ASSESSMENT OF ADHERENCE AND COST EFFECTIVENESS OF ANTILIPIDEMIC AND ANTIDIABETIC MEDICATIONS AT TERTIARY CARE HOSPITAL OF NAWABSHAH, PAKISTAN.

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ABSTRACT:

Introduction: Appropriate utilization of medicines is very important due to its proven effectiveness in management of chronic disorders, but it always remains sub-optimal in health management. **Objective:** To find the antidiabetic and antilipidemic drug adherence and their effects on blood glucose and serum cholesterol level as well as cost of drugs. **Methodology:** Interventional study on three hundred cardiac and diabetic patients was performed at Peoples Medical College Hospital (P.M.C.H.) Nawabshah. Patients with age of 20-70 years and taking either antilipidemic or anti-diabetic were evaluated by using the questionnaire. Patients were counseled about the importance of appropriate medication and then effects were monitored after six months of counseling. **Results:** A total of 300 outpatients including one hundred patients of each disease (hyperlipidemia, diabetes mellitus (DM) and hyperlipidemia with DM). Male and female patients were 167 (55.7%) and 133 (44.3%) with age of 59.5 ± 9.6 years. Over all drug adherence was high 87 (29.0%), moderate 67 (22.3%) and low 146 (48.7%). Drug adherence was high 27 (27.0%), 30 (30.0%) and 30 (30.0%), moderate 24 (24.0%), 26 (26.0%) and 17 (17.0%) and low 49 (49.0%), 44 (44.0%) and 53 (53.0%) in hyperlipidemic, diabetic and hyperlipidemic with diabetic respectively. Before counseling serum cholesterol and fasting blood glucose (FBG) was normal in 79 (39.5%) and 88 (44.0%) patients that increased to 96 (61.1%) and 99 (61.5%) patients after counseling. Cost effective treatment was Niacin in hyperlipidemic, Glipizide in diabetic and Metformin with Atorvastatin in hyperlipidemic with diabetic patients respectively. **Conclusion:** Drug adherence was low that increased with proper counseling and affordable prescribing.

Keywords: Antidiabetic, antilipidemic, adherence, glucose, cholesterol.

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INTRODUCTION

Appropriate utilization of medicines is very important due to its proven effectiveness in management of chronic disorders, but it always remains sub-optimal in health management. Non-adherence to medicines is one of the major problems in achieving therapeutic goals of treatment, even in most of the cases remain unrecognized[1,2]. Increasing the prevalence of non-adherence to medicines is directly correlated with increasing morbidity, progression of disease, as well as also responsible for increasing health expenditures, resources and mortality[3,4]. Although the rate of mortality associated with non-adherence is difficult to measure but literature reported approximately 125,000 deaths / year[4]. Drug adherence is a very important aspect in management of diseases, especially in appropriate management of chronic diseases such as hyperlipidemia and diabetes mellitus (DM)[5,6]. According to World Health Organization (WHO) half of the patients with chronic diseases are not following health care professionals' instructions and non-adherent to medicines[7].

Cardiovascular diseases (CVD) are responsible for increasing the rate of mortality and producing adverse effects on lifestyle. Global prevalence of CVD is increasing in developing countries that accounts for 80.0% of total deaths[8]. Hyperlipidemia is increased serum level of cholesterol with or without increased level of triglycerides[9]. According to W.H.O approximately 2.6 million deaths and 29.7 million disabilities were reported due to hyperlipidemia. It is also one of the risk factors responsible for the development of other diseases such as CVD, stroke and diabetes mellitus (DM)[5].

Diabetes mellitus is global epidemic complex heterogenous disorder characterized with increased level of glucose in blood because of

impairment in insulin secretion[10]. It increases the risk of morbidity, mortality, disability and enormous medical costs[11]. A recent study in 2018 reports that more than 500 million peoples are suffering from diabetes mellitus type 2 worlds widely and prevalence will increase further in next ten years in all countries especially greatest growth expected to be observed in low income countries 12. According to International Diabetic Federation (IDF) report 2018, 451 million people have diabetes mellitus and the figure will reach to 693 million by year 2045 13. Pakistan is included among nineteen countries of IDF Middle East and North Africa (MENA) region, where > 39 million people have diabetes and will increase to 67 million in 2045. In Pakistan 7,474,000 cases of diabetes were reported in 2017 14.

