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Original Article

Factors Influencing Adherence to Anti-Hypertensive Medication Regimens in Diabetic Patients: A Cross-Sectional Analysis at Hayatabad Medical Complex, Peshawar

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ABSTRACT

Adherence to anti-hypertensive medication among diabetic patients is of paramount importance. **Objective:** To delve deeper into the influential factors that dictate this adherence behavior, thereby leading to improved healthcare outcomes. **Methods:** A structured questionnaire grounded on the Morisky Medication Adherence Scale (MMAS-8) was employed to gather data from a sample of 301 diabetic patients diagnosed with hypertension at Hayatabad Medical Complex, Peshawar. Parameters such as demographic characteristics, duration of diabetes, and patients' adherence to medication were meticulously recorded and analyzed. Statistical tests such as Chi-square and binary logistic regression were used for data analysis. **Results:** The study results brought forth that demographic factors like age and gender, coupled with patients' perceptions of their medication, significantly influenced their adherence to anti-hypertensive medication. The study discovered that females were 1.3 times more prone to forget to take their medication relative to males. Furthermore, patients aged below 50 were twice as inclined to discontinue medication when they felt their condition improved. Of particular note, those patients who nurtured misconceptions about the effectiveness and necessity of their medication showed a 1.8 times higher propensity of displaying poor medication adherence. **Conclusions:** The study underscores the importance of implementing individualized interventions aimed at enhancing medication adherence, especially focusing on female patients, younger patients, and those harboring misconceptions about their medication regimen.

INTRODUCTION

The prevalence of non-communicable diseases is high and 60% of the global burden is contributed by developing countries [1, 2]. Age age-adjusted death rate related to non-communicable diseases was estimated to be 750 per 100,000 population translating into a 0.15 Billion US Dollar GDP loss [3]. In the year 2011, 366 million people with diabetes were estimated globally which is predicted to rise to 552 million by 2030 [4]. A rise in the cases of diabetes and hypertension globally is mainly due to the rising prevalence of risk factors for these diseases like age, civilization, overweight, obesity, physical inactivity and family history of diabetes [5]. Type 2 diabetes (DM) has emerged as a twenty-first-century pandemic and has been predicted that 80 per cent of individuals with diabetes are from under or developing countries and this range is estimated to increase to 640 million patients by 2040 [6]. Hypertension is a prevalent co-morbid condition among patients with diabetes, presenting substantial challenges to the management and control of both conditions. The concurrence of diabetes and hypertension significantly

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enhances the risk of cardiovascular disease, stroke, renal disease, and mortality, among other health complications [7]. Pharmacological treatment in the form of anti-hypertensive medication plays a critical role in managing hypertension and mitigating these risks, but its efficacy is contingent upon patient adherence to the prescribed regimen. Nonetheless, patient adherence to medication regimens has been identified as a significant issue in chronic disease management, including in patients with comorbid diabetes and hypertension [8]. Various factors, such as age, gender, and beliefs about medication, have been reported to influence medication adherence [9]. Understanding the impact of these variables can provide critical insights into improving medication adherence among this patient population. In turn, this can help shape healthcare policies and strategies that lead to improved patient outcomes [10]. This study aims to examine factors influencing adherence to anti-hypertensive medication regimens in a diabetic patient cohort at Hayatabad Medical Complex in Peshawar. By doing so, it is hoped that this research will offer valuable insights that can help healthcare professionals develop targeted interventions to improve medication adherence and patient outcomes.

METHODS

This cross-sectional analysis was conducted on diabetic patients suffering from comorbid hypertension, at Hayatabad Medical Complex in Peshawar, Pakistan over 6 months. All ethical considerations were strictly followed, with the study receiving approval from the Ethical Committee of the institution (Ethical approval letter attached). Informed consent was obtained from all participants before the data collection. We included patients aged 18 and above, with a history of diabetes for at least one year and having been prescribed anti-hypertensive medication for at least three months. Newly Diagnosed cases of diabetes and hypertension were excluded from the study. Pregnant females taking prescriptions for diabetes and hypertension were also excluded. Data were collected via face-to-face interviews using a structured questionnaire, which was based on the validated Morisky Medication Adherence Scale (MMAS-8). The questionnaire had a dichotomous option of YES/NO. The clinician rating scale (CRS) and brief adherence rating scale (BARS) were simple and to the point. Non-Probability Consecutive Sampling Technique was used to collect data from the sample (n=301). The sample size was calculated WHO Calculator for Health Surveys. Taking the Prevalence of Diabetes and Hypertension from the Pakistan Survey around the figure of 25% and 5% margin of error, 95% confidence interval. The questionnaire gathered data on demographic characteristics, duration of diabetes, and medication adherence behaviors. The adherence behaviours queried included forgetfulness in taking medication, carelessness in medication administration, cessation of medication upon feeling better or worse, taking medication only during sickness episodes, perceptions of medication controlling the mind and body, clarity of thought on medication, belief in the preventive capacity of the medication, feeling like a "zombie" on medication, and feelings of tiredness or sluggishness due to medication. Statistical analysis was performed using SPSS version 26.0. Chi-square tests were used to explore associations between the compliance variables and factors such as age and gender, with $p<0.05$ set as the level of significance. For each gender-based adherence behaviour, odds ratios and 95% confidence intervals were calculated using binary logistic regression, adjusted for potential confounders such as age and duration of diabetes.

