

Measuring of adherence and its indicators has been studied in this research. As mentioned above, eight item Morisky green scale was used for measuring adherence level. Adherence level was been categorized depending on MMAS-scores to three levels. Good adherence was defined as MMAS scores greater than 6 points, (Middle adherence, 5-6), (low adherence, and 0-4) out of a total score of 8 points.

Statistical Analysis

Data was analyzed and presented in tables. Demographic and socioeconomic status are considered as undependable variables which include age, sex, place of resident, education, occupation, family income, having own house or car. Other main undependable variable are behavioral health habit variables which consisted of smoking status, dietary or food consumption and physical inactivity. Also variables like, adherence to treatment (medications) are main concerning data which have been considered as outcome variable. Each level of adherence was analyzed across the demographic, medical, and controlling condition variable and differences have been tested by using chi- square. SPSS

version 16 was used for analyzing data. Reasons for low adherence were analyzed based on interpreting each item of Morisky green scale and generally were categorized for unintentional and intentional reasons.

Results

Social economic data versus drug adherence:

Three hundred and twenty two participants have fully replied adherence (Morisky green) scale which was described above. Table 1 shows adherence level and its association with demographic and socio economic characteristics. In this study, high adherence level was 96(29.8%), and moderate and lower adherence level were 163(50.6%), 63(19.6%) respectively. However, high rate of high adherence level was observed in female, age below 60 years, living with spouse, literate, have job or retired, family size ≥ 5 , having own house and not car in comparatively, but none of the adherence rates was statistically significant.

Table 1: Distribution of medicine adherence versus socio demographic variables

Sr/ No	Variables	Total N (%)	Lower adherence N (%)	Moderate adherence	Higher adherence N (%)	p-value chi-square
1	Sex					
	Male	95	24(25.3)	50(52.6)	21(22.1)	0.8
	Female	227	39(17.2)	113(49.8)	75(33.0)	5.0
2	Age					
	Below 60 years	180	39(21.7)	84(46.7)	57(31.7)	0.28
	60 years and above	142	24(16.9)	79(55.6)	39(27.5)	2.60
3	Marital status					
	With spouse	72	10(13.9)	39(54.2)	23(31.9)	0.37
	Without spouse	248	53(21.4)	123(49.6)	72(29.0)	1.97
4	Education					
	Illiterate	251	48(19.1)	131()	72(28.7)	0.49
	Literate	68	15(22.1)	30(44.1)	23(33.8)	1.39
5	Occupation					
	Having job or retired	256	48(18.8)	128(50.0)	80(31.2)	0.58
	Don't have job	61	12(19.7)	34(55.7)	15(24.6)	1.06
6	Family size					
	Below 5 member	173	40(23.1)	86(49.7)	47(27.2)	0.19
	5 and above 5 member	143	22(15.4)	74(51.7)	47(32.9)	3.30
7	House ownership					
	Yes	253	53(20.9)	123(48.6)	77(30.4)	0.43
	No	65	10(15.4)	37(56.9)	18(27.7)	1.64
8	Car ownership					
	Yes	100	18(18.0)	55(55.0)	27(27.0)	0.59
	No	215	45(20.9)	105(48.8)	65(30.2)	1.04
	Total	322	63(19.6)	163(50.6)	96(29.8)	

Medical parameters and health conditions association with drug adherence:

Associations of disease condition, health status and behavior, and availability of medicine with adherence have been studied in this research. As illustrated in table 2 below, high rate of high adherence level was less 18(18.4%) in those who have suffering both conditions compared to those who had diabetes or hypertension only, but the difference was not statistically significant ($\chi^2=8.8$, p -value=0.06). High rate of high adherence level 7(13.0%) was significantly less in those diagnosed both conditions with other self-reported

chronic condition compared to other groups ($X=17.01$, P -value=0.007). Moreover, high rate of high adherence level was more in those who live less than 5 years with the condition comparatively with those who lived more than 5 years with condition, but this was not statistically significant.

