THE IMPACT OF RAMADAN FASTING ON HYDRATION STATUS OF TYPE 2 DIABETICS IN KUBANG KERIAN, KELANTAN

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ABSTRACT

Ramadan fasting involves abstaining from all form of oral intake including fluids from the beginning of dawn till sunset. This study aimed to study the impact of Ramadan fasting on the hydration status of type 2 diabetes patients. A total of 43 Muslims type 2 diabetes with no renal, cardiovascular and acute complications were studied. Urine osmolality and blood urea samples were collected on four consecutive visits, four weeks and one week before Ramadan, fourth week of Ramadan and four weeks after Ramadan. Significant increased in urine osmolality was noted on fourth week of Ramadan (p<0.001) but still in the normal acceptable range of hydration. Blood urea showed a non-significant increased on fourth week of Ramadan (p=0.186). These findings suggest that water restriction during fasting Ramadan was not sufficient to cause dehydration in uncomplicated type 2 diabetes patients.

Key words: Type 2 diabetes, Ramadan fasting, hydration status, urine osmolality, blood urea.

INTRODUCTION

Ramadan fasting involves in major changes in dietary intake including fluid intake. A Muslim is required to fast everyday from the beginning of dawn until sunset, which means abstaining from any oral intake including medications and intravenous nutritional fluids. The average duration of fasting in Malaysia in year 2001 was 13.5 hours. Poorly controlled diabetics may lose excessive water because of the high blood glucose. When the kidneys cannot conserve water the patient will suffer from dehydration and more so if the patient continues to fast (Malaysian Diabetes Association, 1993). A dehydrated patient may experience symptoms like feeling dry skin and mucous membrane, cool peripheries, decreased skin turgor, and eyes look sunken (Hope *et al*, 1993). Urine osmolality is more useful to diagnose state of hydration than changes in hematocrit, serum proteins and blood urea nitrogen, which are more dependent on other factors than hydration (Wallach,2000). Study on healthy subjects reported a similar increase in urine osmolality in the morning and afternoon sample as the volume excretion reduced (Azizi and Siakolah,1998). To our knowledge, there is currently no information on hydration status of type 2 diabetic patients who practice Ramadan fasting. Currently, health education for type 2 diabetes patients in Malaysia focused on diet, healthy eating and disease complications (National Action Plan,1998). A health education program on safe Ramadan fasting had been recommended to include diet and drug adjustment, recognition of warning symptoms of dehydration, hypoglycemia and other possible complications and action to be taken when problems arises (Azizi and Siakolah,1998). This study looks into the impact of Ramadan fasting on hydration status of these fasting diabetics. The information will later help to design an evidence based health education program.

MATERIALS AND METHOD

A systematic random sampling was done to recruit subjects at the Family Care clinic, Hospital Universiti Sains Malaysia, from July to September 2001. Muslims type 2 diabetes patients who were currently on oral hypoglycemic agents and plan to fast the whole Ramadan in year 2001. Patients who were known to have underlying or concomitant renal and heart complications or on diuretic medication were excluded. An informed consent was obtained from the patients prior to the study. Urine osmolality and blood urea level were taken on four consecutive visits, four weeks and one week before Ramadan, on fourth week of Ramadan and four weeks after Ramadan. Non-fasting period sample was taken after at least 8 hours of overnight fast and Ramadan sample were taken after at least 8 hours after pre-dawn meal. Urine osmolality was analyzed using freezing point with Osmette 030 D osmometer. Blood urea level was analyzed using urease GLDH kinetic method. Data was entered using SPSS 10.0. The impact of Ramadan fasting was analyzed using Repeated measure ANOVA for

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overall changes and pair wise comparison between time series. Values were expressed as percentage or mean (SD) with $p < 0.05$ was taken as significant difference of mean.