Considering the lack of health care facilities in developing countries, especially in Pakistan, only proper counseling of patients, educating health care professionals and cost effective prescribing is possible for decreasing the non-adherence. Intervention in prescribing and dispensing can also play a vital role in decreasing the non-adherence but it has several limitations in our country such as lack of pharmacist in hospitals and their active role. However, effective counseling of patient by pharmacist can produce the difference and increase the drug adherence in patients suffering from chronic diseases.

METHODOLOGY:
The research was interventional in which three hundred consecutive patients were selected from outpatient department (OPD) of cardiac and diabetic unit of Peoples Medical College Hospital (P.M.C.H.) Nawabshah.

Patients routinely visiting the OPD with age of 20-70 years and were taking antilipidemic and anti-diabetic treatment were included in the study whereas patients with chronic diseases and psychological problems were excluded.

A patient with normal (< 160 mg/dL) or high (>160 mg/dL) serum cholesterol level and taking antilipidemic drug were considered as hyperlipidemia. A patient with normal (< 126 mg/dL) or high (> 126 mg/dL) fasting blood glucose level and taking antidiabetic drug were considered as diabetes mellitus.

Detailed medical and clinical history of recruited patients were collected by using pre-designed questionnaire, divided into following five parts; demographic data, diseases data, drug adherence data, outcome data and interventional data which contain different questions for obtaining the related information.

Study was divided into two sections, first one before intervention and second one after intervention. Before the intervention patient's adherence was evaluated by asking nine different questions and monitoring serum cholesterol and FBG. Drug adherence was classified into high adherence (positive response of 7-9 questions), moderate adherence (positive response of 4-6 questions) and low adherence (positive response of < 3 questions). All patients were properly counseled about their diseases,

appropriate use of prescribed drugs and effects of healthy diet (including vegetables, fruits and milk) and exercise on their health. After intervention patient serum cholesterol and FBG were repeated and drug adherence was calculated.

Descriptive statistics (mean and standard deviation) was calculated for qualitative variables, whereas frequency and percentages were calculated for quantitative variables. Chi-square test was also used for determination of significant or non-significant association by taking ≤ 0.05 as significant p value.

RESULTS
Three hundred patient of OPD were evaluated, out of which male and female patients were 167 (55.7%) and 133 (44.3%). Mean age of patients was 59.5 ± 9.6 years. Majority of the patients were from rural area 197 (65.7%) followed by urban area 103 (34.3%), educated 185 (61.7%) followed by uneducated 115 (38.3%), employed 163 (54.3%) followed by unemployed 137 (45.7%), and belong to lower class 182 (60.7%) followed by middle class 104 (34.7%) and upper class 14 (4.7%) (Table 1).

Hyperlipidemic patients were treated with Simvastatin 29 (29.0%) followed by Atorvastatin 23 (23.0%) and Lovastatin 19 (19.0%). Diabetic patients were treated with Metformin 27 (27.0%), Glipizide 14 (14.0%) and Glimepiride 12 (12.0%). Patients suffering from both hyperlipidemic and diabetes mellitus were treated with Metformin and Atorvastatin 31 (31.0%), Metformin and Lovastatin 20 (20.0%) and Metformin and Simvastatin 24 (24.0%) (Table 2).

Patients were interviewed about drug adherence by asking nine different questions (table 3) and results helps in categorizing patients into high, moderate and low drug adherence. Over all drug adherence was high 87 (29.0%), moderate 67 (22.3%) and low 146 (48.7%). Drug adherence was high 27 (27.0%), 30 (30.0%) and 30 (30.0%), moderate 24 (24.0%), 26 (26.0%) and 17 (17.0%) and low 49 (49.0%), 44 (44.0%) and 53 (53.0%) in hyperlipidemic, diabetic and hyperlipidemic with diabetic respectively (Table 4).

