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A CORRELATIVE STUDY OF RED MEAT CONSUMPTION AND CARDIO METABOLIC RISK FACTORS IN YOUNG AND AGED FEMALE PATIENTS OF TYPE 2 DIABETES.

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Abstract:

Background:*Type 2 diabetes and obesity have reached epidemic proportions all over the world. Women will account for the majority of diabetic cases by the year 2050. Effect of age on Cardio-metabolic risk factors in red meat consuming female type 2 diabetic patients needs to be studied.*

Objective*:The aim of this study was to retrospectively assess the relation between red meat consumption and glycemic control, blood pressure and obesity in young and aged female patients of type 2 diabetes.*

Methods: *This is a retrospective study done from the medical records of the patients of type 2 diabetes attending the YMC hospital, Mangalore. The study group consisted of female diabetic patients predominantly consuming red meat diet aged between 27 to 65 years. They were divided into two groups based on their age (viz. <40 years, >40 years of age). Their FBS, PPBS, Blood pressure and BMI were noted. These parameters between two age groups of red meat consumers were measured by unpaired t-test.*

Results: *The data when analysed statistically revealed that female diabetic patients aged above 40 years was positively associated with poor glycemic control in terms of both FBS and PPBS($p < 0.0005$).There was significantly higher BMI and BP in elderly female diabetic patients ($p < 0.0005$ & $p < 0.005$ respectively).*

Conclusions: *We found that a consumption of red meat was associated with poor glycemic control, hypertension and obesity in patients of type 2 diabetes in elderly-aged women, which is likely due to their hormonal fluctuations.*

Keywords*: Diabetes, Red Meat, Blood Pressure, Body mass Index, Female*

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INTRODUCTION:

The twin epidemics of Obesity and Diabetes mellitus are fuelling an international public health threat. Obesity and diabetes are now considered as blood brothers. In India, there are about 40 million persons with diabetes and this number is predicted to rise to almost 70 million by 2025 according to the Diabetes atlas published by the International Diabetes Federation (IDF). [**1]**

Insulin resistance is a major constituent of the metabolic syndrome - characterized by central fat, hyperglycemia, hyperinsulinemia and dyslipidemia **[2]**. Good glycemic control is important for the prevention of renal and metabolic complications of diabetes as well as for the prolongation of the development of major cardio-vascular disease in long term.

One in ten women aged 45 and over had diabetes in North Carolina in 2007. The prevalence of diabetes increased as women aged, with the highest prevalence among aged 75 and over. The North Carolina diabetes prevention and control fact sheet of February 2009 projected that women will account for the majority of diabetic cases by the year 2050 [3]. Obesity, weight gain and physical inactivity are major risk factors for type 2 diabetes among women. In female population cyclical hormonal changes also contribute to development of complications of diabetes, hypertension and obesity. This study is thus aimed at correlating the blood glucose, blood pressure and body mass index in young and aged female diabetic patients.

MATERIALS AND METHODS:

This is a retrospective study done from the medical records of the patients of DM attending the Yenepoya Medical College hospital, Mangalore, Karnataka, India from Jan 2010 to May 2010. The study group consists of 100 female patients aged between 27 to 65years and all are house wife. These subjects were divided into two groups of 50 each based on their age (viz. <40 years, >40 years of age). The group consuming red meat for at least 5 days a week. And red meat is supplimented along with normal diet. Their diet history were collected from the Dietician's record that included the amount of food consumed everyday for one week for individual patients. We have plotted the average of different food items consumed along with meat intake (grams/week)

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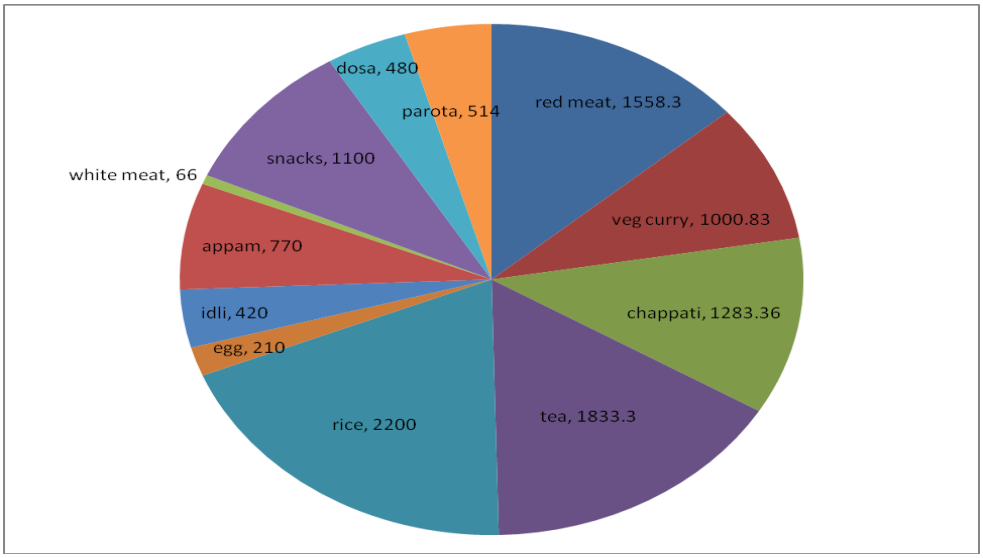


