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Drug Adherence among Diabetic and Hypertensive Patients in Association with Demographic and Healthy Behavior

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Abstract: ***Drug adherence has been taken an imperative role in chronic disease therapy, because, adherence is required in lifelong drug therapy, which is indicated for the most chronic conditions. The aim of this study was to investigate adherence rate among chronic patients in relations to the demographic data, medical and health conditions in Kurdistan. The data have been collected depending on the designed questionnaire of the project and the eight items Morisky green scale (MMAS-8) for measuring adherence level. In this study, the high adherence level was 96(29.8%), and moderate and lower adherence level were, 163(50.6%) and 63(19.6%) respectively. The main causes of low adherence regarding to intentional behavior were patients feeling hassle and difficulty with treatment plan.***

Keywords: diabetes mellitus, hypertension, drug adherence, demographic data, healthy behavior

Running Title: diabetes mellitus, hypertension and drug adherence

1. Introduction

1.1 Adherence

Drug adherence has been taken an imperative role in chronic disease therapy, because adherence is required in lifelong drug therapy, which is indicated for the most chronic conditions. Adherence has been defined as an extent to which a patient has conformity to the treatment recommendations with respect to the timing, dosage, frequency, and duration of a prescribed medication[1]. In this process, patients decide about how to manage their medications[2,1], and scope with the progresses of disease conditions and prescribed meditational plans. Thus, adherence directly affects disease management outcome, for instance, high blood pressure control is achieved in high adherence patients compared to medium and low adherence[3]. In the same context lack of blood pressure control has been determined as a reason for low achieving of adherence rate[4]. More details measuring this correlation have been quantified in a study, after controlling some cofactors, like co morbidity, BMI and age; blood pressure control could achieve 1.5 times more in a good adherence patient compared to non-adherence[5].

Adherence rate is varied from different communities, where which socioeconomic characteristics are main associated factors[6]. For instance, high adherence rate in the most developed countries such as Canada and the US are 77%and 80% respectively[7,8.] Whereas, in some developing countries like Brazil and Nigeria adherence rate is observed as 54%[9, 10], and Egypt as15.9%[11].While in a study about the neighboring country, Saudi Arabia, adherence rate has been shown as (34.2%) [12].In Kurdistan, the findings are similar to that of Nigeria, which is 54%. Moreover, socioeconomic factors like being female, aged above70 and lower education levels are associated with high adherence[6].

However, adherence rate is varied, and effects of demographic characteristics have not been confirmed within countries, for instance in some study women are associated with low adherence[13].Yet, adherence rate in a certain health system of any country can be determined by treatment and its administration determinant (e.g. type of medicine[4], complexity of therapy[1], adverse drug reaction[14], cost of treatment[15, 16]multiple medication[13]) and type of disease or condition (e.g. characteristic of disease [1, 15], type of disease, comorbidity[17], duration of therapy[1].

From another side, psychological status of the patients themselves is another prospective which determines the of causes non-adherences, this aspect could be categorized under intentional and unintentional causes[18].Intentional reasons for non-adherence include patient belief or perceptions about the treatment plan, cost, complexity of medication regimens, and side effects. For instance, patients mostly believe that having too many medications results in increasing side effects, complexity of regimen and increasing the cost of medications. Similarly, when patients feel worse, they stop taking the medicine intentionally[5].In this condition less costly generic medication could lead to improving adherence[19].On the other hand, unintentional reasons are forgetfulness, and availability or accessibility of the medication which are caused by transportation to pharmacy.[20]Causes of forgetfulness in some studies have been dictated as: too busy some time, travelling and forgetting to pack their medications[19].

Despite the above, health system can intervene the adherence rate by provider- patient communication, prescriber follow-up, personal and socioeconomic variables both patient and provider [1], because poor communication will adversely affect the adherence[5], as well as adherence is not concerned only with taking the prescribed medications regularly, rather than adherence follow-up appointments and maintaining the recommendations of the lifestyle

modifications which may be given by health care provider [6]. In Kurdistan health system there is not a special program for strengthening the provider-patient communication. All patients have been given their medications with free of cost and without follow up system. This study tried to assess the adherence situation compared to other neighboring countries and aimed to investigate adherence rate among chronic patients in relation to the demographic data, control of the disease, medical and health condition in Kurdistan. This is the first time this type of study has been conducted in our region.

