Thapa B et al
Health Renaissance 2011; Vol 9 (No. 2):95-101
Alcohol consumption & blood glucose level in diabetes

■ *Original Article*

Alcohol consuming habits and its effects on adherence and blood glucose level in type-2 diabetes mellitus in a town population in eastern region of Nepal

B Thapa[1], PK Pokharel[1], N Jha[1], IS Paudel[1], SK Sharma[2] PM Shyangwa[3], HP Sangraula[4], A Sharma[5]
[1]School of Public Health and Community Medicine, [2]Department of Internal Medicine, [3]Department of Psychiatry, [4]Department of Clinical Pharmacology, [5]Department of Ophthalmology
B P Koirala Institute of Health Sciences, Dharan, Nepal

Abstract

Introduction: Non-adherence to prescribed medications continues to be a major problem worldwide and mostly in developing countries like ours. Keeping blood glucose level normal has become the greatest challenge among alcohol consumers to the health personnel because of the different factors for non adherence to the drugs prescribed for diabetes.
Objectives: To measure the magnitude of non- adherence to the prescribed medications along with the habit of alcohol consumption and the reasons of continuation of alcohol consumption along with the medication. **Methods:** A descriptive cross sectional study was carried out from February 2008 to July 2009 at diabetic clinic of Department of Medicine at BPKIHS, Dharan, Nepal. A total of 300 Type2 diabetic patients aged 24 years and above residing in Dharan Municipality in the eastern region of Nepal, taking treatment for diabetes for at least six months were included using convenient sampling method along with the informed consent and interviewed by reaching them individually to their houses. **Results:** The prevalence of non-adherence was 48%. Among the factors that were independently associated with non-adherence alcohol was also the main factor which played the significant role in non- adherence. Around 59% who had blood glucose level >126mg/dl were found non- adherent to the medicine because of several reasons and among them one was the habit of alcohol consuming at least once daily regardless the quality, quantity, brand and type of alcohol. **Conclusions:** Adherence to diabetic treatment was suboptimal. Alcohol has played a significant role in non- adherence. Blood glucose level among drinkers was found significantly higher than others. There is a need to improve the alcohol habits of the patients to improve the adherence to the drugs prescribed for the disease.
Keywords: adherence, type 2 diabetes mellitus, alcohol, blood glucose level, Dharan Municipality

Introduction

Non-adherence to prescribed medications is being a major problem worldwide. Various studies have shown that adherence is about 50% for medications in chronic diseases.[1, 2] Diabetes is considered to be one of the most psychologically and behaviorally demanding of the chronic diseases.[3]

These complications affects patient's quality of life, increases mortality, morbidity and economic cost to society.[2- 4] Non-adherence in chronic diseases has been described as taking less than 90% of the prescribed treatment [1]. Previous studies have found adherence to Diabetes treatment generally to be sub-optimal ranging from 23 to 77%. [2, 5-8] In addition, these studies have also generated varied results of factors associated with non-adherence to diabetes treatment. Among these main factors alcohol is regarded as one of the main factor which has a direct effecting role in adherence with the prescribed medications.

Address for correspondence:
Dr Bijay Thapa
Senior Resident
School of Public Health and Community Medicine, BPKIHS,
Dharan, Nepal
Email: tbijay@hotmail.com

Thapa B et al
Health Renaissance 2011; Vol 9 (No. 2):95-101
Alcohol consumption & blood glucose level in diabetes

Since alcohol is easily available in the market and people aged more than 40 years consume it mostly. Diabetes is mainly a disease of aged people more than 30 years, so this study has tried to find the co relation of these both factors and the effect of alcohol to the adherence of prescribed medications.

Methods

This was a cross sectional study with quantitative methods of data collection. A total of 300 diabetic patients were sampled from the out-patients diabetic clinic from June 2008 to June 2009 using convenient sampling. The study was approved by the ethical committee of BPKIHS, Dharan, Nepal. Patients for this study were obtained from Diabetic Clinic, Department of Internal Medicine BPKIHS, Dharan, a tertiary centre and teaching hospital in Nepal and address of their house were to be taken and they were interviewed by reaching to their house in their own community and wards.

Inclusion criteria: The main inclusion criteria were:
1. Treating Type 2 diabetes for more than 6 months
2. Attending the diabetic clinic during the study period
3. Verbal consent to participate in the study

Exclusion criteria: Patients who were newly diagnosed with diabetes (less than six months) were excluded from the study.

