



Study on the Effect of Alcoholism on Pharmacodynamic Interactions Among Diabetic Patients Treated with Insulin in Tertiary Care Hospital

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Abstract

Aim: To study the effect of alcoholism on pharmacodynamic interactions among diabetic patients treated with Insulin in Osmania general hospital. **Materials and Methods:** A prospective observational study was conducted among the diabetic patients with and without alcoholism in general medicine (in-patient) department at Osmania general hospital over the period of six months. Data was collected from the collected prescriptions and entered in Microsoft Excel 2010 spreadsheet and analysis was done using multivariate analysis of variance (SPSS for Windows version 16.0 software). **Results:** The multivariate analysis of variance showed no significant association of diabetes with all the factors. It also showed a significant association between the number of DDIs in Insulin treated diabetic patients with gender ($p=0.018$), alcoholism ($p=0.042$) and comorbidity ($p=0.049$) respectively. **Conclusion:** The present study concluded that there is significant effect of alcoholism on the pharmacodynamic interactions in Insulin treated diabetic patients.

Keywords

Alcoholism, Age, Gender, Comorbid, Drug-drug interactions, Diabetes.

INTRODUCTION

A drug interaction is defined as the qualitative or quantitative alteration of the effect of a drug by the simultaneous or successive administration of another drug. The result may be alteration of therapeutic effect and safety of either or both drugs¹. Drug interactions are often categorized into two

groups as pharmacodynamic or pharmacokinetic². Drug-drug interactions (DDIs) are the major concern among the patients receiving multidrug therapy. Diabetes is an endocrine disorder where patients receive multidrug therapy to treat various comorbidities.

Researcher and drug development efforts over the past several decades have provided valuable information that expanded the therapeutic armamentarium. Additionally, interventions to prevent disease in high risk populations for type 1 and 2 diabetes mellitus³.

Insulin is the main source for the treatment of virtually all type 1 Diabetes mellitus and many type 2 Diabetes mellitus⁴. Acute ingestion of alcohol can precipitate hypoglycaemia by depleting hepatic glycogen and also causes reduction of glucose effect by reducing hepatic glucose production^{5,6}. The primary action of ethanol is to inhibit gluconeogenesis. In diabetic patients, β adrenergic receptor antagonists pose a risk of hypoglycemia because of their capacity to inhibit the effects of catecholamines on gluconeogenesis and glycogenolysis⁴. Hence, the present study was designed to assess the effect of alcoholism on pharmacodynamic interactions among diabetic patients treated with Insulin in tertiary care hospital.

MATERIALS AND METHODS

A prospective, observational study was conducted in diabetic alcoholic and non-alcoholic patients treated with Insulin 8 U, T. I. D. with or without comorbid conditions in general medicine (in-patient) department at Osmania general hospital over the period of six months. All diabetic alcoholic/non-alcoholic patients of either sex with or without comorbidities treated with Insulin were included in the study. The diabetic patients' case sheets of both genders with and without comorbidities such as hypertension, coronary artery disease (CAD), Cerebrovascular accident (CVA) and chronic kidney disease (CKD) were collected for this study.

Demographic data, comorbid conditions, diagnosis and drugs prescribed were noted.

Statistical analysis:

Data was collected from the collected prescriptions and entered in Microsoft Excel 2010 spreadsheet. Analysis was done using SPSS for Windows version 16.0 software. Total number of patients and percentages were used to represent different groups like age, gender, comorbidities, number of interactions, alcoholism and non-alcoholism in the patients. Multi variant analysis of variance (MANOVA) was done to determine the occurrence of potential DIs with specified risk factors including age, gender, alcoholism, non-alcoholism and comorbidities. $p < 0.05$ was deemed statistically significant.

RESULTS

Demographic data

The demographic data of diabetic patients was presented in Table 1. Total number of diabetic patients was found to be 102. The number of diabetic patients was found to be more in the age group of between 40 to 60 years (62 patients, 60.78%) when compared to the age below 40 years (6 patients, 5.88%) and above 60 years (34 patients, 33.33%). The number of diabetic patients under males was found to be more (75 patients, 73.53%) when compared to females (27 patients, 26.47%). The number of alcoholic diabetic patients (52.94%) was found to be more when compared to non-alcoholic patients (47.06%). Among them, diabetic patients under comorbid conditions were found to be 81 with 79.41% and non-comorbid conditions were found to be 21 with 20.59% respectively. The diabetic patients with comorbidity were found to be more (79.41%) when compared to the non-comorbidity (20.59%).

