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## ASSESSMENT OF CHRONIC DISEASE PATIENT'S ADHERENCE ON MEDICAL OUTCOMES IN DISTRICT SWAT, PAKISTAN

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### Abstract

**Keywords:** chronic diseases, District Swat

**Introduction:** The prevalence rate of chronic diseases is increasing rapidly, regardless of the region and socioeconomic class. One of the chief components in provision of optimal care in patients diagnosed with chronic diseases is the assessment of patient adherence to medication as well as healthcare provider recommendations.

**Objective:** The objective of the study was to assess chronic disease patient's adherence on medical outcomes in District Swat, Pakistan.

**Methodology:** A descriptive cross-sectional study was used. The study respondents included all the patients suffering from chronic diseases including Hypertension, Myocardial Infarction and Diabetes Mellitus visiting the primary and secondary healthcare facilities of the district. A pre-validated tool MOS measure of patient adherence questionnaire was distributed to 382 patients. Chi square test ( $p \geq 0.05$ ) was used to found out association of general adherence, disease specific adherence and adherence behaviors with demographic variables.

**Results:** The results of the study highlighted that majority of the respondents (29.8%, n=114) had a little difficulty in following the doctors recommendations whereas only 2.1% (n=8) had difficulty in adhering to doctor recommendations. Significant association was found in general adherence and adherence to specific recommendations among different marital, qualification and job status. Married respondents had relatively better general adherence (16.59,  $\pm 5.02$ ). Illiterate patients had comparatively poor adherence (14.88,  $\pm 4.69$ ) while employed respondents had better adherence (23.94,  $\pm 2.87$ ). On the other hand, respondents taking up to 3 medicines had better adherence to recommendations (23.70,  $\pm 3.00$ ).

**Conclusion:** The present study concluded that adherence to medical outcomes among chronic disease patients in Swat was moderate. Illiterate individuals had poor general and specific adherence as well as behaviors. Patients having MI had better adherence whereas patients having two concurrent diseases such as diabetes and hypertension had poor adherence to recommendations.

### Introduction

Chronic diseases serve to be the leading cause of death and disability, worldwide. The prevalence rate of these disorders is increasing rapidly, regardless of the region and socioeconomic class. Globally, 60% of the deaths are due to chronic diseases and the burden of disease has reached up to 43% and will increase to 60% by the year 2020. Hypertension, myocardial infarction and diabetes mellitus are the most prevalent chronic diseases [1]. One of the chief components in provision of optimal care in patients diagnosed with chronic diseases is patient adherence to medication as well as healthcare provider recommendations [2]. Adherence to medications and recommendations is a multifaceted behavior which is linked to various aspects such as the socio-economic status of the patient,

healthcare system, disease status and patient factors. It has been observed that almost half of the patients diagnosed with chronic disorders do not take their medicines as prescribed [3]. This behavior has a profound negative impact on patient as well as healthcare provider including decreased effectiveness of treatment, lower quality of life and increased treatment costs [4].

There is a high prevalence of chronic diseases like hypertension, diabetes and myocardial infarction (MI) etc in Pakistan. Such diseases require a lifelong pharmacological treatment [5]. At initiation of therapy mostly patients are adherent but after some time non-adherence ratio increase due to many factors such as complex regimens, lack of motivation, poor health literacy, ineffective communication among patient and healthcare provider and inadequate social support [6]. Most of the patients with chronic diseases in Pakistan such as asthma, diabetes, hypertension and other cardiac diseases had a low level of medication adherence [7]. Medication adherence has been reported to be affected by age and poor awareness of the disease among hypertensive patients [8]. Beside this education level and duration of disease have also been reported to contribute significantly towards low medication adherence [9]. Limited research has been conducted on chronic disease patient adherence to medical outcomes in Pakistan, especially in resource constraints areas. There is a need for assessment of patient adherence to improve health outcomes and achieve the therapeutic goals. Thus, the present study was designed to assess chronic disease patient's adherence on medical outcomes in District Swat, situated in the north of Khyber Pakhtunkhwa province of Pakistan with poor healthcare facilities and low literacy rate.

## Methodology

A descriptive cross-sectional study was used for assessment of chronic disease patient's adherence on medical outcomes in District Swat, Pakistan. The study sites included the District Headquarter and Tehsil Headquarter hospitals of District Swat Pakistan. The study respondents included all the patients suffering from chronic diseases which included hypertension, myocardial infarction and diabetes mellitus visiting the primary and secondary care hospitals of the district. Raosoft® sample size calculator was used for calculation of sample size. Sample size was calculated to be 382 patients to achieve 95% confidence level with 5% margin of error. Convenient sampling technique was used to select the respondents present at the time of data collection.