Interviewer used a pre-tested semi structured questionnaire to obtain information on patients' demographic characteristics and some risk factors to non-adherence to diabetes treatment. These included: health education attendance, patient's self rating of how well they understood their drug regimens, alcohol drinking habits. The patients' health cards were used to ascertain their medication regimens. They were asked about the alcohol consumption habits and non-adherence was assessed using patient's self reports of missing the doses of their medication on drinking days. The number of doses of tablets and times missed was calculated. Blood glucose of patients who reported of consuming alcohol and missing doses of medications more than 90% were analyzed. Alcohol drinkers were defined if a respondent consumed at least 1 drink regardless the quality of alcoholic beverages. For reassurance, the caretaker at their home was also interviewed separately.

Descriptive statistics were used for general description of study participants and to obtain the prevalence of

non-adherence to diabetes treatment. Odds ratios, their 95% confidence intervals and p-values were obtained. Independent variables whose p-values did not exceed 0.5 were selected for the multivariate analysis in order to determine which variables were independently associated with non-adherence. SPSS 14.0 was used for statistical analysis.

Results

Total of 300 patients were included in the study. All 100% of survey respondents answered questions regarding alcohol consumption. Mean age of the participants in this was 57 years. There were more females than males in this study (53.3% vs. 46.7%). Almost 90% participants were of age more than 40 years. Most of the family was of joint family type. Around 22% of the participants come from the military or police background. Whereas, almost 50% of the participants had never attend schools and they were uneducated in any forms. Twenty-three per cent consumed less than one alcohol-containing drink per day, 47.3% consumed 1–1.9 drinks/ day, 29.7% consumed 2 drinks /day, and only 40% consumed 2-2.9 drinks as well as 37.7% took 3 drinks and rest of them took more than 3 drinks per day.

As depicted in table 2 quantity of alcohol is dependent on age, occupation and among the marital status of the population. Alcohol consuming habit was directly related with the age and on the routine basis i.e. daily. It was seen that the patients were aware of taking alcohol with drugs. Although pattern of consuming alcohol was constant among many respondents the quantity had not crossed more than 2 drinks. Most of the patient took the alcohol up to the limit of 2 drinks. Marital status also did not have the direct impact on the quantity of alcohol drinking habits. Even in occupation there was no significant difference pattern of consuming alcohol than in above mentioned variables.

Table 3 shows about the association between the alcohol consuming habit and the value of glucose level among them. Among 300 participants alcohol habit was seen among only in 140(46.7%) participants. Around 64.5% non drinkers had blood glucose level less than 126mg/dl in comparison to the drinkers .It showed that non drinkers definitely had good control on the blood glucose level. It had also depicted that 58.6% drinkers had higher glucose level in comparison to the non

Thapa B et al
Health Renaissance 2011; Vol 9 (No. 2):95-101
Alcohol consumption & blood glucose level in diabetes

drinkers. This table also proved that there was no absolute guarantee that non drinkers did not have higher glucose levels. Even in non drinkers 41.4% had the glucose level more than 126mg/dl. So this table showed the clear result that alcohol effects directly on the blood glucose level.

The effect on glucose level due to the alcohol habit and the quantity of alcohol consumed was shown in table 4. It had shown the direct relationship between the fasting glucose levels of the patient who had taken more than 2 drinks per day. Data have shown the significance difference between the glucose levels of drinkers. Those who took more than 2 drinks had higher chance (80.8%) of having glucose level more than 126mg/dl among the population who had had glucose level more than 126mg/dl. It has shown that there is 4 times of chance of having glucose level increased than normal level among them who take more than 2 drinks per day. There is significant p value of 0.020. It has shown that there is greater chance of increasing sugar level of more than 126mg/dl among heavy drinkers in comparison to light drinkers.

People had knowledge that alcohol harms their life and the medications for the disease nonetheless people are consuming alcohol almost daily but the quantity differs. Table 5 also showed different view on alcohol consuming reasons. As this was the multiple answer questions, reasons of almost all of them (100%) consuming alcohol was because of habit. Half of them (50%) consumed because they wanted to enjoy their life in spite of being diseased and do not want to leave the habit. Approximately 10% of the patients did not care about the adverse effects of alcohol with medicines, whereas 60% of patients said that lower quantity did not effect to the glucose level and health. No side effect due to the alcohol was experienced by 70% although other 30% experienced little none bothering and unrecognizable side effects. Only small proportions (5%) did not know the real adverse effect and had never any knowledge about it.