RESULTS

Out of 52 subjects who turned up on first visit, only 43 subjects completed data collection. The drop out of 17.3% was due to work transfer, out-

station duty, home accident and family problem. The study subjects mean age is 52.6 (7.73) with mean duration of diabetes of 7.2 (5.13) years. There were about similar proportion of male (48.8%) and female (51.2%) subjects. All study subjects were Malay and only 32.6% reported ever received health education on fasting Ramadan. All study subjects completed their fast for the whole Ramadan.
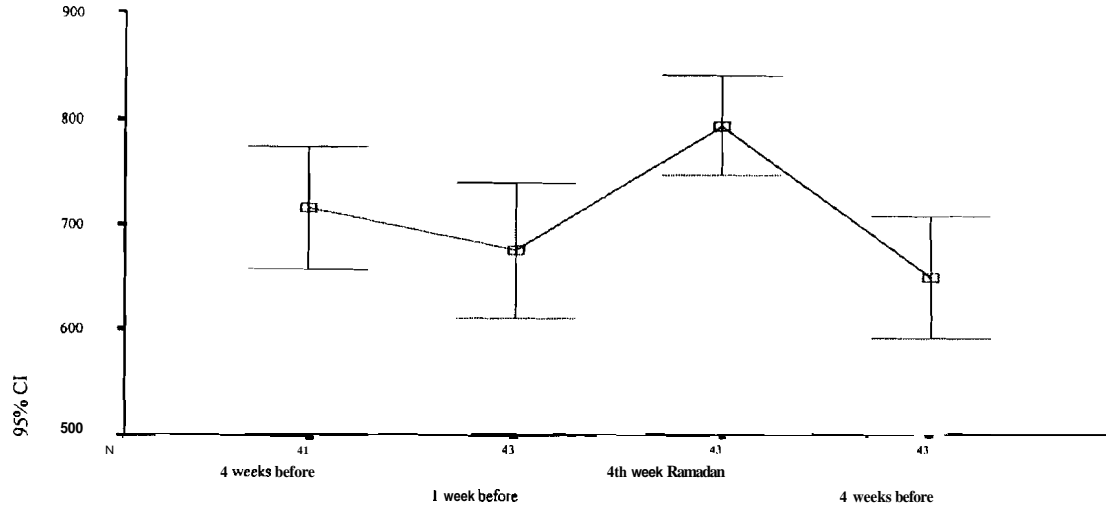

Figure 1: Error bar of mean Urine osmolality $(mOsm/kgH_2O)$ by time series.

Figure 1 shows an increased in mean urine osmolality on fourth week of Ramadan but still within the normal acceptable range. The mean however, reduced back after four weeks of Ramadan. The overall mean change in urine osmolality was significant across the time series

after adjusting the effect of gender (F=12.101, $p < 0.001$). Pairwise comparison shows significant increased in the mean urine osmolality on fourth week of Ramadan and decreased after four weeks of Ramadan.
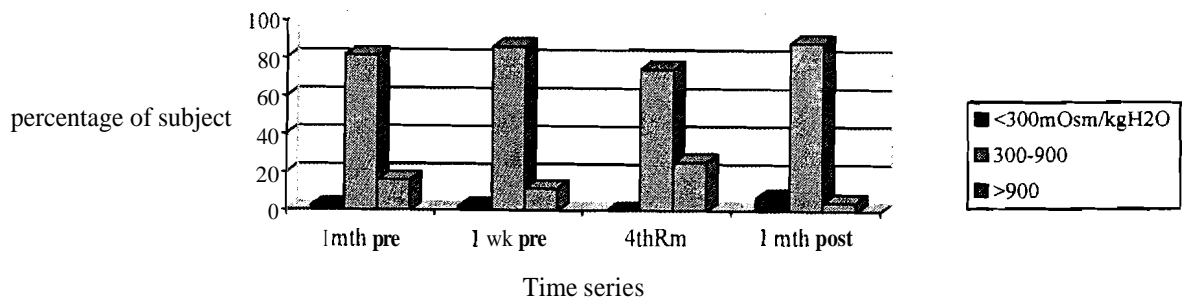

Figure 2: Percentage of subject according to category of Urine osmolality $(mOsm/kgH_2O)$ by time series