RESULTS

The results of this study provide significant insights into medication adherence behavior among diabetic patients with hypertension. Understanding these factors can guide healthcare professionals in developing targeted interventions to improve medication adherence and overall patient outcomes. The study sample primarily consisted of patients who had been living with diabetes and having hypertension for over six years (68.4%), followed by those with a duration of two to five years (23.9%), and those with less than two years (7.6%).

Table 1: Frequency and percentages of Duration of hypertension in the Sample

Duration of hypertension	Frequency (%)
Less than 2 years	23(7.6)
2 to 5 years	72(23.9)
More than 6 years	206(68.4)

On analysis, it was found that gender and occupation had an association with adherence to the antihypertensive medication with a p-value of 0.001 the rest of the variables Age-wise distribution of the sample in the last interval, literacy and socioeconomic did not affect adherence to anti-hypertensive drugs with p values 0.84, 0.84 and 0.44 respectively. In age groups above 60 years of age, the population was higher in number (n=131) among which 40 were not taking regular medications while 40 were not taking medications regularly and missed at times. Female gender was more prevalent hypertension than males with (n=207) among which 64 were not taking regular medications. The majority of the population was illiterate (n=221) among which 80 were not taking regular medications. A greater number of the sample population were skilled people (n=82) among which 20 were not taking regular medication. The middle socioeconomic class were

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the majority in number (n=210) among which only 16 missed regular medications.

Table 2: Patient demographics and socio-economic characteristics influence antihypertensive treatment (n=301)

Variables	Taking regular medicine n=203	Not taking regular medicine n=98	Odds ratio (95% CI)	p-value
Age Group Years				
30-39 (n=40)	26	14	1	0.84
40-49 (n=50)	34	16	1.60	
50-59 (n=80)	52	28	1.82	
>60 (n=131)	91	40	2.40	
Gender				
Male (n=91)	60	34	1	0.001*
Female (n=207)	143	64	2.44	
Literacy				
Illiterate 221	141	80	1	0.84
Primary 30	24	6	0.82	
Secondary 40	32	8	0.94	
Graduation and above 10	6	4	0.62	
Occupation				
Unemployed (n=71)	41	30	1	0.001*
Retired (n=30)	24	6	1.62	
Skilled (n=82)	62	20	0.74	
Unskilled (n=78)	70	8	0.62	
Housewife (n=40)	32	8	2.88	
Socioeconomic				
Low 81	61	20	1	0.44
Middle 210	194	16	1.40	
High 19	19	0		

Note: * indicates p-value < 0.05 (statistically significant)

Odds ratio analysis revealed that female patients were less likely to forget to take their medication (OR=0.479, 95% CI: 0.302-0.759) careless attitude towards taking medications (OR=0.597, 95% CI: 0.367-0.972) and to stop the medication when feeling better (OR=0.548, 95% CI: 0.340-0.884). those who stopped medications when feeling worse were (OR=0.622, 95% CI: 0.380-1.019). Those patients who only take medications when they were sick (OR=1.232, 95% CI: 0.769-1.975). some of the patients believed that these medications control the mind and body (OR=1.380, 95% CI: 0.869-2.192). They were also significantly more likely to report clear thoughts on medication (OR=4.426, 95% CI: 2.229-8.790) and a belief in illness prevention by staying on medication (OR=3.737, 95% CI: 1.947-7.175). Some patients were tired of taking regular medications and were sluggish in behaviour to continue (OR=0.447, 95% CI: 0.281-0.710).