Discussion
Over the past few decades we have witnessed several phases in the development of approaches aimed at ensuring that patients continue therapy for chronic conditions for long periods of time. Initially the patient was thought to be the source of the "problem of adherence". Most of the study have shown the value

of non adherence to oral diabetes medications ranges from 7% to 64%.[9, 10] The common reason for non-adherence in this study was simply that the patient's forgetfulness. The reasons are due to the patient's behavioral habits including the most important about smoking and drinking habits. In this study overall prevalence of adherence was 52% which was consistent with the study carried out in Hungary having only 52.1% of the patients who had adherence to the anti diabetic medicines within the designated time frame in the prescribed dose, while 47.9% did not take the appropriate medicine as required.[11,12] In another community-based study undertaken in a rural primary health center area near Chennai (Madras), South India, non-adherence was seen in 57% of the total patients interviewed.[13]

Alcohol consumption can be considered as a good marker and one of the good factors for poorer adherence to diabetes self-care behaviors. These findings highlight and emphasize the importance of routine assessment of alcohol intake in people with diabetes, particularly all the population of the world regardless of the disease like diabetes consume alcohol. Given extant evidence that moderate alcohol intake may have cardiovascular benefits for patients with diabetes, examination of the trade-offs between cardiovascular benefits vs. potential risk of lower adherence with self-care behaviors deserves study[14]. In this study it was found that people with diabetes in this population reported a significant levels 46.7% of current alcohol consumption although among them only 18.6% were heavy drinkers of more than 2 drinks per day. This suggests that people with diabetes may have curtailed their alcohol consumption because of declining health, perceived risk of alcohol on diabetes course[15, 16] or because of physician advice to limit alcohol intake.[17-20] Alcohol use was associated with key self-care behaviors that are important for the health of patients with diabetes. We observed a gradient of increasing risk for poor adherence to diabetes self-care behaviors with increasing alcohol consumption, starting with those who consume even one drink a day. So, this study has shown that the alcohol can cause direct effect on glucose levels and has a great role for the non adherence to the drugs prescribed. As no such type of study could be found in Nepal no comparison among the data could be made.

Thapa B et al
Health Renaissance 2011; Vol 9 (No. 2):95-101
Alcohol consumption & blood glucose level in diabetes

Table1. Socio-demographic characteristics of the participants

Characteristic		Participants [n, (%)]
Sex	Male	140 (46.7)
	Female	160 (53.3)
Age	< 40 years	30 (10.0)
	40- 49	45 (15.0)
	50-59	89 (29.7)
	60-69	85 (28.3)
	70 above	51 (17.0)
Marital status	Married	265 (88.3)
	Unmarried	35 (11.7)
Education level	No schooling Up to secondary	144 (48.0)
		115 (38.3)
	Above secondary	41 (13.70
Occupation	Farming	61 (20.3)
	Police/military	67 (22.3)
	Prof/tech	45 (15.0)
	Business	40 (13.3)
	Others	87 (29.0)

Table2. Association between demographic characteristics and quantity of alcohol consumption (N=140)

$\leq$ $\geq$

A study done by A. T. Ahmed et al in Northern California showed that the Current alcohol consumption was reported by 50.8% of subjects with diabetes.[21] In adjusted models, they observed a gradient of increasing risk for poor adherence to diabetes self-care behaviors with increasing alcohol consumption, starting with those who consume even one drink a day.

This study greatly resembles with our study as our study showed the reported alcohol consumption by 46.7% of participants. As our study participants were mostly of older age group we had less number of alcoholic.

As this study said that the alcohol decreased as the age increased, our study also showed the same type of pattern. It has decreased from 97.2% to 70% as the age increased from 50 to 60 years old. Although the prevalent of drinkers are more the difference is seen significantly among the consumer of number of drinks per day. Only 18.6% among all of the consumers consume alcohol more than 2 drinks per day.

