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Correlation of Dietary Intake and Serum Lipid and Blood Sugar Profile in Male and Female Cardiac Patients

Shaista Hanif Ansari
Student, Department of Clinical Nutrition and Dietetics (part II),
Dr. B. M. N. College of Home Science 338, Mumbai, Maharashtra, India
Dr. Rekha Battalwar
Associate Professor, Department of Food and Nutrition, Sir Vithaldas Thackersey (SVT) College of Home Science, SNDT Women's University, Mumbai, Maharashtra, India

Abstract:
Introduction: Heart is one of your body's most important organs. Essentially a pump, the heart is a muscle made up of four chambers separated by valves and divided into two halves. Heart and blood vessel disease also called heart disease includes numerous problems, many of which are related to a process called atherosclerosis (American Heart Association. 2014).
Objective: To compare and find association of dietary intake with blood parameters between male and female cardiac patients attending public and private hospital.
Methodology: A cross-sectional study was conducted in 150 cardiac patients (98 males) attending private and public hospital in Mumbai city. Anthropometry was measured. Dietary intake was calculated using 2 day diet recall. Serum lipid profile, fasting and post-prandial blood sugar were measured. Analyses was performed using SPSS software for Windows (version 16. 0, 2007, SPSS Inc, Chicago, IL). Independent sample T test was used to analyse the data. Pearson's correlation was used to assess correlation between dietary intake and blood parameters. P-value < 0. 05 was considered to be statistically significant.
Results: The mean HDL cholesterol was 33±5 mg/dl; LDL cholesterol was 143±38 mg/dl. VLDL cholesterol was 103±39 mg/dl, total cholesterol was 256±55 mg/dl, triglyceride was 104±33 mg/dl, fasting blood glucose was 120±25 mg/dl and post-prandial blood sugar was 206±25 mg/dl. Dietary intake of the patients was also assessed carbohydrates were250. 1±74. 8 g/day, protein was 57. 5±10 g/day, fats were 58. 7±9. 7 g/day and energy was 1718±224 kcal/day. The percentage energy intake from carbohydrates was 58. 1±15. 1%, protein was 13. 5±2. 5% and fat was 31. 0±5. 4%. Percentage RDA intake for energy was 78. 2±15. 5% and that for protein was 102. 3±19. 8%. As seen in, there was a significant correlation of percentage energy from fats with LDL cholesterol (p<0. 05). In females, HDL cholesterol was correlated with carbohydrates, fats and energy intake (p<0. 05). Total cholesterol was correlated with percentage energy from carbohydrates in females (p<0. 05). Post prandial blood sugar was fats, percentage energy from fats and RDA proteins in females (p<0. 05).
Conclusion: Both in males and females cardiac patients, there is a significant association of dietary intake with lipid profile and blood sugar levels. Nutrition counseling and dietary interventions should be planned to improve lipids profile of cardiac patients.

Keywords: *Heart, Saturated fats, HDL, LDL, VLDL, Serum lipid, Blood sugars, Nutrients.*

1. Introduction

Heart is one of your body's most important organs. Essentially a pump, the heart is a muscle made up of four chambers separated by valves and divided into two halves. Heart and blood vessel disease also called heart disease includes numerous problems, many of which are related to a process called atherosclerosis (American Heart Association. 2014). Diabetes is a major risk factor for heart disease. A diabetic person's risk of developing heart disease is equivalent to the risk of a person who has had a previous heart attack. (Fuller NR,etal. 2015). Excessive intake of fat especially saturated fats has been linked to the development of CVD (Crider Krista et al, 2008). Stress, drinking too much alcohol and depression has all been linked to cardiovascular disease (Varghese Tet al, 2016). A study investigated the association between fat intake and incident of dementia. CVD diseases have been associated with dementia (Hunt JR et al, 2005). Exchanging soluble fibre for fat intake produces even greater reduction in LDL cholesterol levels (Steven C masley et al, 2010). It is seen that people who consume energy dense, high saturated fat and low fibre dietary pattern were longitudinally associated with increase in cardio metabolic risk factors in severe obesity but not with CVD (David J Johns et al, 2015). A fat diet rich in saturated SFA and low in PUFA is said to be an important cause of atherosclerosis and CVD. Dietary SFA have harmful effects and dietary PUFA have protective effects on atherosclerosis and CVD (Renaud S et al, 2005). It is seen that improving

adherence to diet quality scores over time was associated with significantly lower risk of CVD (Mercedes S Priet et al, 2015). Saturated fat and trans fat consumption is linked to cardiovascular disease(K Merriam PAet al. 2009).