2. Methodology

Material and Method

This is cross sectional study that has been carried out in Garmianprovince from 15th august, 2013 to 1st of Jan 2014, Garmian is in Kurdistan administrative area which include three districts:Kalar, Kifry, Khanaqeen. Around 250000 people are resident in the study population area. This is a hospital based study which is one general hospital in Kalar and three health centers from Kalar, Kifry and and Rzgari have been included in this study.

Study Population

As a part of Kurdistan health system strategy for controlling chronic diseases; any diagnosed chronic conditions like cardio vascular, hypertension, diabetic, asthma, epilepsy and others have been kept on target medicine. From this circumstance, around 5000 patients have been recorded for administering their medications monthly in the General hospital in Kalarand around 1000 in each health centers in Kifry and Rzgari. Only some data, like name, age, sex, patient diagnosis, drug and dose have enlisted in an Excel sheet. Hypertensions, cardiovascular and diabetic were the most highly diagnosed cases among enlisted population, but as per objective of this research diabetic and hypertension patients were selected as study population. Based on this reference, we recruited our sample size randomly from study population to our study. We collected, and interviewed patients at the time of administering their medicines in Kalar general hospital, and the two health centers of Kifry and ShahidQasm.

Chronic conditions like diabetic and hypertension, which one month earlier have been diagnosed by the physicians, met inclusion criteria, after signinga written consent form, were recruited to this study. Exclusion criterion was, a patient who is younger than 18 years old, and pregnant women.

Tool and Technique

Initially, a questionnaire was developed in English language, and then translated to local language (Kurdish). Data was collected based on designed questionnaire which consists of relevant variables and taking of physical measurements. Variables consisted of socio demographic, medical information and adherence to medicine sections. Physical measurements which were conducted in this study include height, weight, blood pressure, and random blood sugar. This data has been collected by experienced diploma nurse, who have attended a standardized workshop on questionnaire administration to enhance inter-rater reliability. They collected data by direct interviews with participants by using convenes sampling technique.

Eight item Morisky green scale (MMAS-8) was used for measuring adherence level. This scale developed from a previously validated four-item scale and has been used in many studies in the world wide. Additional items have been set to better capture barriers associated with adherence behavior and each of the 8 items measures a specific medication-taking behavior and determines the adherence behavior[21]. On the other hand, four item scales has been used previously in Kurdistan[6], but we used the MMAS-8 because of its higher sensitivity than the original 4-item scale[22] and significant correlation of MMAS-8 with 4-item MMAS in previous studies has been shown[23].

This scale has been demonstrated to have good concurrent and predictive validity and could be used as an initial tool for screening the lower adherence patients as well as out patient clinic. Sensitivity and specificity of the 8-item scale have been determined in a study to 93% and 53% respectively[24]. MMAS-8 scores can range from zero to eight in integers. The advantages of this instrument over other methods of measurement include its simplicity, quick administration and low-cost[26].
Furthermore, information about behaviors regarding to cause of low adherence have been investigated in the MMAS, for example causes of low adherence may be unintentional behavior like (forgetfulness), or intentional behavior like (not taking medications when one feels worse)[27].

Material

Despite the enquiries in the questionnaire, many different tools and scales have been used in this study. Blood pressure, blood sugar, and body weight were measured on one record. A calibrate mercury sphygmomanometer has been used in measuring blood pressure, and standardized digital glucometer has been used for measuring blood sugar. Validated digital scales have been used for measuring body weight.

Measurement

Uncontrolled higher blood pressure has been considered systolic blood pressure more than 140 mmHg, and diastolic more than 90mm Hg. As well as, uncontrolled diabetic condition has been defined by random blood sugar more than 200 *dl* at once.
General obesity was described by body mass index (BMI). BMI was estimated using the formula: (BMI= body weight (kg)/ the square of body height in meters (m^2). Participants were defined as obese when BMI≥ 30 kg/m^2, and overweight if BMI ≥ 25 kg/ m^2.

