Med. J. Cairo Univ., Vol. 92, No. 3, Accepted 30/4/2024
DOI: 10.22608/MJCU. 709-715, September 2024
www.medicaljournalofcairouniversity.net

The Risk of Excess Lamb Meat (Mutton Meat) Consumption on the Emergence of Ischemic Heart Diseases and other Related Health Problems in Habitants of North Sinai Governorate

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Abstract

Background: Besides having health effects, fatty acids also play an important role by enhancing the texture, flavour and aroma, and subsequently acceptability of meat. In this regards among the different food sources for human consumption lamb meat contain the highest fat content so decrease lamb meat consumption and enrichment of other different sources meat with healthful fatty acids can be achieved by innovative nutritional approaches.

Aim of Study: This study aimed to studying the relation of excess lamb meat consumption and prevalence of cardiovascular risk factors (CVR) as diabetic mellitus (DM), hypertension obesity and dyslipidaemia in the North Sinai Governorate.

Patient and Methods: This study included 100 patients attending the outpatient clinics either the Cardiology or the Internal Medicine over a period of one year from January to December 2023. According to lamb meat consumption patients were classified into two groups: Group (1) Included 50 Patients with higher and group (2) Included 50 patients with lower lamb meat consumption. All patients were subjected to full history, general examination and laboratory investigations.

Results: The study results revealed that increased consumption of lamb meat had significant relationship with increased risk factors of CVS. There was a highly significant relationship between weight of lamb meat content per meal & days per week of lamb meat consumption for one year and glycated haemoglobin, LDL cholesterol, obesity and elevated blood pressure (p<0.001).

Conclusion: This study concluded that excess lamb meat consumption is associated with development of coronary heart disease (CHD) by increasing risk factors of atherosclerosis, stroke, dyslipidaemia and diabetes mellitus.

Key Words: *Risk – Lamb meat (mutton meat) consumption – Cardio vascular risk – Habitants – North Sinai Governorate.*

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Introduction

MEAT is an essential component of human diets in several populations especially in the north Sinai Governorate providing high-quality nutrients (i.e., proteins and fats) and essential micronutrients, including iron, zinc and B vitamins **[1]**.

However, not all meat is created equal, some cuts of red meat contain high amounts of unhealthy saturated fat, whereas fatty fish contain healthy fats. Specifically, the U.S. Department of Agriculture recommends consuming no more than an average of 1.8 ounces = 51 gm (1 ounce = 28.3 gm) of red meat, 1.5 ounces (42.5 gm) of poultry and 0.4 ounces (11.3 gm) of seafood per day, based on a 2,000-calorie diet. The rest of protein foods should be from non-meat sources. In the advices of National Health Society, not more than 70-90 grams of red meat should be eaten per day **[2]**.

Meat is a highly nutritious and versatile food. It is endowed with high satiety value and its proteins are having high biological value. As such meat consumption can influence the frequency of other foods and reduce the size of meals **[3]**, where every 100 grams of lamb contains 258 calories, 57% water, 25.6 grams protein, 0 sugar, 0 carbohydrates, 16.5 grams fat, 0.23 grams omega-3, 0.9 grams omega-6 **[4]**.

On the average, the body should get 15% of its daily calories from proteins of animal origin, and this is equivalent to 50-150 grams of meat per day. The negative effects of fats on human health overshadow the benefits associated with consumption of ruminant-derived fat. This perception emanates from the high content of saturated fatty acid (SFA), more so the presence of thrombogenic and atherogenic fatty acids (FA), including myristic (14:0) and palmitic acids (16:0) **[5]**.

The cholesterol-raising effect of dietary saturated fatty acids is largely accounted for by lauric, myristic, and palmitic acids. Myristic and palmitic acids have been associated with increased risk of developing cardiovascular disease (CVD) in humans relating to their low-density lipoprotein (LDL) and cholesterol-raising properties **[4]**. Another underlying mechanism is purported to be through the generation of carcinogens and mutagens by certain fatty acids types during processing. Previously, most interest has been in reducing the negative health impact of fatty acids (FA) related to cardiovascular disease (CVD), but it is now clear that some fatty acids have positive influence on cardiovascular disease and a range of other diseases **[6]**.