Findings of this study extend those of past studies that found alcohol consumption was related to poorer compliance with diabetes self-care behaviors in more

Table 3 Association of alcohol consumption habits and blood glucose level

Fasting glucose level	Alcohol habits		Odds ratio (95%C.I)	Range	Total
	Yes	No			
$\leq$ 126 mg/dl	55(35.5%)	100(64.5%)	0.3888	0.244-0.619	300
$\geq$126 mg/dl	85(58.6%)	60(41.4%)			

*p=0.000= highly significant

Thapa B et al
Health Renaissance 2011; Vol 9 (No. 2):95-101
Alcohol consumption & blood glucose level in diabetes

limited populations, including 154 older men treated at a Veterans Administration clinic[22], 176 patients treated in a tertiary-care clinic in Mexico City [23], and 392 minority patients at inner-city primary care clinics.[24] Our study highlights the importance of alcohol consumption as a marker and potential risk factor for poorer adherence to diabetes medications. This suggests that diabetes health-care providers should routinely ask their patients about alcohol consumption and be aware that heavy consumption may be a marker for poor self-care behaviors, as well as for increased risk of alcohol use disorders and finally the main source for the non compliance to the medications prescribed. For each of the patients who had had alcohol consuming behaviors we examined, we found a gradient of compliance across level of alcohol consumption: those who consumed greater quantities of alcohol were less likely to comply with recommended self-care behaviors and with medications, exercise and advice of doctors or health personnel than those who consumed less. Similar type of pattern of consuming alcohol has been found in the study done by A. T. Ahmed et al in Northern California.[21] This study is also consistent with the study done by Cox et al in U.K.[25]

Table5. Reasons for continuing alcohol along with medications (N=140)

Reasons	No.(%)
Habit	
To enjoy during	
No worry about the future	
Little does not harm	84(60%)
No side effects yet	98(70%)
Don't know the adverse effect	7(5%)

Table4: Association between glucose level and quantity of alcohol

Fasting glucose level	Quantity of alcohol		Odds ratio (95%C.I)	Range	Total
	≤2 drinks	>2 drinks			
≥120mg/dl	50(43.9%)	64(56.4%)	3.281	1.156-9.312	140
≤126mg/dl	5(19.2%)	21(80.8%)			

*P=0.020=significant

In this study Most significant adherence was seen in group of respondents aged >40 years followed by up to 60 years. Here, 40 years or less aged respondents had 80% adherence to the medications followed by 56% when age increased up to 60years. Similar type of results was shown in study done in Mexico, Hungary, and India which comprised the trend of decreasing the adherence as the age increased.

Nearly one in every 2 respondents was not adhering to diabetes treatment and alcohol is seen as one of the strong factors for the reasons non- adhering to the medicines. In addition, our respondents were from city

Greater alcohol use was related to poorer prescribed medication compliance (p < 0.01), and stronger expectations of immediate, positive consequences of drinking alcohol were related to several indices of lower quality of life (p < 0.005). These results imply interactive relationships among diabetics' alcohol use and expectancies, treatment compliance, and quality of life.

areas, most of the respondents were ex-army personnel and alcohol is mostly used by them. The prevalence of alcohol dependence is too high for comfort in Dharan, a town in eastern Nepal. The prevalence of alcohol dependence increased with age to peak in the age group of 45–54 years in this area.[26] Most of ex-army has stable economic status as compared to the normal local populations and they can afford alcohol beverages according to the need. Our most of the

respondents fall within the age group of 45-54 years. This also proves very strongly that the people of this age love drinking and this habit contributes very strongly forgetting to take the medicines prescribed for the disease. Consequently, glucose level of the patient gradually increases above the normal level.

Conclusion

The study found 52% patient adherence to the drug therapy. Although different prevalence of adherence were seen for each factor studied, most of the association was statistically significant. Alcohol was one of the most influencing reasons for non adherence towards the medications which finally contributed for the increase in blood sugar level. This study reveals that the drinkers have elevated blood glucose level in comparison to the non drinkers. Nearly half of the population of diabetic patients is seen consuming alcohol in spite of the complication known to them. The main reasons for consuming alcohol was just because of the habit and hobby.

In order to combat this problem, patients should be counseled regularly and their glucose level should regularly be monitored and should be made more cautious about compliance to the drugs. And every health personnel who are treating diabetes should be more cautious about the drinking habit of the patient and should be ready to help them regularly.

