 or more portions of vegetables and/ or fruits?"*, and 34.1% answered with "*Three days a week*". Third question was *"On how many days a week did you skip eating food that contains high amount of fat (e.g., Full-fat milk and red meat)?",* and 29.5% answered with "*Three days a week*". Fourth question was "*On how many days a week did you perform special type of sport e.g., walking?",* and 19.2% answered with "*Three days a week*". As for the question "*On how many days a week did you perform continuous exercise for more than 30 minutes?"* "*Five times*" was the most chosen answer by 22.5% of patients.

For patients with diabetes, they were asked "*On how many days a week did you measure your blood glucose level?",* and 25.4% answered with *"Three times a week".* Sixth question was "*On how many days a week did you check your feet?", and* 22.5% answered with *"Three times a week, as for the question "On how many days a week did you checked your shoes?",* "*Five times*" was the most chosen answer by patients (21.4%). The detailed patients' responses to the self-care activities scale are shown in table 3.

Associations with adherence to medications and adherence to self-care activities scores

Table 4 presents two multivariable regression analysis results; one for the adherence to medications as a dependent variable

Table 3. Assessment of self-care activities for study patients (n=173)

Statement	One time n (%)	Two times n (%)	Three times n (%)	Four times n (%)	Five times n (%)	Six times n (%)	Seven times n (%)
1. "On how many days a week did you follow a healthy diet?"	7 (4.0)	9 (5.2)	53 (30.6)	31 (17.9)	26 (15.0)	30 (17.3)	17 (9.8)
2. "On how many days a week did you eat 5 or more portions of vegetables and/or fruits?"	8 (4.6)	8 (4.6)	59 (34.1)	31 (17.9)	22 (12.7)	29 (16.8)	16 (9.2)
3. "On how many days a week did you skip eating food that contains high amount of fat (e.g., Full-fat milk and red meat)?"	7 (4.0)	7 (4.0)	51 (29.5)	26 (15.0)	29 (16.8)	31 (17.9)	22 (12.7)
4. "On how many days a week did you perform continuous exercise for more than 30 minutes?"	18 (10.4)	13 (7.5)	23 (13.3)	22 (12.7)	27 (15.6)	39 (22.5)	31 (17.9)
5. "On how many a week did you perform special type of sport e.g., walking?"	18 (10.4)	12 (6.9)	33 (19.2)	22 (12.7)	28 (16.2)	33 (19.0)	27 (15.6)
Mean self-care score (SD)	23.15 (2.69)						
6. "On how many days a week did you measure your blood glucose level?*"	23 (13.3)	19 (11.0)	44 (25.4)	24 (13.9)	22 (12.7)	24 (13.9)	17 (9.8)
7. "On how many days a week did you check your feet? *"	22 (12.7)	19 (11.0)	39 (22.5)	19 (11.0)	20 (11.6)	35 (20.2)	19 (11.0)
8. "On how many days a week did you checked your shoes? *"	36 (20.8)	11 (6.4)	33 (19.1)	13 (7.5)	15 (8.7)	37 (21.4)	28 (16.2)

*Questions 6, 7 and 8 were asked for patients with diabetes

Table 4. The regression models for participants characteristics with adherence to medication/s and self-care (n=173)

Variable	Adherence to medication/s score Model A			Adherence to self-care score Model B		
	Beta	t	*p*	Beta*	t	*p*
Age	-0.131	-1.729	0.086	-0.190	-2.530	0.012
Gender	0.144	1.251	0.213	0.014	0.123	0.902
Living status	-0.131	-1.603	0.111	0.100	1.223	0.223
Educational status	0.008	0.095	0.924	0.036	0.459	0.647
Monthly income	-0.101	-1.275	0.204	-0.008	-.100	0.921
Smoking status	0.130	1.575	0.117	0.128	1.550	0.123
Marriage status	0.017	0.202	0.840	0.008	0.096	0.924
Working status	0.020	0.160	0.873	0.011	0.090	0.928

*Beta= Standardized regression coefficient. Backward regression method was used.

and one for the adherence to self-care as a dependent variable. The overall fit of the two model were R2=0.019, p=0.073 (Model A) and R2=0.036, *p*=0.012 (Model B), respectively. Adherence to medications score showed no significant association with any of the variables. However, for adherence to self-care activities score, age was the only significant variable.

DISCUSSION

Adherence to a health regimen is defined as the degree to which an individual's behaviour be consistent with the recommendations from a health professional.[22] Adherence is one of the most important issues when discussing long term management for patients with chronic diseases, including those that can lead to a stroke. This exploratory study conducted in Saudi Arabia evaluated the adherence of stroke patients to their pre stroke medications and self-care activities. Although it is recognised that drugs for stroke treatment are critical for the prevention and management of recurrent stroke, adherence is frequently poor.[13] This fact was supported by this study, as results indicated that about 84% of patients had a low adherence level to their medications, while the majority of the patients performed their life-care activities mostly three times a week. Low adherence to medications could have contributed to their latest stroke incident.

Several factors can affect adherence to medications. In this study, sociodemographic characteristics were reported to affect patients' adherence levels supporting previous reporting.[23] Females in this study showed a significantly better adherence score compared to males, while patients living in the city reported better adherence compared to patients living in rural areas. Patients with higher educational status reported better adherence to their medications as well. Patients' place of residency and adherence scores showed significant association as living in urban areas could provide better accessibility to health care services, facilities and healthcare providers. This could have reflected not only on the accessibility to medications, but also on patient's knowledge level and thus resulting in better adherence levels.

