Vol.1.Issue.2.;2013

Bulletin of Pharmaceutical and Medical Sciences (BOPAMS)
A Peer Reviewed International Journal http://www.bopams.com

Research Article

E-ISSN 2341-4103

LIFESTYLE INTERVENTIONS TO PROMOTE HEALTH IN DYSLIPIDEMICS

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Article Info:
Received: 18/06/2013
Revised from:10/07/2013
Accepted on:15/07/2013

Abstract

Fats are part of our food. Hence, lipid metabolism is a continuous process. Dyslipidemia is a condition related with metabolism. The prevalence of dyslipidemia in India is not exactly known as it usually appears as subclinical case without symptoms. Framingham Study has documented dyslipidemia as one of the factors that increase the risk of cardiovascular diseases which are major cause of mortality in the Indian subcontinent, causing more than 25% of deaths. It has been predicted these will increase rapidly in India and country will host more than half the cases of heart disease in the world within next 15 years in India. Dyslipidemia can be tackled with lifestyle changes. Both Yoga and Ayurveda stress adoption of healthy lifestyle. Lifestyle changes which can be adopted include those alleviating *Kapha, Medas* and control *Vata*. Lifestyle changes can reverse the pathology and promote the quality of life of risk group.

Key words: Lifestyle, Dyslipidemia, Ayurveda, Yoga. *Swasthya*,

Introduction and Background:

Health is a state of complete physical, mental, social well-being not merely the absence of disease or infirmity [1]. It can also be defined as a continuous process of adjustment between man and his environment where environment can both be internal and external. Health promotion has been defined by the World Health Organization's 2005 Bangkok Charter for Health Promotion in a Globalized World as "the process of enabling people to increase control over their health and its determinants, and thereby improve their health"[2]. Any disturbance or discontinuity in this adjustment can be named as ill health or abnormal health. There are various health conditions which cannot be named as diseases as such, but when neglected will lead to a battery of diseases. Dyslipidemia, a common lipid abnormality is characterized by elevated low density lipoprotein cholesterol (LDL), elevated triglycerides (TGs), or low high density lipoprotein cholesterol (HDL) [3], is one such health condition which may end up in coronary and other heart disease. Dyslipidemia is one of the leading causes of death and cardiovascular morbidity in western countries [4]. Framingham Study has documented dyslipidemia as one of the factors that increase the risk of cardiovascular diseases. Cardiovascular diseases are major causes of mortality in the Indian subcontinent, causing more than 25% of deaths. It has been predicted that these diseases will increase rapidly in India and this country will be host to more than half the cases of heart disease in the world within the next 15 years in India [5]. The prevalence of dyslipidemia in India is not exactly known as it can, most of the time, appear as subclinical case without symptoms. Lifestyle interventions demonstrated trends for better HDL in a study [6] proves dyslipidemia to be consanguineously related with lifestyle.

Foot Note: *Vata*, *Pitta* & *Kapha* are the three body humors in Ayurveda. It also describes seven *Dhatu* (~tissues types) viz*., Rasa, Rakta, Mamsa, Meda, Asthi, Majja* and *Shukra*; three main *mala* (~excreta) viz, *Mutra, Pureesha, Sweda.* Agni is responsible for digestion and metabolism. There are 13 types – A. That is responsible for digestion (one *Jatharagni*) B. Those responsible for metabolism (Seven *Dhatwagni* & five *Bhutagni*). Based on its capacity, any *Agni* is of four types – balanced, low, high and erratic. *Ama* occurs in the absence of balanced *Agni*.

Pathology of Dyslipidemia:

Dyslipidemia may be the result of over-production or lack of clearance of the lipoprotein particles, or related to other defects in the apolipoproteins or enzyme deficiencies [7]. In the clinical setting, a primary dyslipidemia typically refers to a genetic defect in the lipid metabolism as a cause of the problem.