2. Objective

To compare and find association of dietary intake with blood parameters between male and female cardiac patients attending public and private hospital.

3. Methodology

A cross-sectional study was conducted in 150 cardiac patients (98 males) attending private and public hospital in Mumbai city. Patients were taken from private and government hospital to understand the correlation of educational status, socio economic group, literacy, lifestyle habits, physical activity, eating disorders, etcon the serum lipid and blood sugar profile in male and female cardiac patients. Anthropometric measurements were assessed. Dietary intake was calculated using one day diet recall. Serum lipid profile, fasting and post-prandial blood sugar were measured. Analyses were performed using SPSS software for Windows (version 16. 0, 2007, SPSS Inc, Chicago, IL). Data are presented as Mean ± SD. Independent Sample T Test was used to analyse the difference in parameters according to gender or 2 hospitals. Pearson's correlation was used to assess correlation between dietary intake and blood parameters. P-value < 0. 05 was considered to be statistically significant.

4. Results

Results on 150 cardiac patients (98 males) aged 53±11 years are presented in the current study.

Anthropometric measurements	**Private (n=75)**		**Public (n=75)**	
	Males(n=49)	Females (n=26)	Males(n=49)	Females (n=25)
Height (cm)	163. 2±8. 1	161. 1±4. 4#	165. 1±6. 5	157. 1±7. 4*
Weight (kg)	76. 2±11. 0	77. 0±9. 8	74. 9±11. 5	71. 8±14. 8
BMI (kg/cm^2)	28. 5±4. 0	29. 1±3. 7	27. 3±3. 9	628. 1±3. 9

Table 1: Anthropometric Characteristics of Males and Females Visiting Two Hospitals
*Data presented as Mean±SD. *p<0. 05 for comparison between males and females*
#p<0. 05 for comparison between private and public hospital

The mean weight of the adults was 75. 2±11. 7 kg, height was 162. 4±7. 4 cm and BMI was 28. 1±3. 9 kg/cm^2. Table 1 gives anthropometric characteristics of cardiac patients when classified according to gender visiting 2 hospitals. As seen in Table 1, there was a significant difference in height of males and females visiting public hospital (p<0. 05). No other difference was seen in anthropometry of males and females of visiting either hospitals (p>0. 05) (Table 1) There is a significant difference in height of females attending private and public hospital (p<0. 05). There is no difference in other anthropometric characteristics between private and public hospitals (p>. 05) (Table 1).

Lipid profile	**Private (n=75)**		**Public (n=75)**	
	Males(n=49)	Females (n=26)	Males(n=49)	Females (n=25)
HDL cholesterol (mg/dl)	33±5	36±5	32. 2±4. 1	34. 0±5. 1
LDL cholesterol (mg/dl)	141±38	142±41	141. 3±40. 7	154. 1±31. 6
VLDL cholesterol (mg/dl)	95±31	112±40*	101. 9±48. 7	110. 5±33. 3
Total cholesterol (mg/dl)	261±50#	277±42	225. 6±58. 9	278. 9±44. 7*
Triglyceride (mg/dl)	100±25	109±33	110. 5±42. 3	92. 2±20. 7*
Fasting blood glucose (mg/dl)	128±31	115±4*	119. 7±26. 8	110. 6±11. 1
Post prandial blood glucose (mg/dl)	208±36	205±25	209. 5±37. 3	197. 1±26. 7

Table 2: Blood Parameters of Males and Females
*Data presented as Mean±SD. *p<0. 05 for comparison between males and females*
#p<0. 05 for comparison between private and public hospital