Before counseling serum cholesterol and fasting blood glucose (FBG) was normal in 79 (39.5%) and 88 (44.0%) patients that increased to 96 (61.1%) and 99 (61.5%) patients after counseling. Overall counseling shows positive impact on serum cholesterol, FBG and on health behavior (Table 5). Cost effective treatment was Niacin in hyperlipidemic, Glipizideindiabetic and Metformin with Atorvastatin in hyperlipidemic with diabetic patients respectively.

Variables	Frequency (n=300)	Percentage (%)
Gender		
Male	167	55.7
Female	133	44.3
Age (Years)		
21-30	13	4.3
31-40	22	7.3
41-50	55	18.3
51-60	124	41.3
61-70	86	28.7
Locality		
Rural	197	65.7
Urban	103	34.3
Education		
Uneducated	115	38.3
Educated	185	61.7
Primary	47	25.4
Secondary	59	31.9
Higher Secondary	40	21.6
Graduate	26	14.1
Masters	13	7.0
Job Status		
Employed	163	54.3
Unemployed	137	45.7
Socioeconomic Status		
Lower	182	60.7
Middle	104	34.7
Upper	14	4.7

Table 1. Demographic data analysis of patients (N=300).

iseases and Drugs	Frequency (n=300)	Percentage (%)
Hyperlipidemia	100	33.3
Atorvastatin	23	23.0
Lovastatin	19	19.0
Simvastatin	29	29.0
Gemfibrozil	18	18.0
Niacin	11	11.0
Diabetes Mellitus	100	33.3
Metformin	27	27.0
Glipizide	14	14.0
Glimepiride	12	12.0
Vildagliptin	9	9.0
Gliclazide	7	7.0
Metformin + Gliclazide	12	12.0
Metformin + Glipizide	9	9.0
Metformin + Glimepiride	10	10.0
Hyperlipidemia + Diabetes Mellitus	100	33.3
Metformin + Atorvastatin	31	31.0
Metformin + Lovastatin	20	20.0
Metformin + Simvastatin	24	24.0
Glipizide + Atorvastatin	13	13.0
Glipizide + Simvastatin	8	8.0
Glimepiride + Simvastatin	4	4.0

Table 2. Analysis of disease and treatment of patients (N=300).

Variables	Yes (%)	No (%)
Sloppy about medication	114 (38.0)	186 (62.0)
Missed dose during the therapy	117 (39.0)	183 (61.0)
Reasons of Missed Doses		
Cost	38 (32.5)	
Not satisfied	23 (19.7)	
Forgetfulness	27 (23.1)	
Unavailability	29 (24.8)	
Medications took according to prescription	129 (43.0)	171 (57.0)
Stopped taking medicine when feel better	141 (47.0)	159 (53.0)
Thought about change of medicine	132 (44.0)	168 6.0)
Missed doctor visit as per schedule	168 (56.0)	132 (44.0)
Discontinued therapy without informing doctor	159 (53.0)	141 (47.0)
Reasons of Discontinuation of Therapy		
Long duration	65 (40.9)	
Early Satisfaction	32 (20.1)	
Lack of Knowledge	35 (22.0)	
Lack of follow-up	27 (17.0)	
Forget to carry medication during traveling	129 (43.0)	171 7.0)
Side effects of drugs observed	159 (53.0)	141 (47.0)
Side Effects		
Fever	32 (20.1)	
Pain	47 (29.6)	
Stomach discomfort	24 (15.1)	
Nausea	22 (13.8)	
Vomiting	17 (10.7)	
Diarrhea	17 (10.7)	

Table 3. Analysis of drug adherence (N=300).

Drug Adherence	High (%)	Moderate (%)	Low (%)
Hyperlipidemia	27 (27.0)	24 (24.0)	49 (49.0)
Diabetes Mellitus (DM)	30 (30.0)	26 (26.0)	44 (44.0)
Hyperlipidemia + DM	30 (30.0)	17 (17.0)	53 (53.0)
Total	87 (29.0)	67 (22.3)	146 (48.7)

Table 4. Analysis of Hyperlipidemia, Diabetes Mellitus (DM) and Hyperlipidemia plus DM drugs adherence (N=300).