From another side, regarding the health system, the percentage of the high rate of adherence level 35(21.1%) was found significantly high ($X=19.2$, $P=0.00$) among those who reported drug was always available in hospital compared to those who reported that drug sometimes was

not available. While adherence level in those who take one medicine with those who take two or more medicines slightly different and this difference was not statistically significant.

Significant difference in some health related behavior, and obesity was found in adherence level. High percentage of high adherence level was significantly observed in obese 50 (36.2%) in compared overweight and normal body weight(X=10.03, P=0.03). Similarly high percentage of high adherence level was observed in those who smoker 11(40.7%), not consumed high fruit and vegetable 18(46.2), and doing physical exercise 13(40.6), comparatively, but the variance in consuming high fruit and vegetable have was statistically significant (X=6.6, P=0.03).

Table 2: Distribution of medicine adherence versus medical variable

Sr/No	Variables	Total N (%)	Lower adherence N (%)	Moderate adherence	Higher adherence N (%)	p-value chi-square
9 Diagnosis						
	Hypertension	143	26(18.2)	67(46.9)	50(35.0)	0.06 8.8
	Diabetic	81	15(18.5)	38(46.9)	28(34.6)	
	Diabetic &hypertension	98	22(22.4)	58(59.2)	18(18.4)	
10 Cor-morbidity						
	Present with DM or BP	128	29(22.7)	60(46.9)	39(30.5)	0.007 17.01
	Present with DM or BP with other NCD	96	12(12.5)	45(46.9)	39(40.6)	
	Present with DM and BP	44	12(27.3)	21(47.7)	11(25.0)	
	Present with DM and BP with other NDC	54	10(18.5)	37(68.5)	7(13.0)	
11 Living with condition						
	Up to 5 years	198	43(21.7)	94(47.5)	61(30.8)	0.29
	5 years and over	121	20(16.5)	68(56.2)	33(27.3)	2.40
13 Availability of medicine at hospital						
	Available	166	43(25.9)	88(53.0)	35(21.1)	0.00
	Not always available	140	15(10.7)	68(48.6)	57(40.7)	19.2
14 Number of drug administered						
	One medicine	130	25(19.2)	67(51.5)	38(29.2)	0.93
	Two medicine & more	182	38(20.9)	91(50.0)	53(29.1)	0.13
15 Body weight and obesity						
	Normal body weight	65	17(26.2)	34(52.3)	14(21.5)	0.03 10.03
	Overweight	116	28(24.1)	57(49.1)	31(26.7)	
	Obese	138	17(12.3)	71(51.4)	50(36.2)	
16 Smoking habit						
	Yes	27	6(22.2)	10(37.0)	11(40.7)	0.30
	No	295	57(19.3)	153(51.9)	85(28.8)	2.3
17 Consuming high fruit and vegetable						
	Yes	283	55(19.4)	150(53.0)	78(27.6)	0.03
	No	39	8(20.5)	13(33.3)	18(46.2)	6.61
18 Doing physical exercise						
	Yes	32	7(21.9)	12(37.5)	13(40.6)	0.30
	No	272	52(19.1)	140(51.5)	80(29.4)	2.40

Adherence rate is a main factor for conditional control in diabetic and hypertension. Most study has discussed this relationship. In this study high percentage of high adherence

level was observed in un- control group 55(58.5) in compared with control group 39(41.5). While lower percentage of low adherence level was observed in controlled group 27(42.9) compared with un-control group 36(57.1). However this variance was not statistically significant (X= 2.01, P=0.36).

Table 3: Distribution of adherence versus conditional control

Adherence level	Total (N)	controlled of condition		p- value chi- square
		Yes N (%)	No N (%)	
Lower adherence	63	27(42.9)	36(57.1)	0.36 2.01
Moderate adherence	163	56(34.4)	107(65.6)	
High adherence	94	39(41.5)	55(58.5)	

3. Main Causes of Low Adherence

Both intentional and unintentional cause of low adherence which was studied in this research has been shown in table 4. Analyzing of those causes were depend on 8 Questions of Morinsky scale. Feeling hassle about condition treatment plan 234(68.8%) and difficulty remembering at the time of taking medicine 230(68.5%) were the main reasons of intentional behavior of lower adherence.