Besides having health effects, fatty acids also play an important role by enhancing the texture, flavour and aroma, and subsequently acceptability of meat. In this regard, production of sheep meat may be one area with considerable potential for providing whole foods enriched with health promoting fatty acids for human consumption. Since nutrition is the major factor influencing the fatty acids profile of ruminants, enrichment of sheep meat with healthful fatty acids can be achieved by innovative nutritional approaches **[7]**.

Increased fatty diet consumption increase the risk of many disease as hypertension, Cancers, Type 2 Diabetes, gallstones, arthritis, fatty liver disease, arteriosclerosis, obesity, dyslipidaemia, ischemic heart disease by increasing all risk factors for CVD and stroke **[8]**.

Aim of the study:

This study aimed to study the correlation of excess lamb meat consumption and risk factors of cardiovascular disease (CVD) as DM, hypertension obesity and dyslipidaemia in the North Sinai Governorate.

Patients and Methods

The study included 100 patients who presented to the outpatient clinic of the Cardiovascular Department and Internal Medicine Department Written consent was obtained from all participants in the study, patients divided in two groups:

- Group (1) included 50 patients with excess consumption of lamb meat (three days or more every week and 200 gram/day or more).
- Group (2) included 50 patients with lower consumption of lamb meat (less than three days every week and less than 200 gram/day.

Study design and setting:

This retrospective and prospective cohort study, with repeated measures of diet and lifestyle factors, had been conducted in the North Sinai Environment at Arish General Hospital over a period of one year, to estimate and evaluate significant relation of increasing lamb meet intake for one year and prevalence of risk factors for CVD as DM, obesity and dyslipidaemia in the North Sinai Governorate.

Patients:

The study included 100 prospective patients coming to the Internal Medicine and Cardiology departments from January 1, 2023 to December 30, 2023.

Inclusion criteria: All patients 30 years of age or older, attending the Cardiovascular Outpatient clinic and Internal Medicine outpatient Clinic over a period of one year, from January 1, 2023 to December 30, 2023, providing detailed information about their, lifestyle and usual diet, amount of lamb meat consumption.

Full history data and a questionnaire sheet was completed for every patient included, to update information on potential risk factors and occurrence of cardiovascular diseases.

Exclusion criteria: Participants who had a history of cancer, known chronic ischemic heart disease, previous myocardial infarction, angina, or coronary artery disease or stroke were excluded from the study.

Methods:

All patient included in study were subjected to:

- Full history taking, questionnaire sheet for all patients either directly or sent by mail.
- Clinical examination and measurement of vital signs (pulse, blood pressure, temperature, respiratory rate).
- Laboratory investigations:

• Haematology profile: Complete blood count (CBC), fasting blood sugar (FBS), random blood sugar (RBS), Glycated Haemoglobin (HgA1c).

• Lipid profile that includes, total cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL) and triglycerides.

• History for hospital admission during one year by acute ischemic heart disease with coronary intervention or ischemic stroke.

• BMI was calculated as weight (kg) / (height in m^2) for detection of obesity which is defined as more than 30 Kg/height in $_m2$ **[9]**.

Statistical analysis: Statistical analysis was carried out using SPSS© for WindowsTM Version 26.0. Differences in intakes of lamb meat between consumer groups were assessed using independent sample *t*-tests for normally distributed data **[10]**, and Mann–Whitney U tests for non-normal data. Differences between groups were assessed using Chi-square tests. To minimise type 1 errors (as a result of multiple testing), the Bonferroni adjustment was used by dividing the alpha level (0.05) by the number of comparisons with intakes considered to be significantly different from each other if $p<0.001$.

Results

The study included 100 who presented to the out patients clinics of either the Cardiology or the Internal Medicine Department over a period of one year Table (1) shows that, the demographic characters including age and sex did not differ significantly, [mean ± SD age was 57.6±6.3 year in group (1) versus 56.3±6.14 year in group (2).

There was also no statistically significant difference in sex either.