Variables	Before Counseling (%)	After Counseling (%)	P-value
Serum Cholesterol (mg/dL)			
< 160	79 (39.5)	96 (61.1)	0.001
> 160	121 (60.5)	61 (38.9)	
Fasting Blood Glucose (FBG) (mg/dL)			
< 126	88 (44.0)	99 (61.5)	0.001
> 126	112 (56.0)	62 (38.5)	
Health Behaviour			
Taking regular meals	131 (43.7)	151 (64.8)	0.001
Eating vegetables	106 (35.3)	136 (58.4)	0.001
Sleeping > 7 hours	141 (47.0)	164 (70.4)	0.001
Drinking 200 ml milk/day	99 (33.0)	153 (65.7)	0.001
Smoking	111 (37.0)	75 (32.2)	0.001
Exercise	108 (36.0)	138 (59.2)	0.001

Table 5. Analysis of the effects of counseling on patients (N=300).

DISCUSSION

Failure of therapy was most commonly observed due to increasing non-adherence of patients with prescribed drugs particularly with drugs prescribed for management of chronic diseases. Drug adherence is very critical in appropriate management of hyperlipidemia and DM [15,16]. Success rate of therapy can be increased by increasing the drug adherence, but the rate of drug adherence is very low in management of hyperlipidemic and diabetic patients [17,18].

Drug non-adherence is one of the increasing global issues that came into the limelight in last few decades, because of its direct association with failure of therapy, poor health outcomes, progression of disease, increased hospital stay and health expenditures and finally death of the patient. In Pakistan lack of health care facilities,

lack of pharmacist, prescribing expensive medicines, illiteracy and poverty are the key reasons of increasing the non-adherence. Therefore, current research focuses on the prevalence of drug adherence and effect of counseling on drug adherence.

Current research investigates the drug adherence among the patients suffering from hyperlipidemia or DM or from both. Level of drug adherence was low in half of the patients irrespective of their diseases. Drug adherence was low in patients suffering from both diseases 53.0% followed by hyperlipidemia 49.0% and DM 44.0%, whereas drug adherence was high in patients suffering from both diseases 30.0%, and DM 30.0% followed by hyperlipidemia 27.0%. High prevalence of low drug adherence was also reported by several other researcher such as Imran, M., et al., 61.0% in DM patients[19], Devi, L. K., 51.43% cardiac patients[20], whereas low prevalence of drug adherence was reported by Kirkman, M. S., et al., 30.9% DM patients[21], Aloudah, N. M., et al., 23.3% DM patients[22], Alqarni, A. M., et al. 21.4% DM patients[23], Altuwairqi, H. B. 33.7% cardiac patients[24] and Naderi, S. H., et al., 23.3% cardiac patients[25].

In our research level of low drug adherence was high as compared to other researchers because of several reasons such as in current research 65.7% of patients were from rural areas, low level of education or uneducated 38.3%, high rate of unemployment 31.7% and 60.7% patients belong to lower class of socioeconomic status. Increasing poverty, unemployment, decreasing level of education and lack of facilities are the key factors responsible for increasing non-adherence in management of chronic diseases.

The second important finding of current research was effect of counseling on patient serum cholesterol and blood glucose level and their health behavior. Before counseling serum cholesterol and fasting blood glucose (FBG) was normal in 79 (39.5%) and 88 (44.0%) patients that increased to 96 (61.1%) and 99 (61.5%) patients after counseling of patients. Health behavior of patients before and after counseling was regular meals 131 (43.7%) vs 151 (64.8%), eating vegetables 106 (35.3%) vs 136 (58.4%), sleeping > 7 hours 141 (47.0%) vs 164 (70.4%), taking 200 ml milk/day 99 (33.0%) vs 153 (65.7%), smoking 111 (37.0%) vs 75 (32.2%) and regular exercise 108 (36.0%) vs 138 (59.2%). Pharmacists are the expert of drugs not only responsible for identification of drug related, patient related and physician related problems responsible for increasing the non-adherence of drug but also responsible for development of different strategies to solve these problems. Current research shows the positive effect of counseling of patients for to increase drug adherence, achieving therapeutic outcomes, decreasing the stay in hospital and health expenditures and enhance the quality of life.

CONCLUSION

Drug adherence was low in all patients that increased with proper counseling about their diseases, appropriate use of prescribed drugs and effects of healthy diet and exercise on their health.

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