There were an increased in percentage of those who had high urine osmolality level during

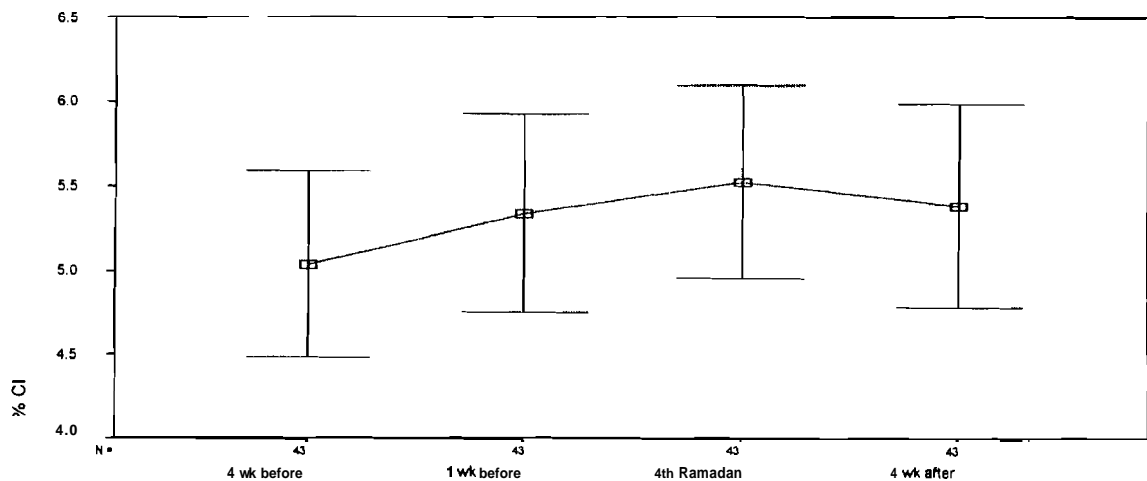Ramadan from 11.6% to 25.6% as shown in Figure 2 (normal range 300-900 $mOsm/kgH_2O$).

Figure 3: Error bar of **mean blood urea (m mol/L) by time series**

Mean blood urea also showed an increased on fourth week of Ramadan (Figure 3). Overall mean changes were not significant across the four-time series (F=0.897,p=0.445).

DISCUSSION

The significant increased but still beyond the normal limit in the mean urine osmolality with no significant change in blood urea level during Ramadan suggest that water deprivation during fasting was not sufficient to cause dehydration. This reflects the ability of the kidneys to excrete relatively high concentrated urine in the daytime and thus, showed that the body adapted adequately to the water deprivation during the day. It does also indicate that the concentrating ability of the kidneys remained unimpaired during Ramadan. The reduction of the mean back to similar level after Ramadan further suggests the body adaptation ability and the changes were related to amount of fluid intake. The increased in percentage of subjects who were having high urine osmolality level during Ramadan was also illustrated by increased in mean urine osmolality and mean blood urea level. However, no subjects reported having symptoms of dehydration. Dehydration due to over-exertion (Malaysian Diabetes Association, 1993) among the study subjects can be excluded since subjects reported no strenuous exercise during fasting although they continue their daily routine physical activity. Exposure to the hot sun may also predisposed diabetic patients to dehydration

(Malaysian Diabetes Association, 1993). However, Ramadan in Malaysia in year **2001** was more in the rainy season rather than hot season. Diet therapy is an essential tool in diabetic management. The dietary management by giving advice and prescribed individual diet plan was stressed on to help control of glucose levels in the blood, to achieve satisfactory body weight and to ensure sufficient calories for normal activities. Water on the other hand, is not a nutrient and provides no calories. It is however, essential as the medium in which all body processes take place. Adequate water intake thus, tend to be forgotten in giving advise to diabetic patients. Therefore, although water restriction during fasting was not sufficient t cause dehydration in uncomplicated type **2** diabetic patients, adequate water intake still need to be emphasized in health education program for Ramadan fasting.

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