Graph 1: Depicts the average diet patterns of predominantly red meat consumers

Table.1: Inclusion & Exclusion Criteria for Study are shown.

No	Inclusion	Exclusion
1	Females	on insulin
2	Diabetic on oral hyperglycemic	practicing yoga / any other exerice
3	Red meat consumers predominately>5days/week	Anti lipidemic drugs
4	Housewife/sedentary life style (4hrs watching T.V&2hrs day time sleeping)	

Table 2: Comparison between Various Parameters of Young (<40yrs) & old (>40yrs) Female Red Meat Consumer's in Type 2 Diabetic Patients (Mean ± SD).

Parameters	<40 years	>40 years	p- value
FBS	111.44 ± 11.14	187.12 ± 78.14	<0.0005**
PPBS	177.16 ± 16.85	278.16 ± 93.75	<0.0005**
SBP	126.54 ± 11.82	151.00 ± 18.21	<0.0005**
DBP	81.20 ± 7.99	93.00 ± 8.86	<0.0005**
BMI	22.86 ± 2.57	25.94 ± 3.81	<0.0005**

**p<0.001

Their anthropometric measurements, Blood Pressure (BP) recordings, Fasting Blood Sugar (FBS), Post Prandial Blood Sugar (PPBS) were noted.

Body mass index (BMI) was calculated as weight (in kilograms) divided by standing height (in meters squared). According to standard guidelines, those with a BMI greater that 24.9 kg/m^2 were defined as overweight and those with a BMI greater than 29.9 kg/m^2 were defined as obese. People with systolic/diastolic blood pressure levels >/= 140/90 mmHg were defined as having hypertension. These parameters between two groups of red meat consumers were measured by unpaired *t*-test.

RESULTS:

Different parameters of young (<40yrs) & old (>40yrs) female red meat consumer's in type2 diabetic patients were measured by unpaired *t*-test. The statistical software SPSS ver17 & MS Excel were used for analysis. All tests were two-tailed and conducted at the 0.05 significance level. The results revealed that females aged less than 40 years of age tend to have significantly lower blood glucose levels. The older group patients have hypertensive pattern of blood pressure recordings and were significantly higher than the younger group patients. The older group have over-weight patterns of BMI ranging up to 29.75 and are significantly higher than younger group who have values below the cut off for over-weight.

DISCUSSION

The effect of Age on Blood Glucose levels in red meat consuming diabetic Women:

In this study, we found that consumption of red meat was associated with a poor glycemic control in middle-aged women. Our findings are consistent with recent evidence from the Nurses' Health Study II of younger and middle-aged U.S. Women **[4].** Red meat appeared entirely responsible for the elevated diabetes risk in these large cohort studies **[5].** Nevertheless, red meat is also a major source for saturated fat, cholesterol, animal protein, and heme iron. It has been shown that certain types of fat from red meat may play a major role in the development of type 2 diabetes **[6].**

However, cholesterol intake tended to be positively related to an elevated risk of diabetes. Cholesterol intake from red meat may thus explain the observed association between red meat intake and poor glycemic control. Recently, body iron overload has been postulated to promote insulin resistance and increase type 2 diabetes risk **[7-11].**

Endogenous estrogens levels are sufficient to exert a full protective effect against insulin resistance and glucose intolerance in experimental mice **[12].** Estrogen receptors ERalpha and ERbeta exist in beta-cells. The role of ERbeta is still unknown, yet ERalpha plays an important role in the regulation of insulin biosynthesis, insulin secretion and beta-cell survival. Activation of ERalpha by 17beta-estradiol (E2) and the environmental estrogen bisphenol-A (BPA) promotes an increase of insulin biosynthesis through a non-classical estrogen-activated pathway that involves phosphorylation of ERK1/2 **[13].** Hence those who are in menstruating phase of life are generally protected against hyperglycemia. In post menopausal women, due to hyper stimulation of beta cells, they have a tendency to produce insulin resistance **[13].**