Serum lipid profile and blood sugar (fasting and post-prandial) were assessed of the patients. The mean HDL cholesterol was 33±5 mg/dl, LDL cholesterol was 143±38 mg/dl. VLDL cholesterol was 103±39 mg/dl, total cholesterol was 256±55 mg/dl, triglyceride was 104±33 mg/dl, fasting blood glucose was 120±25 mg/dl and post-prandial blood sugar was 206±25 mg/dl. Table 2 gives blood parameters of cardiac patients when classified according to gender visiting 2 hospitals. As seen in Table 2, for those visiting private hospital, males had significantly lower VLDL cholesterol and significantly higher fasting blood sugar levels as compared to females (p<0. 05). For those visiting public hospital, males had significantly low total cholesterol and significantly higher triglycerides as compared to females (p<0. 05) (Table 2). There was no significant difference in other parameters between males and females of the 2 hospital (p>0. 05) (Table 2). There is a significant difference in total cholesterol of males attending private hospital as against those attending public hospitals. There is no significant difference in blood parameters of public or private hospital patients (p>0. 05) (Table 2)

Nutrients	Private (n=75)		Public (n=75)	
	Males (n=49)	Females (n=26)	Males (n=49)	Females (n=25)
Carbohydrates (g/day)	253. 7±77. 1	259. 4±74. 8	247. 0±76. 3	197. 1±26. 7
Proteins (g/day)	60. 7±10. 9	58. 1±9. 5#	56. 3±9. 7	52. 9±7. 2
Fat (g/day)	58. 4±10	60. 5±9. 6	58. 0±10. 0	58. 7±8. 9
Energy (kcal/day)	1699±213	1838±181*#	1709±243	1646±214
Percentage energy from carbohydrates (%)	59. 4±15. 3	61. 5±19. 4	54. 9±12. 7	58. 0±13. 6
Percentage energy from proteins (%)	14. 5±3. 3#	13. 0±1. 7	13. 1±2. 1	12. 9±1. 1
Percentage energy from fats (%)	31. 1±5. 4#	33. 1±5. 4	29. 1±4. 0	32. 6±6. 1*
RDA energy (%)	67. 9±9. 7#	95. 5±11. 9*	71. 5±8. 2	93. 3±12. 0*
RDA protein (%)	96. 8±18. 9#	112. 5±17. 8*	95. 2±15. 9	116. 7±19. 5*

Table 3: Dietary Nutrients Intakes of Males and Females
*Data presented as Mean±SD. *p<0. 05 for comparison between males and females*
#p<0. 05 for comparison between private and public hospital

Dietary intake of the patients was also assessed carbohydrates were 250. 1±74. 8 g/day, protein was 57. 5±10 g/day, fats were 58. 7±9. 7 g/day and energy was 1718±224 kcal/day. The percentage energy intake from carbohydrates was 58. 1±15. 1%, protein was 13. 5±2. 5% and fat was 31. 0±5. 4%. Percentage RDA intake for energy was 78. 2±15. 5% and that for protein was 102. 3±19. 8%. . Table 3 gives dietary intake of cardiac patients when classified according to gender visiting 2 hospitals. As seen in Table 3, for those visiting private hospitals, females had significantly higher total energy, percentage RDA proteins and percentage RDA energy as compared to males (p<0. 05) (Table 3). For those visiting public hospitals, females had significantly higher energy from fats, percentage RDA proteins and percentage RDA energy as compared to males (p<0. 05) (Table 3). There was no significant difference in dietary intake between other dietary intake of males and females of the 2 hospitals (p>0. 05) (Table 3). As seen in Table 3, there is a significant difference in percentage energy from proteins, fats and percentage RDA energy between males attending private and public hospitals (p<0. 05). Similarly, total protein and energy intake is significantly different between (Table 3) females attending public and private hospitals (p<0. 05).