References

1. Sabate E.WHO Adherence Meeting Report. Geneva, World Health Organization 2001.
2. Sackett D et al. Patient compliance with antihypertensive regimens. Patient Counselling & Health Education1978; 11:18-21.
3. Farmer KC. Methods for measuring and monitoring medication regimen adherence in clinical trials and clinical practice. Clinical Therapeutics1999; 21:1074-1090.
4. Spector SL et al. Compliance of patients with asthma with an experimental aerosolized medication: implications for controlled clinical trials. Journal of Allergy & Clinical Immunology 1986; 77:65-70.
5. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a selfreported measure of medication adherence. Medical Care 1986; 24:67-74.
6. Freudenheim JL. A review of study designs and methods of dietary assessment in nutritional epidemiology of chronic disease. Journal of Nutrition 1993; 123:401-405.
7. Sumartojo E. When tuberculosis treatment fails. A social behavioral account of patient adherence. American Review of Respiratory Disease 1993; 147:1311-1320.
8. World Health Organization. (2003). *Adherence to long-term therapies: evidence for action.* Ret Balkrishnana, R. (2005). The importance of medication adherence in improving chronic-disease related outcomes: what we know and what we need to further know. *Medical Care* 43(6) 2005; 517-520.
9. Cramer JA. A systematic review of adherence with medications for diabetes. Diabetes Care 2004;27(5):1218-1224.
10. Dailey G, Kim MS, Lian JF. Patient compliance and persistence with antihyperglycemic drug regimens: evaluation of a Medicaid patient population with type 2 diabetes mellitus. Clin Ther 2001;23(8):1311- 1320.
11. Hungarian Central Statistical Office (homepage on the Internet). Counted population 2004. Budapest, Hungarian Central Statistical Office (cited 18 Jul 2004).
12. Hungarian Gallup Organization (homepage on the Internet). National Health Interview Survey Hungary. Hungarian Gallup Organization (cited 15 Jan 2005).
13. Annette Winkler, Adrian U. Teuscher et al. Monitoring adherence to prescribed medication in type 2 diabetic patients treated with sulfonylureas. Swiss Med Wkly 2002;132:379–385
14. A. T. Ahmed, A. J. Karter and J. Liu Alcohol consumption is inversely associated with adherence to diabetes self-care behaviours Diabetic Medicine, 23, 795–802
15. Zins M, Carle F, Bugel I, Leclerc A, Di Orio F, Goldberg M. Predictors of change in alcohol consumption among Frenchmen of the GAZEL study cohort. Addiction 1999; 94: 385–395.
16. Poikolainen K, Vartiainen E, Korhonen HJ. Alcohol

Thapa B et al
Health Renaissance 2011; Vol 9 (No. 2):95-101
Alcohol consumption & blood glucose level in diabetes

intake and subjective health. Am J Epidemiol 1996; 144: 346–350.

17. Burman ML, Kivlahan D, Buchbinder M, Broglio K, Zhou XH, Merrill JO et al. Alcohol-related advice for veterans affairs primary care patients: Who gets it? Who gives it? J Stud Alcohol 2004; 65:621–30.

18. Reiff-Hekking S, Ockene JK, Hurley TG, Reed GW. Brief physician and nurse practitioner-delivered counseling for high-risk drinking. Results at 12-month follow-up. J Gen Intern Med 2005; 20: 7–13.

19. Grossberg PM, Brown DD, Fleming MF. Brief physician advice for high-risk drinking among young adults. Ann Fam Med 2004; 2: 474– 480.

20. Fleming MF, Mundt MP, French MT, Manwell LB, Stauffacher EA, Barry KL. Brief physician advice for problem drinkers: long-term efficacy and benefit-cost analysis. Alcohol Clin Exp Res 2002; 26: 36–43.

21. Toljamo M, Hentinen M.Adherence to self care and glycaemic control among people with insulin dependent diabetes mellitus. Journal ofAdvanced Nursing 2001, 34:780–786.

22. Cox WM, Blount JP, Crowe PA, Singh SP. Diabetic patients' alcohol use and quality of life: relationships with prescribed treatment compliance among older males. Alcohol Clin Exp Res 1996; 20:327–331.

23 Lerman I, Lozano L, Villa AR, Hernandez-Jimenez S, Weinger K, Caballero AE et al. Psychosocial factors associated with poor diabetes self-care management in a specialized center in Mexico City. Biomed Pharmacother 2004; 58: 566–570.

24. Johnson KH, Bazargan M, Bing EG. Alcohol consumption and compliance among inner-city minority patients with type 2 diabetes mellitus. Arch Fam Med 2000; 9: 964–970.

25. Cox WM, Blount JP, Crowe PA, Singh SP. Diabetic patient's alcohol use and quality of life: relationship with prescribed treatment compliance among males. Alcohol Clin Exp Res. School of Psychology, University of Wales, United Kingdom. 1996 Apr;20 (2):327-31

26. H. P. Jhingan, Pramod Shyangwa, Avneet Sharma K. M. R. Prasad S. K. Khandelwal. Prevalence of alcohol dependence in a town in Nepal as assessed by the CAGE questionnaire. Addiction 1998, 339–343