The effect of Age on Blood Pressure levels in red meat consuming diabetic Women:

In our study, red meat consumption in elderly aged females had higher blood pressure. Studies have shown that consumption of red meat was positively associated with 15-year cumulative incidence of increased blood pressure in black and white women. Red meat may contain higher amounts of saturated fat, sodium, nitrates, or other food compounds that are detrimental to blood pressure **[14-17]**, Furthermore, the consumption of red meat 1–2times/d was associated with a 20–40% higher risk of developing elevated blood pressure than was the consumption of red meat 0.6 times/d. The mechanism through which higher meat intake may lead to higher blood pressure is unclear, except that intake of meat replaces other foods, such as whole

grains, fruit, and vegetables, through a "substitution effect." **[14].**

Hormonal fluctuation in women influences the blood pressure in different age groups. At the time of menopause, in addition to aging and together with the loss of estradiol (which is known to decrease renin release), this poor suppression of renin by salt could contribute to the development of salt-sensitive hypertension in elderly women and may reflect an interaction between the renin system and menopausal status **[18].**

Androgens could also play a role in the rise in BP observed in menopausal women. Several studies have suggested that sex steroid hormones have direct vascular effects that may contribute to the gender differences in BP regulation **[19-21].** However, there is also some evidence suggesting that female sex hormones may actually protect against a salt-induced increase in BP, possibly by augmenting the renal excretion of sodium. Thus, when Dahl salt-sensitive (DS) rats receive a high-sodium diet, female rats become less hypertensive than male rats **[22].** A greater rise in BP has also been reported in spontaneously hypertensive female rats after ovariectomy **[23,24].**

The effect of Age on BMI levels in red meat consuming diabetic Women:

We found that BMI levels were higher in the above 40 age group. Studies have shown that consistent and highly significant associations were noted between increased adiposity and elevated concentrations of estrogens and androgens. The associations between increased physical activity and decreased concentrations of several of these hormones suggest that these hormones can be modified by lifestyle changes **[25].**

Study in experimental mice shows that high fat content leads to insulin resistance by down regulating the gene responsible for mitochondrial oxidative phosphorylation in muscle tissue [26] and also by disrupting insulin signaling cascade. [27]. The proinflammatory cytokines released from visceral fat cells & adipose tissue resident macrophages causes disturbance in insulin signalling [28].

Management of hyperglycemia in different age groups of women:

Women of reproductive age withT2D were associated with poor glycemic control compared to non-reproductive age women. Treatment regime for these women were followed as given in table.2. Total of 30,427 women were analyzed in a Malaysian population [29]. In a meta analysis study, treatment protocol followed showed first emphasis was given to diet & nutrition. The detail treatment schedule is shown in the flowchart. The choice of drugs used in the order of preference is shown in the list **[30].**

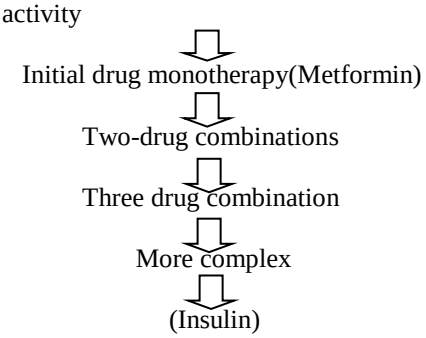
Table 3: Management of Diabetes for Women with T2D in Reproductive Age and Non-Reproductive Age Group.

Treatment of diabetes (n= 29871)	Reproductive n (%)	Non-reproductive n (%)
Diet only	1.4%	1.2%
Oral ADA only	85.4%	86%
Insulin only	2.6%	2.2%
Both oral &insulin	10.6%	10.6%

Order of usage of glucose lowering agents:

1. Biguanides
2. Sulfonylureas
3. Meglitinides
4. (glinides)
5. Thiazolidinediones
6. a-Glucosidase
7. inhibitorsa
8. DPP-4 inhibitors
9. Bile acid
10. Dopamine-2
11. GLP-1 receptor
12. Amylin mimeticsa
13. Insulins

Treatment Regime for Type 2 Diabetes:
Healthy eating, weight control,increased physical activity



CONCLUSION:

In summary, our study indicates that a higher the age group of red meat consuming diabetic females, higher will be their blood glucose, Blood Pressure and BMI values. Hence hormones may play a major role in regulation of the above parameters in red meat consuming diabetic women.

Limitations of the study

1. Retrospective study.
2. Small study group.
3. Limited variables.

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Conflict of Interest: "None to Declare"

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