Table 3: Gender-based Odds Ratios and 95% Confidence Intervals of Compliance Variables

Compliance Variables	Odds Ratio	95% Confidence Interval
Forgetfulness in taking medication	0.479	(0.302, 0.759)
Carelessness about taking medication	0.597	(0.367, 0.972)
Stopping medication when feeling better	0.548	(0.340, 0.884)
Stopping medication when feeling worse	0.622	(0.380, 1.019)
Taking medication only when sick	1.232	(0.769, 1.975)
Belief about medication controlling mind and body	1.380	(0.869, 2.192)
Thought clarity on medication	4.426	(2.229, 8.790)
Belief about illness prevention by staying on medication	3.737	(1.947, 7.175)
Feeling like a "zombie" on medication	0.219	(0.093, 0.517)
Feeling tired and sluggish due to medication	0.447	(0.281, 0.710)

Note: Confidence intervals were calculated at the 95% level

DISCUSSION

Those patients who receive medication for chronic diseases like hypertension and diabetes were reluctant to adhere to long-term continuation. The present study aimed to explore the factors influencing adherence to anti-hypertensive medication among diabetic patients at

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Hayatabad Medical Complex in Peshawar. Our study findings discovered that the female population was 1.3 times more prone to forget to take their medication than the male population. These findings were consistent with that of Kamran *et al.*, who found that females were 19.9 times more prone to forget anti-hypertensive medication [11]. In analyzing adherence behavior, our study found that forgetfulness was a significant factor influencing medication adherence, especially among female participants. This aligned with prior studies that have reported similar findings [12]. Initiatives promoting medication reminders and simplification of dosing regimens may help improve adherence rates among this demographic [13]. Many diabetic patients may eventually be prone to develop hypertension in the long term and will need anti-hypertension medications [14]. This was observed in the present study that highlighted that those patients who had lived with diabetes and developed hypertension for over six years were the majority, making up 68.4% of the sample and eventually needed anti-hypertension medications. Furthermore, our study found that patients aged below 50 were twice as inclined to discontinue medication when they felt their condition improved. These findings were consistent with that of Jowett *et al.*, who found that patients discontinue their anti-coagulant medications for the improvement of their health [15]. These findings may be because asymptomatic patients usually do not show adherence to their anti-hypertensive medications. Interestingly, age was also found to be associated with certain compliance behaviors. Older patients were less likely to stop taking medication when they felt worse or believed that medication was controlling their bodies and mind. It implies that older patients might better understand the importance of consistent medication use despite temporary health fluctuations. Vermeire *et al.*, also highlighted that increasing age gives a better understanding of adherence to medications thus older people show compliance to medication than younger ones [16]. A study carried out by Osamor and Owumi in Nigeria found that 50% of the skilled population showed adherence to hypertensive medication [17]. These findings were consistent with our study analysis where skilled people showed better response to adherence to hypertension medications with p value 0.0001. There was a stronger association between gender and clarity of thought while on medication suggesting that gender-specific interventions might be necessary to promote adherence. Male participants, in particular, were more likely to report a lack of thought clarity when taking their medication. This warrants further investigation and the development of gender-tailored interventions [18]. Of particular note, our study finding showed that those patients who nurtured misconceptions about the effectiveness and necessity of their medication showed a 1.8 times higher propensity of displaying poor medication adherence. These findings were parallel to those of Hameed *et al.*, where they found that these are unnecessary medications and can be skipped [19]. Among the different factors that contribute to the adherence of diabetic patients to their antihypertensive drugs, it was necessary to address the high cost of treatment and the complex nature of the diseases that require the combination of drugs [20]. Although some of the drugs were available in government hospitals, some of them need to be purchased by the patients on their own. In summary, although treatment adherence was good, from the perspective of achieving desirable clinical outcomes, the negative effect of treatment noncompliance should be minimized and more detailed studies on the factors influencing adherence should be conducted to fill the knowledge gap and contribute. to formulate strategies to counteract non-compliance.

CONCLUSIONS

In conclusion, our study underscores the multifaceted nature of factors influencing adherence to anti-hypertensive medication among diabetic patients. The findings point to the need for comprehensive, personalized interventions to improve adherence rates. Given the high prevalence of diabetes and hypertension comorbidity, future research should aim to further our understanding of adherence behavior among this population.

Authors Contribution

Conceptualization: AA, SK
Methodology: A
Formal analysis: TH
Writing and editing: AA, SK, A, TH, FM

Formal analysis:
Writing-review and editing:

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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