Table (1): Demographic characters of examined patients among different groups.

Item	Group (1) (eat lamb meat Equal to or more than 3 Day/week)	Group (2) (Eat lamb meat) Less than 3 Day/weak	Test of significance	Probability
n	50	50		
Age (years)	57.6±6.34	56.3±6.14	$t = 1.24$	$p=0.15$ NS
Sex:				
Male	32 (64%)	36 (72 %)	$Chi^2 = 0.67$	$p=0.15$ NS
Female	18 (36%)	14 (28 %)		

NS = Non significant at ($p<0.05$). ** = Significant at ($p<0.01$).

Days per week and amount of lamb meat consumption and the prevalence of obesity:

Table (2) shows that, there was a significant differences ($p<0.05$) in the amount of lamb meat consumption and obesity, where the amount of meat consumption in group-1 was 250 gm. day in group (1) and in group (2) was 150 gm. day.

Days per week and amount of lamb meat consumption and cardiovascular disease:

Table (3) shows that there was a significant relation between the two groups as regarding CV D as group (1) acute ischemic heart disease was 36 P (72%) versus 16 P (32%) in group (2), also acute ischemic stroke was group (1) 16 P (32%) versus 4 P (8%) in group (2).

Days per week and amount of lamb meat consumption and prevalence of HF and elevated BP:

The prevalence of heart failure was 10 (20%) in group (1) and group (2) was 1 (2%). The incidences of elevated blood pressure more than (140/90) in a group (1) was 22 (44%) and in group (2) was 2 (4%).

Days per week and amount of lamb meat consumption and HbA1c and LDL levels:

Table (4) shows that the level of HbA1c and LDL levels differed significantly among the patients eat lamb meat differ significantly among the two groups ($p<0.05$). The HbA1c in group (1) was 8.66 versus 5.2 in group (2). Also, the LDL level in a group (1) was 163.42±22.9 versus 89.50±17.18 in group (2).

Table (2): Amount of lamb meat consumption per day and prevalence of obesity among the two studied groups.

Item	Group (1) n=50 P (eat lamb meat Equal to or more than 3 Day/week)	Group (2) n=50 P (Eat lamb meat) Less than 3 Day/weak	Test of significance	Probability
- Amount of lamb meat consumption (Gram / Day)	250±10.17	150±12.14	$t = 10.75$	$p=0.0012$**
Obesity	40	10	$Chi^2 = 7.48$	0.01

NS = Non significant at ($p<0.05$). ** = Significant at ($p<0.01$).

Table (3): Relation between days per week and amount of lamb meat consumption and cardiovascular incidences.

Item	Group (1) (eat lamb meat Equal to or more than 3 Day/week)	Group (2) (Eat lamb meat) Less than 3 Day/weak	Test of significance	Probability
- Acute ischemic heart disease	36 (72%)	6 (12%)	$Chi^2 = 8.50$	0.0012**
- Acute ischemic stroke	16 (32%)	4 (8%)	$Chi^2 = 7.49$	0.011**

** = Significant at (p<0.01).

Table (3): Relation between days per week and amount of lamb meat consumption and cardiovascular incidences.

Item	Group (1) (eat lamb meat Equal to or more than 3 Day/week)	Group (2) (Eat lamb meat) Less than 3 Day/weak	Test of significance	Probability
- Acute ischemic heart disease	36 (72%)	6 (12%)	$Chi^2 = 8.50$	0.0012**
- Acute ischemic stroke	16 (32%)	4 (8%)	$Chi^2 = 7.49$	0.011**

** = Significant at (p<0.01).

Table (4): Relation between days per week and amount of lamb meat consumption and heart failure and elevated BP.

Heart failure		10 (20%)	1 (2%)	$Chi^2 = 11.12$	0.0015**
Elevated BP More than140/90	Yes	22 (44%)	2 (4%)	$Chi^2 = 7.48$	0.012**

** = Significant at (p<0.01).

Table (5): Relation between days per week and amount of lamb meat consumption and HbA1c and LDL levels.