Lipid profile	Carbohydrates	Proteins	Fats	Energy	Percentage energy from carbohydrates	Percentage energy from proteins	Percentage energy from fats	RDA energy	RDA protein
Males									
HDL cholesterol	-0. 178	0. 013	-0. 14	-0. 14	-0. 175	0. 177	-0. 059	0. 086	0. 002
LDL cholesterol	-0. 065	0. 089	0. 097	0. 026	-0. 109	-0. 075	. 263*	-0. 095	-0. 013
VLDL cholesterol	-0. 015	-0. 038	-0. 091	-0. 086	-0. 167	-0. 132	0. 088	-0. 008	-0. 099
Total cholesterol	0. 04	0. 185	-0. 02	-0. 007	-0. 054	0. 162	0. 104	0. 028	0. 111
Triglyceride	-0. 03	0. 004	0. 175	0. 064	0. 111	-0. 044	-0. 056	-0. 082	0. 049
Fasting blood glucose	-0. 115	0. 134	0. 101	0. 086	0. 039	0. 06	0. 191	0. 097	0. 157
Post prandial blood glucose	-0. 153	0. 055	0. 152	0. 098	0. 129	-0. 179	0. 244	0. 165	0. 221
Females									
HDL cholesterol	. 291*	-0. 069	. 326*	. 302*	0. 232	0. 052	0. 099	-0. 055	0. 116
LDL cholesterol	0. 047	-0. 004	0. 231	0. 007	-0. 178	-0. 147	0. 278	0. 207	0. 021
VLDL cholesterol	0. 145	0. 246	0. 239	0. 232	0. 029	0. 004	-0. 144	0. 002	-0. 131
Total cholesterol	0. 169	-0. 13	-0. 134	0. 146	. 338*	0. 044	-0. 265	0. 04	0. 186
Triglyceride	0. 148	0. 271	0. 017	0. 012	0. 151	-0. 071	0. 257	0. 028	0. 187
Fasting blood glucose	0. 141	-0. 124	0. 028	-0. 121	0. 099	0. 041	0. 231	0. 22	0. 333
Post prandial blood glucose	0. 136	-0. 217	. 415*	-0. 035	0. 185	-0. 103	. 548*	0. 2	. 405*

Table 4: Correlation of Dietary Nutrients Intake with Blood Parameters in Males and Females
*Data presented as Pearson's r value. *p<0. 05*

Correlation of dietary intake with blood parameters is presented in Table 4. As seen in Table 4, there was a significant correlation of percentage energy from fats with LDL cholesterol (p<0. 05). In females, HDL cholesterol was correlated with carbohydrates, fats and

energy intake (p<0. 05) (Table 4). Total cholesterol was correlated with percentage energy from carbohydrates in females (p<0. 05) (Table 4). Post prandial blood sugar was fats, percentage energy from fats and RDA proteins in females (p<0. 05) (Table 4).

5. Discussion

There was no significant difference seen in anthropometric measurements of males and females visiting either hospitals (p>0. 05) but As seen in Table 1, there was a significant difference in height of males and females visiting public hospital as compared to private (p<0. 05). A study stated that Low fitness in adolescents and adults is common in the US population and is associated with an increased prevalence of CVD risk factors (GranataA et al, 2016).

In Table 2 it is seen that the VLDL cholesterol levels of female in private hospital is higher as compared to those of public hospitals. There was a significant difference seen in the total cholesterol, triglycerides and fasting blood glucose levels of females attending private hospital as against those attending public hospitals. A study stated that a reduction in saturated fat intake must be evaluated in the context of replacement by other macronutrients. Replacement of saturated fatty acids by PUFA and MUFA has shown to lower the levels of both LDL and HDL cholesterol (GuoK et al, 2010).

Table 3 gives dietary intake of cardiac patients when classified according to gender visiting 2 hospitals. As seen in Table 3, for those visiting private hospitals, females had significantly higher total energy, percentage RDA proteins and percentage RDA energy as compared and percentage RDA of fats to males (p<0. 05) (Table 3). A study stated that females tend to consume more energy and high levels of fats through diet as compared to males (Tania B Huedo-Medina et al, 2016).

As seen in Table 4, there was a significant correlation of percentage energy from fats with LDL cholesterol (p<0. 05). In females, HDL cholesterol was correlated with carbohydrates, fats and energy intake (p<0. 05) (Table 4). In a study it was shown that raising the CHO content of the diet increases serum triacylglycerol concentrations. As compared with starches, sugars tend to increase serum triacylglycerol concentrations by 60%. hence it was stated that the content of CHO and sugars through diet should be monitored for prevention of CHD (RubinshteinR et al, 2010).

6. Conclusion

Both in males and females cardiac patients, there is a significant association of dietary intake with lipid profile and blood sugar levels. However females are more prone than males because the levels of VLDL, TC, TG, and LDL are comparatively higher in females. Hence, Nutrition counseling and dietary interventions should be planned to improve lipids profile of cardiac patients.

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