Uncontrolled condition was referred in this study for patients who one of their conditions (blood pressure or blood sugar) was uncontrolled, and Patient who diagnosed with conditions, hypertension and diabetic, considered as a control in case when both conditions were under control.

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 1shows 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 were163(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.

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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 less18(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 (x2=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
	Diabetic	81	15(18.5	38(46.9)	28(34.6)	8.8
	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)	
	Present with DM or BP with other NCD	96	12(12.5)	45(46.9)	39(40.6)	0.007 17.01
	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
	Overweight	116	28(24.1)	57(49.1)	31(26.7)	10.03
	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
Moderate adherence	163	56(34.4)	107(65.6)	2.01
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 too[6]. 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 countries[7]. 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 adherence[28]. 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.

Reference

[1] World Health Organization Hypertension in adherence to long-term therapies: evidence for action. Geneva, Switz: World Health Organization; 2003

[2] Krousel-Wood M, Thomas S, Muntner P, Morisky D. Medication adherence: a key factor in achieving blood pressure control and good clinical outcomes in hypertensive patients. CurrOpinCardiol 2004;19(4):357-62. [PubMed]

[3] Bramley TJ, Gerbino PP, Nightengale BS, Frech-Tamas F. Relationship of blood pressure control to adherence with antihypertensive monotherapy in 13 managed care organizations. J Manag Care Pharm. 2006 Apr;12(3):239-45.

[4] Vinker S, Alkalay A, Hoffman RD, Elhayany A, Kaiserman I, KitaiELong. Term adherence to antihypertensive therapy: a survey in four primary care clinics, Expert Opin Pharmacotherapy. Jun;9(8) 2008:1271-7. doi: 10.1517/14656566.9.8.1271 .

[5] Nancy R. Kressin, FeiWan , and Dan R. Berlowitz.Hypertensive Patients' Race, Health Beliefs, Process of Care, and Medication Adherence. J Gen Intern Med. 2007 June; 22(6): 768–774.

[6] Samim A. Al-Dabbagh, Md, Dtm&H, D. Phil (Oxford)Sirwan M. Aswad, Md, Msc, Compliance Of Hypertensive Patients To Management In Duhok Governorate Using Morisky-Green Test, Duhok Medical Journal Volume 4, Number 1, Accepted 4 May 2010

[7] NandiniNatarajan,, Wayne Putnam, Kristine Van Aarsen, Kristine Beverley Lawson, and Fred Burge.Adherence to antihypertensive medications among family practice patients with diabetes mellitus and hypertension. Can Fam Physician. 2013 February; 59(2): e93–e100. PMCID: PMC3576963

[8] Schmittdiel JA, Uratsu CS, Karter AJ, Heisler M, Subramanian U, Mangione C, et al. Why don't diabetes patients achieve recommended risk factor targets? Poor adherence versus lack of treatment intensification. J Gen Intern Med 2008;23(5):588-94Epub 2008 Mar 4. [PubMed]

[9] Ingaramo RA, Vita NA, Bendersky M, Arnolt M, Bellido C, Piskorz D, et al. National study on compliance to treatment. Am J Hypertens 2005;18(Suppl 5):88A-A.

[10] Strelec MA, MionJr AM. The influence of patient's consciousness regarding high blood pressure and patient's attitude in face of disease controlling medicine intake. Arq Bras Cardiol 2003;81(4):349-54.

[11] Ibrahim MM, Rizk H, Appel LJ, Aroussy WE, Helmy S, Sharaf Y, et al. Hypertension prevalence, awareness, treatment, and control in Egypt: Results from the Egyptian National Hypertension Project (NHP). Hypertension 1995;26(6):886-90.

[12] Al-Sowielem LS, Elzubier A. Compliance and knowledge of hypertensive patients attending PHC centres in Al-Khobar, Saudi Arabia East.