A pre-validated tool MOS measure of patient adherence survey developed by RAND Health, USA was used to assess chronic disease patient's adherence on medical outcomes. The tool comprise of four sections. Section I include demographics of patient such as age, gender, marital status, education level, income status, disease, smoking status, job status and number of medicines. Section II includes five questions related to general adherence of patients to physician's instructions. A 6 point likert scale was used to assess responses where 1 indicates none of the time whereas 6 indicate all the time. The scores of question 1 and 3 were reversed. The average of all the responses of the items indicated the score of general adherence. The score range was 5-30 where the higher score indicate better adherence to physician's instructions. Section III comprise of fifteen questions to assess adherence to specific recommendations for diabetic, cardiac and hypertensive patients. Nominal scale was used to assess the responses where 1=yes and 2=no. The responses specific to the patient were averaged. The score range was from 0-15. The higher score indicate better adherence to specific recommendations. Section IV comprise of fifteen questions to assess specific adherence behaviors of patients. A 6 point likert scale was use to assess responses where 1 indicates none of the time whereas 6 indicates all the time. The score ranges from 15-90. The responses specific to the patient were averaged. The higher score indicate better adherence behaviors. Pilot testing was conducted at 10% of sample after data collection. The value of Cronbach alpha was 0.79 for MOS measures of patient adherence survey which was satisfactory considering that 0.68 is the acceptable cut off value.

The questionnaires were hand delivered to the respondents and were collected back on the same day. SPSS version 21 was used for statistical analysis after cleaning and coding of the data. Descriptive statistics comprising of frequency and percentages were calculated. Chi square test ( $p \geq 0.05$ ) was used to found out association of general adherence, disease specific adherence and adherence behaviors with demographic variables.

## Results

Out of the total respondents, 0.5% (n=2) were of the age group 18-30 years, 8.4% (n=32) were of 31-40 years, 28% (n=107) were of the age group 41-50 years, 38.2% (n=146) were of 51-60 years and 24.1% (n=92) were of age greater than 60 years. Out of 382 respondents, 63.9% (n=244) were males while 36.1% (n=138) were females. Out of the total respondents, 92.9% (n=355) were married while 7.1% (n=27) were unmarried. Out of the 382 respondents, 23.3% (n=89) were employed, 38.7% (n=148) were unemployed, 33.8% (n=129) were housekeepers and 4.2% (n=16) were retired. Eleven percent (n=93) were smokers and 88.7% (n=339) were non-smokers. The total number of medicines taken by the respondents were 01-03 medicines by 45.5% (n=174), 04-06 medicines by 49.7% (n=190) while more than 06 medicines were taken by 4.7% (n=18) of the respondents (Table 1).

*Table 1 Demographic Characteristics*

Variables	n (%)	
Age	18-30 Years	2 (0.5)
	31-40 Years	32 (8.4)
	41-50 Years	107 (28.0)
	51-60 Years	146 (38.2)
	>60 Years	94 (24.6)
Gender	Male	244 (63.9)
	Female	138 (36.1)
Marital status	Married	355 (92.9)
	Unmarried	27 (7.1)
Qualification	Illiterate	123 (32.2)
	Primary	44 (11.5)
	Matric	62 (21.5)
	Intermediate	82 (21.5)
	Masters	71 (18.6)
Job status	Employed	89 (23.3)
	Unemployed	148 (38.7)
	House keeper	129 (33.8)
	Retired	16 (4.2)
Income	>Rs.10000	19 (5.0)
	Rs.10000-20000	7 (1.8)
	Rs.21000-35000	17 (4.5)
	Rs.36000-50000	28 (7.3)
	>Rs.50000	38 (9.9)
No income	273 (71.5)	
Cigarette smoking	Smoker	43 (11.3)
	Non-smoker	339 (88.7)
Number of medicine	01-03	174 (45.5)
	04-06	190 (49.7)
	>06	18 (4.7)
Diseases	DM	119 (31.1)
	DM+HTN	90 (23.5)
	DM+MI	17 (4.4)

HTN	123 (32.1)
HTN+MI	26 (6.8)
MI	7 (1.8)

The results of the study highlighted that majority of the respondents (29.8%, n=114) had a little difficulty in following the doctors recommendations whereas only 2.1% (n=8) had difficulty in adhering to doctor recommendations. The results of the study showed that only 1.8% (n=7) of the respondents agreed that they followed the doctors instructions completely. The results highlighted that 27.5% (n=105) of the respondents agreed that they faced difficulty in following the doctors instruction. Thirty eight percent (n=145) of the respondents agreed that they sometimes followed the physicians recommendations with ease whereas 9.7% (n=37) of the respondents were unable to follow instructions.