Education and level of knowledge is also expected to affect patients' adherence. It was not surprising to find in this study that higher educational level was associated with higher adherence scores. Such association is a result of higher educational level leading to better knowledge about the risk factors of stroke as shown in earlier studies.[24-26] A previous study in Nigeria reported that patients at the level of tertiary education had 48 times higher knowledge scores and higher adherence to medications scores compared to other patients with lower levels of education.[27]

Chronically ill patients with complex medication regimens (polypharmacy) have been reported to have poor adherence.[28] For example, diabetic patients were reported to have lower adherence to their medications compared to other patients with chronic diseases.[29] In this study, findings showed that post stroke diabetic patients were found to have higher adherence scores compared to patients with hypertension. This could be due to the reported regular glucose monitoring among these patients imposing better adherence and health outcomes, while patients with hypertension performed less testing and hence had less adherence.

Regarding self-care activities among stroke patients, this study showed that in general, patients performed their self-care activities mostly three times a week. Earlier studies reported significant association between age, gender, and marital status of patients with good self-care activities.[30-33] This study showed a significant association between younger aged patients and higher self-care activities score. In addition, due to the recent criteria for the diagnosis of hypertension,[34] more patients are now diagnosed with hypertensive early on and are benefiting from lifestyle modifications and early medical management.[35]

Patients in the current study were on direct oral anticoagulants, which is indicated for atrial fibrillation as a first-line therapy with an additional stroke risk factor. Published studies highlighted the role of anticoagulants in stroke management; for example, a systemic review of random controlled trials among patients with atrial fibrillation documented that adjusted doses of oral anticoagulants are highly effective for stroke prevention.[36] Furthermore, a cohort retrospective analysis of the US MarketScan claims databases was conducted to assess adherence to anticoagulant medications among non-valvular atrial fibrillation; results revealed that higher adherence (low discontinuation) for certain anticoagulants translated to lower stroke incidence. Thus, strict adherence to these medications is essential in order to maximize the treatment benefits and achieve a higher efficacy.[37]

Reasons for non-adherence presented by the patients in the current study included forgetfulness, complications from taking the medications, medication dislike, ineffective medication, time of taking the medication being not suitable or easy to follow, and taking a high number of medications (polypharmacy) simultaneously, which goes in line with the previous finding where the main reasons for non-adherence among stroke

patients were fear of side effects (such as bleeding),[38] not liking drugs in general,[39] and forgetting to take the medication.[12] Moreover, polypharmacy has been documented as a reason for non-adherence; which together, in turn, would raise the cardiovascular risks (adverse cardiovascular events).[40] Despite major differences in the health-care systems, socio-economic factors and cultural settings across countries, the reasons for non-adherence remain consistent.

The majority of the study participants agreed to be visited at home by a pharmacist following hospital discharge to receive a medication management review (MMR) service. Worldwide, the MMR expands the clinical health services provided by the pharmacist. Pharmacists are considered essential healthcare providers that deliver personalized care services for patients such as MMR.[9,20] The MMR service results in positive clinical outcomes, as well as a decrease in disease severity, costs, and adverse drug events.[41] Several published studies have highlighted the role of pharmacists and the usefulness of MMR services.[9,20,42,43] Moreover, since anticoagulant medications have complicated pharmacokinetics and a narrow margin of safety, they need a qualified skilled healthcare provider, such as pharmacists, that can ensure the safe and effective use of these medications through their distinctive knowledge in pharmacokinetic, pharmacology, and interaction between drugs.[44] Because medication might induce adverse reactions, stroke patients' caregivers, who provide the most critical long-term support throughout recovery and rehabilitation for patients with stroke, urge sharing data about specific medications or therapies with the responsible pharmacist.[45]

Study limitations

This study comes with few limitations. Firstly, the study was conducted in certain governmental hospitals and did not include a representative number of all hospital (private as well) from the different cities in SA, which could have affected the representativeness of the Saudi stroke community included in this study. Secondly, excluding patients with aphasia who were unable to verbalize their answers was a limitation, as such group of stroke patients can add to the findings of the study. Thirdly, the outcomes of the study, adherence to medications and self-activities depended on the patient's reporting, which may not be highly accurate from stroke patients in hospital. Finally, social biases could also have affected the answers of the patients, who might choose to give a good picture of their adherence level to please the researcher. Similar future cohort studies can benefit from overcoming these limitations to provide a more generalized more accurate outcome. More hospitals across the country can be involved and a more rigid assessment of adherence can be followed. Given these limitations, the study results highlighted the problem of low medication adherence amongst stroke patients, using a validated assessment tool, ad causes behind such problem.

CONCLUSION

Results from this study unveiled important findings regarding medication and self-care adherence by post-stroke patients. Patients susceptible to stroke or who have had a stroke need to be counselled on the importance of their adherence to their medications on regular basis. Self-care activities were followed well by the stroke patients in this study, which highlights the good education delivered in this aspect by the healthcare professionals in Saudi Arabia. Patients with a higher educational level, a greater number of medical conditions, and reporting higher glucose monitoring levels among diabetes patients were all found to have better self-reported drug adherence. Taking these findings into account, concentrating on providing essential education about medication adherence and self-care activities to post-stroke patients could be a crucial area in the future in attempting to enhance adherence and health outcomes for stroke patients.

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