On the other hand, travel and going out of home were the main reason for forgetfulness 171(51%), which is causes of lower adherence, in a same concerning,94(27.8%) of participant, sometime forget to take its medicine without any reason.

Table 4: Factors for non-adherence according to Morinsky scale

Sr.no	Questions of Morinskyscale	Total	Frequency Yes (%)
1	Do you sometimes forget to take your pills?	338	94(27.8)
2	Over the past two weeks, were there any days when you did not take your medicine?	337	68 (20.2)
3	Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	334	52 (15.6)
4	When you travel or leave home, do you sometimes forget to bring along your medications?	335	171(51)
5	Did you take your medicine yesterday?	333	294 (88.3)
6	When you feel like your condition is under control, do you sometimes stop taking your medicine?	335	77(23.0)
7	Do you ever feel hassled about sticking to your condition treatment plan?	336	234(68.8)
8	How often do you have difficulty remembering to take all your medication?	336	230(68.5)

4. Discussion

Health conditions associated with drug adherence:

This study was conducted on hypertension and diabetic patients aiming to find the adherence rate, its determinants and causes of adherence. In this study, patients were mostly moderate adherence 163(50.6%) compared to high adherence level, 96(29.8%), and lower adherence, (19.6%) respectively. High adherence level 96(29.8%) was less

compared to previous Kurdistan study 54% which measured adherence rate based on Morisky scale too⁶. However, in Kurdistan health system medicines have been provided for any chronic patients without any cost, adherence rate is still low compared to most developed countries⁷. As well as, a different methodology has own effects on findings, in two different studies in some neighboring countries like Saudi Arabia which adherence has rated by counting pill, has shown (66%)¹² and (47%)²⁷.

Adherence rate is almost the same in diabetic and hypertension patients, but in case of both conditions, high adherence rate is quite low 18(18.4) in comparatively. However, this difference was not statistically significant ($p=0.06$). Results of this study failed to confirm the frequency findings of the previous studies, which are significant association of demographic variables with adherence rate. While, Co-morbidity ($p=0.007$), patients' belief about medicine not always available in the hospital ($p=0.00$), obesity ($p=0.03$), and not consuming higher vegetable and fruit ($p=0.03$) were significantly associated with low adherence level. Since in Kurdistan health system, there is a routine medical care for chronic condition, diabetic and hypertension, and patients were taken their medicines in free of cost, this could affect adherence rate, because a study in china has shown that receiving free drugs enhance medication adherence²⁸. These may cause number of medicines not affect the adherence rate. The result of this study failed in confirming comprehensive association adherence rate with controlling rate, results were controversial with recent published paper^{3,5}, because high rate of higher adherence was seen in uncontrolled patient however the difference was not statistically significant ($p=3.36$).

As explained above, Morinsky *scale*, has consisted of 8 item, 4 questions were directly asked about the reasons of intentional behavior of low adherence, and other 4 questions regarding the test of the reasons of unintentional behavior. Intentional behavior is regarding to patient belief about medical course plan and health state e.g. feeling difficulty about conditional treatment and control. According to Morinsky *scale* in this study the most reasons for lower adherence were caused by intentional behavior. For instance, 234(68.8%) felt hassle about condition treatment plan, and 230(68.5%) had difficulty remembering at the time of taking medicine. Since intentional behavior was the main cause of low adherence in this study, structural educational plan to improve drug adherence may have positive effect on adherence rate.

5. Conclusions

Good adherence rate in this study was low compared to other studies in the place. Co-morbidity and health condition like non consuming high vegetable, and obesity were the main determinants of the low adherence. The main causes of low adherence regarding the intentional behavior were patients feeling hassle and difficulty with treatment plan.

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