[13] Philippe Latry, Mathieu Molimard, Bernard Dedieu, Thierry Couffinhal, Bernard Bégaud, and Karin Martin-Latry, Adherence with statins in a real-life setting is better when associated cardiovascular risk factors increase: a cohort study

[14] Kennedy J, Tuleu I, Mackay K. Unfilled prescriptions of medicare beneficiaries: prevalence, reasons, and types of medicines prescribed. J Manag Care Pharm. 2008;14(6):553–560. [PubMed]
[15] Briesacher BA, Gurwitz JH, Soumerai SB. Patients at-risk for cost-related medication nonadherence: a review of the literature. J Gen Intern Med. 2007;22(6):864–871. doi: 10.1007/s11606-007-0180-x. [PMC free article] [PubMed] [Cross Ref]
[16] Piette JD, Wagner TH, Potter MB, Schillinger D. Health insurance status, cost-related medication underuse, and outcomes among diabetes patients in three systems of care. Med Care. 2004;42(2):102–109. doi: 10.1097/01.mlr.0000108742.26446.17. [PubMed] [Cross Ref]
[17] Vinker S, Alkalay A, Hoffman RD, Elhayany A, Kaiserman I, KitaiELong-term adherence to antihypertensive therapy: a survey in four primary care clinics, Expert OpinPharmacother. 2008 Jun;9(8):1271-7. doi: 10.1517/14656566.9.8.1271 .
[18] Ahmad NS, Ramli A, Islahudin F, Paraidathathu T, Medication adherence in patients with type 2 diabetes mellitus treated at primary health clinics in Malaysia, Patient Prefer Adherence. 2013 Jun 17;7:525-30. doi: 10.2147/PPA.S44698. Print 2013.
[19] Kavita V Nair, Daniel A Belletti, [...], and Saira Jan, Understanding barriers to medication adherence in the hypertensive population by evaluating responses to a telephone survey,Journal ListPatient Prefer Adherencev. Dove Medical Press 5; 2011Also cited by2011; 5: 195–206
[20] Turner BJ, Hollenbeak C, Weiner MG, et al. Barriers to adherence and hypertension control in a racially diverse representative sample of elderly primary care patients.Pharmacoepidemiol Drug Saf. 2009;18:672–681. [PubMed]
[21] Marie Krousel-Wood, Tareq Islam, Larry S Webber, Richard Re, Donald E.Morisky, ScD,e and Paul Muntner, New medication adherence scale versus pharmacy fill rates in hypertensive seniors, Am J Manag Care. Jan 2009; 15(1): 59–66. PMCID: PMC2728593 NIHMSID: NIHMS68741
[22] Gabrielle K. Y. Lee, Harry H. X. Wang, Kirin Q. L. Liu, Yu Cheung, Donald E. Morisky, and Martin C. S. Wong. Determinants of Medication Adherence to Antihypertensive Medications among a Chinese Population Using Morisky Medication Adherence Scale, PLoS One. 2013; 8(4): e62775. Published online Apr 25, 2013. doi: 10.1371/journal.pone.0062775, PMCID: PMC3636185
[23] Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care. 1986 Jan;24(1):67-74.
[24] Donald E. Morisky, Alfonso Ang, Marie Krousel-Wood, and Harry J. Ward, Predictive Validity of A Medication Adherence Measure in an Outpatient Setting.J ClinHypertens (Greenwich). May 2008; 10(5): 348–354. PMCID: PMC2562622 NIHMSID: NIHMS52858
[25] K. Y. Lee , Harry H. X. Wang , Kirin Q. L. Liu ,Yu Cheung , Donald E. Morisky , and Martin C. S. Wong , William Cameron, Editor. Determinants of Medication Adherence to Antihypertensive Medications among a Chinese Population Using Morisky Medication Adherence Scale Gabrielle Advanced. Journal list * Help * Journal List * PLoS One * v.8(4); 2013 * PMC3636185 Logo of plosonePLoS One. 2013; 8(4): e62775. Published online 2013 April 25. doi: 10.1371/journal.pone.0062775 PMCID: PMC3636185
[26] Harmon G, Lefante J, Krousel-Wood M. Overcoming barriers: the role of providers in improving patient adherence to antihypertensive medications. CurrOpinCardiol. 2006 Jul;21(4):310-5.
[27] Khalil SA, Elzubier AG. Drug compliance among hypertensive patients in Tabuk, Saudi Arabia. J Hypertens 1997;15(5):561-5.
[28] Yu B, Zhang X, Wang G. Full coverage for hypertension drugs in rural communities in China,Am. J Manag Care. 2013 Jan 1;19(1):e22-9.