Item	Group	N	Mean Std. Deviation	Test of significance	Probability
HbA1c (normal range below 6)	1.00	50	8.66±2.23	$t = 5.22$	0.01**
	2.00	50	5.20±0.45		
LDL cholesterol Optimal less than (100mg dl)	1.00	50	163.42±22.9	$t = 7.28$	0.01**
	2.00	50	89.50±17.18		

** = Significant at (p<0.01).

Discussion

Meat is an essential component of human diets in several populations especially in the north Sinai Governorate providing high-quality nutrients (i.e., proteins and fats) and essential micronutrients, including iron, zinc and B vitamins **[1].**

Lamb meat consumption is inconsistently associated with development of coronary heart disease (CHD), stroke, and diabetes mellitus, limiting quantitative recommendations for consumption levels. Effects of meat intake on these different outcomes, may also vary. The main objectives of the current study were to identify the associations of excess consumption of lamb meat with cardiovascular risk factors in the North Sinai Governorate, to study the relationship between the excess consumption of lamb meat to the risk of developing other health problems beside the cardiovascular disease. The

current study included 100 patients who presented to the outpatient clinic of Cardiology and Internal Medicine Department.

A similar study conducted by Fan et al., *[11]* to explore the metabolic biomarkers linking red lambed meat consumption to ischemic heart disease mortality in the UK Biobank, it was found that the mean (SD) age of patients was 55.4 (8.09) years, and 52.1% were women *[11]*.

In the current study there were positive relation between weight of lamb meat content per meal, and obesity, DM and IHD Further study conducted by Bellavia et al., *[12]*. In contrast, a negative association between moderate meat consumption and IHD death was observed in non-obese men *[12]*.

Santaliestra-Pasías et al., *[13]* studied the impact of reduced red and processed meat consumption on cardiovascular risk factors, regarding the HgA1c or the lipid profile, an increase in the glucose levels and an increase in the haemoglobin were statistically significant ($p<0.05$) *[13]*.

Our Current study agreed with another study by Simpson et al. *[14]* who stated that, despite the study participants demonstrating lipoprotein cholesterol concentrations within the 'normal' range, and as a result the range to assess a change to these parameters was narrow, a significant reduction in LDL and HDL was induced over the intervention period. These findings may have been confounded by changes in behaviour during the pre-intervention period, which tended to elevate TC and LDL from baseline concentrations, those with total and LDL cholesterol concentrations in the upper ranges of normal at baseline still demonstrated greater reduction in this variable over the intervention period compared with those starting with lower TC and LDL levels *[14]*.This agreed with another study demonstrating that red meat consumption was also relevant to elevated levels of other lipid risk factors for IHD, including apolipoproteins VLDL, IDL, LDL and their subfractions (including cholesterol, free cholesterol, cholesteryl esters, and phospholipids), and fatty acids *[11]*.

According to Fan et al. *[11]*, authors found that triglycerides in seven lipoprotein subclasses (very small VLDL, IDL, large LDL, LDL, medium LDL, small LDL, and very large HDL) were positively associated with excess lambed meat consumption and ischemic heart disease (IHD) mortality *[11]*. cholesterol can easily be deposited on the arterial walls and damage the endothelium, leading to atherosclerosis or the thickening of the arteries (arteriosclerosis), which is a well-known risk factor for cardiovascular diseases *[12]*.

According to Zhang J, et al. *[15]* study suggest that red lambed meat consumption may also link to a higher CVD risk through other nonlipid-related metabolisms. For example, red lamb meat, as an important dietary source of amino acids, upregulates the metabolism of aromatic and branched-chain amino acids, which are associated with atherosclerotic plaques and coronary artery lesion. Red meat may also mediate inflammation, glucose metabolism, and renal metabolism, and previous metabolomic studies have demonstrated the association of these metabolites with cardiovascular risks *[16]*.

In the current study, the excess consumption of lamb meat increased the level of LDL-cholesterol. This agreed with another study by Consortium *[17]* suugest that because of its high content of saturated fat and cholesterol, consumption of lambed meat increases low density lipoprotein cholesterol compared with plant sources of protein, such as nuts, soy foods, and other legumes *[17]*.