The results highlighted that only 1.8% (n=7) were able to follow the doctors instructions over the past 4 weeks (Table 2).

*Table 2 Assessment of Medical Outcomes General Adherence among Chronic Disease Patients*

Variables	None of the time n (%)	A little of the time n (%)	Some of the time n (%)	A good bit of the time n (%)	Most of the time n (%)	All of the time n (%)
I had a hard time doing what the doctor suggested I do	52(13.6)	112(29.3)	114(29.8)	48(12.6)	48(12.6)	8 (2.1)
I followed my doctor's suggestions exactly	25(6.5)	75(19.6)	121(31.7)	84(22.0)	70(18.3)	7 (1.8)
I was unable to do what was necessary to follow my doctor's treatment plans	24(6.3)	54 (14.1)	105(27.5)	100(26.2)	80(20.9)	19(5.0)
I found it easy to do the things my doctor suggested I do	37 (9.7)	54 (14.1)	145(38.0)	70 (18.3)	61(16.0)	15(3.9)
Generally speaking, how often during the past 4 weeks were you able to do what the doctor told you?	31(8.1)	78 (20.4)	96 (25.1)	90 (23.6)	80(20.9)	7 (1.8)

The results of the study highlighted that 44.5 % (n=170) patients were recommended to follow a low salt diet. Thirty nine percent (n=151) of patients were suggested to use a low fat diet. Out of the total respondents, 40.3 % (n=154) were recommended to follow a diabetic diet. Eighty six percent (n=329) of the respondents were recommended to take a prescribed medication. The results of the study showed that 73 % (n=279) were recommended to check blood glucose level. The recommendations for cardiac rehabilitation was 2.4 % (n=90) and for exercise was 24.3 % (n=93). Sixty four percent (n=247) of the respondents were recommended to socialize more than usual with others. Thirty seven percent (n=143) of the respondents were recommended to check feet for minor bruises, injuries, and in grown toenails. The results highlighted that 26.7% (n=102) were recommended for stress management (Table 3).

*Table 3 Medical Outcomes Study Specific Adherence Recommendations among Chronic Disease Patients*

Variables	Yes n (%)	No n (%)
Follow a low salt diet?	170 (44.5)	211 (55.2)
Follow a low fat or weight loss diet?	151 (39.5)	231 (60.5)
Follow a diabetic diet?	154 (40.3)	228 (59.7)
Take a prescribed medication?	329 (86.1)	53 (13.9)

Check your blood for sugar?	279 (73.0)	103 (27.0)
Take part in a cardiac rehabilitation program?	9 (2.4)	373 (97.6)
Exercise regularly?	93 (24.3)	289 (75.7)
Socialize more than usual with others?	247 (64.7)	135 (35.3)
Cut down on the alcohol you drink?	115 (30.1)	267 (69.9)
Stop or cut down on smoking?	259 (67.8)	123 (32.2)
Check your feet for minor bruises, injuries, and in grown toenails?	143 (37.4)	239 (62.9)
Cut down on stress in your life?	102 (26.7)	280 (73.3)
Use relaxation techniques like biofeedback or self-hypnosis?	36 (9.4)	346 (90.6)
Carry something with sugar in it as a source of glucose for emergencies?	200 (52.4)	182 (47.6)
Carry medical supplies needed for your self-care?	230 (60.2)	152 (39.8)

The results of the study highlighted that majority of the respondents (76.2%, n=291) did not adhere to the recommendation of reducing stress. Fifty two percent (n=199) of the respondents did not follow the recommendation of exercising regularly. Majority of the respondents (32.7%, n=125) agreed that they took the prescribed medicine most of the time. The results of the study highlighted that 30.9% (n=118) of the respondents agreed that they checked their blood glucose most of the time. Thirty four percent (n=132) of the respondents did not adhere to the recommendations of foot care suggested by doctor. The results of the study showed that 41.6% (n=159) did not follow the recommendation of low salt diet, 52.1% (n=199) did not follow the recommendation of low fat diet whereas 53.1% (n=203) did not follow the recommendation of diabetic diet (Table 4).