Table 1: Demographic data

Variable	Number of Patients	Percentage (%)
Age		
< 40 years	6	5.88
40-60 years	62	60.78
> 60 years	34	33.33
Gender		
Male	75	73.53
Female	27	26.47
Alcoholism		
Yes	54	52.94
No	48	47.06
Comorbid conditions		
Yes	81	79.41
No	21	20.59

Table 2: Drug interactions in diabetic patients

Variables	Total number of patients	DIs	Percentage (%)
Age			
<40	6	4	66.67
40-60	62	37	59.68
>60	34	23	67.65
Gender			
Male	75	48	64.00
Female	27	16	59.26
Alcoholism			
Yes	54	38	70.37
No	48	26	54.17
Comorbid conditions			
Yes	81	49	60.49
No	21	15	71.43

Table 3: Multivariate analysis of variance for factors associated with diabetes

Variable	df	F	Diabetes (p-value)
Age	1	1.787	0.185
Gender	1	1.599	0.209
Comorbidity	2	1.644	0.199
Alcoholism	1	0.947	0.333
Gender * Alcoholism	1	0.761	0.385
Gender * Comorbidity	2	0.315	0.730
Alcoholism * Comorbidity	2	0.849	0.431
Gender * Alcoholism * Comorbidity	1	0.426	0.515

R Squared = 0.143 (Adjusted R Squared = 0.039); * $p < 0.05$ considered statistically significant

Table 4: Multivariate analysis of variance for factors associated with drug interactions

Variable	df	F	Drug Interactions (p-value)
Age	1	3.220	0.076
Gender	1	5.857	0.018*
Comorbidity	2	3.113	0.049*
Alcoholism	1	4.243	0.042*
Gender * Alcoholism	1	4.795	0.031*
Gender * Comorbidity	2	3.383	0.038*
Alcoholism * Comorbidity	2	3.544	0.033*
Gender * Alcoholism * Comorbidity	1	0.014	0.907

R Squared = 0.209 (Adjusted R Squared = 0.112); * $p < 0.05$ considered statistically significant

Drug interactions in diabetic patients

The drug interactions in diabetic patients treated with insulin were presented in Table 2. Frequency of DIs found in the above 102 patients was 64 and the percentage of DIs found was 62.75%. The percentage of Drug interactions in diabetic patients was found to be more in the age group of above 60 years (67.65%) when compared to other age groups. The incidence of DIs was found to be more in male diabetic patients (64.00%) when compared to female (59.26%). The incidence of DIs was found to be more in alcoholic diabetic patients (70.37%) when compared to non-

alcoholic patients (54.17%). The incidence of DIs was found to be more in non-comorbid diabetic patients (71.43%) when compared to comorbid patients (60.49%).

Multivariate analysis of variance for factors associated with diabetes and drug interactions

The results of multivariate analysis of variance for factors associated with diabetes and DIs were given in Table 3 and 4. The multivariate analysis of variance showed no significant association of diabetes with all the factors. In addition, the present study also showed a significant association between the

number of DDIs with gender ($p=0.018$), alcoholism ($p=0.042$) and comorbidity ($p=0.049$) respectively.

DISCUSSION

During the six months study period, a total of 102 patients those who visited the general medicine department at Osmania General Hospital with the symptoms of diabetes treated with Insulin were selected.

Total 102 diabetic patients (both comorbid and non-comorbid) were distributed into different groups based on factors like age, gender, alcoholism and comorbid conditions respectively (Table 1). Out of total 102 patients, 21 patients were found to be only diabetic. (non-comorbid) and remaining 81 patients were found to be in comorbid conditions (hypertension, CAD, CVA, CKD, seizures and more than one comorbid condition along with diabetes). Maximum DIs were found in the age group of above 60 years (67.65%), male (64%) alcoholic (70.37%) non-comorbid patients (71.43%) respectively (Table 2).

The present study revealed that DDIs in this study were mainly of minor and moderate types. The comorbidities, gender and alcoholism are the important factors determining the DDI.

There was a significant association of pharmacodynamic activity of Insulin with alcoholism. Ingestion of alcohol can precipitate hypoglycaemia by depleting hepatic glycogen and also causes reduction of glucose effect by reducing hepatic glucose production^{5,6}. In addition, the present study also showed a significant association between the number of DIs in Insulin treated diabetic patients with gender ($p=0.018$), alcoholism ($p=0.042$) and comorbidity ($p=0.049$) respectively (Table 3 and 4).

The above results may provide baseline data that can be applied in finding the prevalence of potential DDIs in patients with diabetes, to identify factors associated with these interactions which can help in

designing and implementing appropriate interventions, educational programs and carrying out other related studies. The limitation of the present study was the software used in this study will provide only the potential estimate of DDI and was conducted only in one institution (Osmania General Hospital).

CONCLUSION

Our study concluded that there was significant effect of alcoholism on the pharmacodynamic interactions in Insulin treated patients. Meticulous monitoring and continuous follow-up over longer duration are required to identify the potential DIs.

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