A secondary dyslipidemia may be due to environmental factors (such as a diet rich in saturated fat or a sedentary lifestyle), diseases (such as diabetes, hypothyroidism, obstructive liver disease), and medications (such as thiazide diuretics, progestins, or anabolic steroids), which could be potentially resolved by correcting the underlying condition. Hypercholesterolaemia (high LDL) is classically seen as familial and when excess saturated fat or cholesterol is ingested [8]. Hypertriglyceridemia (high TGs) is often caused or exacerbated by obesity, and sedentary habits [9]. Smoking is one of the important causes for Hypoalphalipoproteinemia (low HDL) [10].

Ayurveda considers *Medas* as the body fat. *Majja* is typically the skeletal muscle fat [11]. But due to the similarities they share, *Medas*, most of the time, is synonymous with *Majja* or *Majja* is merged with the *Medas*. Both *Kapha* and *Medas* share same qualities like *Snigdha* (oily/unctuous), *Shaitya* (cold), *Shouklya* (~white), *Gourava* (heavy for digestion), *Madhurya* (sweet), *Shaithilya* (~loose/lax). It is the reduced functioning ability of *Dhatvagni* that causes *Ama* leading excess of *Medas* and various diseases as its complication. Wrong lifestyle practice causing over nutrition leads to excess of *Medas* [12].

Faulty lifestyle, highway to dyslipidemia

Lifestyle is the way in which a person lives [13]. Ayurveda opines that the way of living is the reason for both health and disease. Not following the prescribed daily / seasonal regimen, dietary rules and regulations, having sedentary lifestyle all lead to disturb the level of health. Almost 95% of diseases all over the world are caused by a "faulty lifestyle", says a latest book on the effect of lifestyle on people's health [14]. A faulty lifestyle also includes eating the wrong food at the wrong time at the wrong place, in a wrong manner, in a wrong dose, in a wrong environment, excess consumption of alcohol, sedentary life and so on. There are lots of researches which have proved that a faulty lifestyle ends up in various health conditions leading to diseases. This is an important and common cause for dyslipidemia.

Faulty Food habits:

Nutrition or the foods that we eat determines body's internal chemistry and that chemistry determines, in large part, the quality and resiliency of virtually every organ, cell and system in the body. There are certain dietary habits which increase the body's oxidative stress there by leading to dyslipidemia and further its complications. Oxidative modifications of LDL represent an early stage of atherosclerosis, and small, dense LDL is more susceptible to oxidation than larger, more buoyant particles. Oxidized LDL is independent predictors of subclinical and clinical atherosclerosis [15]. Some of the important dietary causes to disturb lipid levels are enlisted in Ayurveda as those causing increase *Medas*. *Ati Snigdha* (too much of oily foods), *Madhura* (excess sweet), *Guru* (heavy to digest or satiating), *Pichchila* (slimy or sticky), *Goudika* (sugar, jaggery and their preparations), *Paishtika* (~refined flour), *Navanna* (newly harvested grains) and *Nava Madya* (newly prepared alcoholic preparations); in short, foods and regimen those increase *Kapha* and *Santarpaka* (~nourish the body) [16] are the probable etiology of dyslipidemia. Various researches have proved long term use of saturated fats raise the LDL level. Long term use of Vanaspati in food, a weakness for fast food, regular consumption of deep fried foods, having a sweet tooth, too much of Simple/refined carbohydrate in diet, frequent munches at desk/car/when stressed are also other important accepted causes.