**Table 4 Medical Outcomes Study Specific Adherence Behaviors among Chronic Disease Patients**

Variables	None of the time n (%)	A little of the time n (%)	Some of the time n (%)	A good bit of the time most n (%)	Most of the time n (%)	All of the time n (%)
Cut down on stress in your life	291(76.2)	45(11.8)	30(7.9)	14(3.7)	0(0)	2(0.5)
Used relaxation techniques (biofeedback, self-hypnosis etc.)	312(81.7)	39(10.2)	16(4.2)	11(2.9)	0(0)	2 (0.5)
Exercised regularly	199(52.1)	57(14.9)	51 (13.4)	60(15.7)	8(2.1)	7(1.8)
Tried to socialize more with others	106(27.7)	43(11.3)	101(26.4)	101(26.4)	15(3.9)	16(4.2)
Took prescribed medication	32(8.4)	42(11.0)	62 (16.2)	125(32.7)	59(15.4)	62 (16.2)
Took part in a cardiac rehabilitation program	382(100)	0(0)	0(0)	0(0)	0(0)	0(0)
Stopped or cut down on smoking	135(35.5)	25(6.5)	35 (9.2)	32 (8.4)	18(4.7)	137(35.9)
Checked your blood for sugar	59 (15.4)	49(12.8)	112(29.3)	118(30.9)	35(9.2)	9 (2.4)

Checked your feet for minor bruises, injuries, and ingrown toenails	132(34.6)	50(13.1)	118(30.9)	56 (14.7)	22(5.8)	4(1.0)
Carried something with sugar in it (a source of glucose) for emergencies when outside your home	93 (24.3)	33 (8.6)	73(19.1)	115(30.1)	52(13.6)	16(4.2)
Carried medical supplies needed for your self-care when outside your home...	88 (23.0)	23 (6.0)	75(19.6)	108 (28.3)	61(16.0)	27 (7.1)
Followed a low salt	159(41.6)	16 (4.2)	59(15.4)	61 (16.0)	38 (9.9)	49(12.8)
Followed a low fat or weight-loss diet	199(52.1)	5 (1.3)	53(13.9)	36 (9.4)	45(11.8)	44(11.5)
Followed a diabetic diet	203(53.1)	11 (2.9)	52(13.6)	31 (8.1)	41(10.7)	44(11.5)

Significant association was found in general adherence and adherence to specific recommendations among different marital status. Married respondents had better general adherence (16.59,  $\pm$ 5.02) as compared to unmarried respondents (13.55,  $\pm$ 3.90). Specific adherence was higher in unmarried respondents (24.62,  $\pm$ 2.92) as compared to married respondents (23.32,  $\pm$ 3.06). Significant association was found in general adherence among different qualification levels. Respondents who had completed their matric had better adherence (18.27,  $\pm$ 6.18) whereas illiterate patients had poor adherence (14.88,  $\pm$ 4.69). Significant association was found in disease specific adherence among different job status

. Employed respondents had better adherence (23.94,  $\pm$ 2.87) as compared to respondents who had retired (22.64,  $\pm$ 3.15). Significant association was found in adherence to specific behaviors among different income levels. Respondents having income level <Rs.10000 had better adherence (41.94,  $\pm$ 10.77) whereas respondents who had income level Rs.36000-50000 had poor adherence levels (34.17 $\pm$ 10.29). Significant association was found in general adherence of respondents having different smoking status. Smokers had better adherence (18.30,  $\pm$ 4.91) than those who were non-smokers (16.15,  $\pm$ 4.97). Significant association was found in specific adherence to recommendations as well as behaviors among respondents taking different number of medications. Respondents who were taking up to 3 medicines had better adherence to recommendations (23.70,  $\pm$ 3.00) than those taking greater than 6 medicines (22.50,  $\pm$ 3.07). Respondents who were taking 3-6 medicines had better behaviors (38.31,  $\pm$ 9.81) as compared to those taking 1-3 medicines (33.78,  $\pm$ 10.57). Significant association was found in specific adherence among respondents having different diseases. Respondents having MI only had better adherence (26.33,  $\pm$ 1.50) whereas respondents having diabetes mellitus as well as hypertension had lower adherence (22.60,  $\pm$ 3.56). A detailed description is given (Table 5).