It is widely observed that excess lamb meat consumption is associated with CV death. A recent study demonstrated positive association of CV death with excess lamb meat consumption among all participants and the participants with obesity and non-obesity. The observed association was in agreement with the results reported in the recent dose–response meta-analysis included nine studies *[18]*.

A recent Japanese study did not find any strong association between lambed meat consumption and cardiovascular disease death *[19]*.

A recent study investigated the association of 'fresh beef and lamb' consumption with markers of nutrition and health status in adults found that, higher consumption of 'fresh beef and lamb' was not associated with increased risk factors of cardio-metabolic diseases (as indicated by mean values and proportions of the population with values outside generally accepted cut-offs indicating high BP, cholesterol or HgA1c *[19]*.

Furthermore, a recent study investigating associations between meat intakes and markers of health and cardio metabolic diseases among adults in the UK found that while higher lambed meat consumption was associated with negative outcomes (e.g., higher BMI, hip circumference, higher TC, LDL-C, HgA1c and elevated BP). These associations were not observed for higher meat consumption, supporting the evidence for dietary guidance on the reduction in meat consumption *[20]*.

While the effects of red meat consumption compared to white meat are well documented, a recent study found that levels of atherogenic lipids and lipoproteins did not differ following consumption of diets with red meat compared to similar amounts of white meat concluding that the trial did not support evidence for choosing red over white meat for reducing CVD risk based on lipid and lipoprotein effects *[21]*.

Another recent randomized clinical trial (RCT) investigated the effect of incorporating lean beef into a healthy dietary pattern, found that the benefits of a healthy, low saturated fat, Mediterranean-style diet were not attenuated by the inclusion of smaller to moderate amounts of lean beef further supporting evidence that the negative outcomes previously linked to red meat consumption are associated with the wider dietary patterns and confounding factors (e.g., BMI) associated with consuming red meat **[2].**

This study concluded that, excess lamb meat consumption significantly increases risk factors of cardiovascular disease and is associated with development of diabetes mellitus Acute ischemic stroke and ischemic heart disease (IHD).

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مخاطر زياده اكل الحوم الضأن على زياده مخاطر الاصابه بامراض الشرايين التاجيه للقلب وبعض الامراض الاخرى لسكان محافظه شمال سيناء

تعتبر اللحوم من مكونات الاكل الاساسيه لسكان محافظه شمال سيناء وبخاصه لحوم الضان وذلك بحكم العوامل البيئيه والطبيعيه وتحتوى لحوم الضان علي اعلى نسبه بين انواع اللحوم المختلفه فى الدهون والكوليسترول وتهدف الدراسه إلى معرفه ارتباط زياده تناول اللحوم الضأن وارتفاع نسبه الكوليسترول وبالتالى الاصابه بامراض الشرايين التاجيه للقلب وتم عمل الدراسه على مائة مريض مائه (١٠٠) مريض لهم ملفات متابعه بالفعل بالمستشفى ومائه مريض من المترددين على عياده القلب وعياده الباطنه بمستشفى العريش العام خلال الفتره من يناير وحتى يونيو من عام ٢٠٢٣ وتم اخذ التاريخ المرضى والكشف الطبى وتم عمل جميع الفحوصات والتحاليل الطبيه وقد تم استبعاد المرضى المصابين بالاورام السرطانيه واظهرت النتائج وجود ارتباط مباشر بين زياده تناول اللحوم الضأن وبين ارتفاع نسبه الكوليسترول بالدم وارتفاع السكر والاصابه بالسمنه وحيث ان هذه الامراض من عوامل الخطوره للاصابه بتصلب الشرايين فبالتالى ادى الافراط بتناول لحوم الضأن إلى زياده مخاطر الاصابه بالسكته الدماغيه والاصابه بقصور الشرايين التاجيه الحاد ولذلك ننصح بالاعتدال فى تناول اللحوم وتقليل المعدل الاسبوعى وبخاصه اللحوم الضان وتناول انواع اخرى من اللحوم تحتوى على نسبه اقل من الدهون.