**Table 5 Mean Scores of Chronic Disease Patients Adherence to Medical Outcomes by Demographic Characteristics**

Variables	General Adherence			Specific Adherence Recommendations			Specific Adherence Behaviors		
	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
<b>Age</b>									
18-30Y	12.5	2.12	0.134	19	1.41	0.206	41	8.48	0.134
31-40Y	14.56	4.40		24.25	3.34		33	10.28	
41-50Y	17.34	5.46		23.57	3.14		36.59	9.90	
51-60Y	17.06	4.81		22.58	2.92		38.30	10.64	
>60Y	15.02	4.53		24.27	2.77		33.23	9.34	
<b>Gender</b>									
Males	16.45	4.93	0.376	23.40	2.97	0.469	36.11	10.26	0.466



Females	16.25	5.14		23.43	3.23		36	10.37	
<b>Marital Status</b>									
Married	16.59	5.02	<b>0.001</b>	23.32	3.06	<b>0.017</b>	36.19	10.29	0.202
Unmarried	13.55	3.90		24.62	2.92		34.51	10.30	
<b>Qualification</b>									
Illiterate	14.88	4.69	<b>0.001</b>	23.59	2.99	0.484	36.08	10.72	0.262
Primary	16.02	2.98		22.97	2.88		35.52	11.04	
Matric	18.27	6.18		23.25	3.17		35.01	9.43	
Intermediate	16.87	4.79		23.31	3.29		36.56	10.74	
Masters	16.95	4.98		23.61	2.97		36.90	9.37	
<b>Job Status</b>									
Employed	16.79	4.86	0.210	23.94	2.87	<b>0.017</b>	35.92	9.87	0.101
Unemployed	15.48	4.88		23.37	3.14		35.16	10.47	
House keeper	17.02	5.21		23.21	3.07		36.79	10.36	
Retired	17.21	4.66		22.64	3.15		39.64	10.65	

<b>Income Level</b>									
<Rs.10000	15.57	2.83	0.488	22	2.82	0.359	41.94	10.77	<b>0.032</b>
Rs.10000-20000	15.85	2.73		23.28	3.14		37.85	8.55	
Rs.21000-35000	17.94	6.07		24.64	2.64		34.58	9.40	
Rs. 36000-50000	15.85	4.49		24.21	3.34		34.17	10.29	
>Rs. 50000	17.50	4.88		23.39	2.64		38.21	9.69	
No income	16.24	5.15		23.35	3.10		35.61	10.33	

<b>Cigarette Smoking</b>									
Smoker	18.30	4.91	<b>0.003</b>	23.69	2.55	0.350	33.76	9.91	0.089
Non smoker	16.15	4.97		23.36	3.12		36.39	10.31	

<b>Number of Medicines</b>									
01-03	16.09	5.69	0.343	23.70	3.00	<b>0.026</b>	33.78	10.57	<b>0.001</b>
04-06	16.77	4.40		23.23	3.10		38.31	9.81	
>06	14.94	3.36		22.50	3.07		34.61	7.31	

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Diseases									
DM	16.20	6.20	0.001	22.94	2.78	<b>0.006</b>	36.39	10.10	0.068
DM+ HTN	16.71	3.82		22.60	3.56		40.65	13.68	
DM+ MI	22.16	3.80		24.83	2.91		41.16	10.65	
HTN	16.26	4.88		23.88	3.17		32.69	10.06	
HTN+ MI	15	2.48		24.57	2.37		33.92	7.16	
MI	16.66	3.44		26.33	1.50		37.83	5.41	

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Chi-square test ( $p \geq 0.05$ )

## Discussion

Adherence to medicines as well as medical recommendations is a crucial barrier for optimal care of patients diagnosed with chronic diseases such as diabetes, hypertension and myocardial infarction. Patient adherence is an important link between therapeutic expertise of the healthcare provider and medical outcomes among patients [10]. The current study showed that medication adherence was moderate among patients of diabetes mellitus, hypertension and myocardial infarction. The results highlighted that general adherence was higher among individuals having age between 41-50 years. Individuals having age greater than 60 years had better adherence to disease specific recommendations whereas patients having age between 18-30 years had poor adherence. This might be due to the fact that elderly patients have been administering medicines for a long period of time so are accustomed to their daily medicine routine. Individuals having age between 18-30 years showed better adherence behaviors whereas individuals having age between 31-40 years showed poor adherence behaviors. It might be due to the fact that as age increases the co-morbidities also increases leading to a more complex regimen. Similar results were reported in a study conducted in Pakistan and USA [7, 11].

Gender has been found to be an important demographic variable influencing different health behaviors of chronic disease patients. The results of the study showed that males had better general adherence than females. This could be due to the fact that females have more fear of side effects so they tend to discontinue their medications. Females had slightly better adherence to disease specific recommendations as compared to males. Males had comparatively better adherence behaviors than females. The results of the current study are in line with another study conducted in Italy [12]. The results of the study showed that married individuals had better general adherence as compared to unmarried individuals. Unmarried individuals had better adherence to disease specific recommendations as compared to married individuals. Married individuals had better adherence behaviors as compared to unmarried individuals. This might be due to the fact that married individuals receive more social support from their partners than unmarried individuals. The caregivers of married individuals can monitor the administration of medicines directly and regularly. Similar results were reported in a study conducted in Germany [13]. The level of education can have a great impact on patient adherence to medical outcomes. The results of the current study highlighted that individuals who had completed their matric had better general adherence whereas illiterate individuals had the lowest adherence. Individuals having masters had better adherence to disease specific recommendations whereas those having matric had poor adherence. Individuals having masters had better adherence behaviors as compared to individuals having primary education. This might be due to the fact that highly educated individuals have a complete understanding of their disease, its complications and treatment regimen. Similar results were reported in a study conducted in Canada among patients having MI [14].



Various transitions in daily routine can also have a negative impact on chronic disease patient adherence. The results of the current study showed that retired patients had better general adherence as compared to individuals who were unemployed. Employed individuals were more adherent to recommendations whereas retired individuals were least adherent. This might be due to the fact that retired individuals forget the medicines and recommendations as well as a reduction in income is observed in such individuals leading to poor adherence. Retired patients had more adherent behaviors as compared to unemployed individuals. The results of the present study are in line with a study conducted in USA [15]. The results of the study highlighted that individuals having income between Rs.21000-30000 had better adherence than individuals having income between <Rs.10000. This might be due to the fact that patients with low income were not able to purchase medicines or visit their physicians on a regular basis. Respondents having income <Rs.10000 had more adherent behaviors as compared to individuals having income between Rs.36000-50000. Similar results were reported in a study conducted in USA [16]. Healthcare behaviors of smokers may differ from non-smokers leading to different degree of adherence. The results of the current study highlighted that smokers had better adherence than non-smokers. This might be due to the fact that complications among smokers are more pronounced leading to increase in adherence to control the disease. The results of the study are in line with a study conducted in Palestine [17].

Complexity of the prescribed drug regimen greatly affects the degree of adherence to medical recommendations. The results of the current study highlighted that patients taking 1-3 medicines had better adherence to disease specific recommendations whereas those taking greater than 6 medicines had poor adherence. This might be due to the fact that increased number of medicines led to increased cost as well as increased complexity. Respondents taking 4-6 medicines had better adherence behaviors than those taking up to 3 medicines. Similar results were reported in a study conducted in USA [18]. The level of adherence varies among patients diagnosed with different chronic disease and the number of comorbidities. The results of the current study highlighted that patients having MI had better general adherence whereas those having diabetes mellitus and hypertension had poor adherence. This might be due to the fact that the number of medicines prescribed are greater in patients with both HTN and DM as well as dietary and lifestyle recommendations are stricter. Individuals having diabetes mellitus and hypertension had better adherence whereas those having only hypertension had poor adherence. Similar results were reported in a study conducted in Lebanon [19].

## Conclusion

The present study concluded that adherence to medical outcomes among chronic disease patients in Swat was moderate. Males had better general adherence as compared to females. Married respondents had better adherence as compared to unmarried. Illiterate individuals had poor general and specific adherence as well as behaviors. Patients having MI had better adherence whereas patients having two concurrent diseases such as diabetes and hypertension had poor adherence to recommendations. Appropriate pharmacological counseling regarding disease and treatment regimen as well as non-pharmacological counseling regarding diet and physical activity ought to be given to improve patient adherence to healthcare provider recommendations. Patient education should be a prime component in care of chronic disease patients. A multidisciplinary approach should be adopted in order to improve medical outcomes and adherence in chronic disease patients.

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