Vanaspati, hydrogenated plant oil, is a trans fat. Trans fat behaves like saturated fat by raising the level of LDL, but, unlike saturated fat, it has the additional effect of decreasing levels of HDL. The net increase in LDL/HDL ratio with trans fat is approximately double to that due to saturated fat [17]. Fast foods are usually prepared out of trans fats (typically hydrogenated or partially hydrogenated vegetable oils) to increase the shelf life of processed food. The trans fats are saturated due to the hydrogenation and hence are atherogenic. The ingestion of

deep-frying oil elevates oxidative stress [18] which is a pathology involved in dyslipidemia. Consuming lot of added sugar increases chance for dyslipidemia. Fructose is a monosaccharide found in large quantities in nearly all added sugars. Fructose has been shown to increase de novo lipogenesis in the liver, hepatic triglyceride synthesis, and secretion of very low-density lipoproteins. Fructose also appears to decrease the peripheral clearance of lipids [19]. Sweets also are prepared out of sucrose (the refined, highly processed and crystallized version of plant sugars). The human body evolved with a limited ability to break down sugar, and very limited access to it in concentrated forms, so processing the comparatively giant loads we consume nowadays puts a huge strain on our systems. Excess sugar loiters in the blood and causes trouble by glomming onto protein molecules, accelerating process called glycosylation. It spawns oxidative stress [20]. Too much of Simple/refined carbohydrates like maida, corn, cola and other carbonated drinks go through a manufacturing process that breaks down the complexity of their natural chains. This allows them to be digested quickly, rapidly increasing serum blood glucose levels. The body, in response, releases insulin to try to return it back to a state of homeostasis. After meeting the body cells' immediate energy needs and reaching glycogen storage capacity, the body has a third path to accommodate excess sugar. The insulin allows the entry of glucose into fat cells by converting it into triglycerides in the liver [21]. Stress hormones are automatically released by the body under all kinds of stressful circumstances. They are antithetical to digestion in a couple of ways. First, the release of adrenaline and cortisol divert blood toward limbs and away from stomach and intestines, which hinder the intestines' ability to break down food and absorb nutrients. As a result, digestion grinds to a halt and food ferments, sending unusual metabolites into the bloodstream, explains Kevin Spelman, a research scientist in the Department of Biochemistry at the University of North Carolina in Greensboro [22].

Sedentary life -dyslipidemia

Sedentary lifestyle is that with no or irregular physical activity. There is no doubt that being physically active aids health. Ayurveda very clearly mentions that *Chesta Dewsha* (~sedentary lifestyle) will lead to increase in *Kapha* and *Medas* and also various diseases related with over nutrition [23]. Once the consumed macronutrients are not converted into energy and used up, they tend to get settled as triglycerides in adipose tissue especially in skeletal muscles. Lack of exercise leads to diminished mitochondrial lipid oxidation**.** The hampered skeletal muscle lipid turnover leads to hypertriglyceridemia. Many studies also have proved that sedentary lifestyle is important cause for cardiovascular diseases.

Lifestyle changes can promote health in dyslipidemics: A healthy lifestyle involves right quantity and quality of food and regular exercise which helps a person to be in complete state of physical, social and mental well being, whilst having the ability to meet the demand of the environment without undue fatigue. Lifestyle intervention is an important factor in dyslipidemics to prevent its complications from occurring. As the verse goes 'A stitch in time saves nine', lifestyle intervention is a savior for dyslipidemics. "Following of daily and seasonal regimen is the best lifestyle that can be adopted by a person to be healthy" says Ayurveda.

Unsaturated fats should always be opted instead of saturated fats. Flax seed oil [24], [25], sesame oil [26] are among the list. Consumption of trans fat must be avoided by avoiding processed foods, fast foods. Complex carbohydrates should be considered over simple and refined carbohydrates [27] like par boiled rice, millets, legumes. Ayurveda emphasizes upon consumption of *Purana Shali* (old rice), *Yava* (~barley), *Purana Godhuma* (old wheat), *Jurna* (maize), *Kudhanya*/*Trunadhanya* (various millets), legumes like *Kulattha* (horse gram), *Mudga* (green gram) etc. The rate of the small intestine amylolytic digestion appears to be a major determinant of the glycemic response. Foods such as legumes appear to be digested less rapidly than many cereal foods although, even amongst these, large differences in rates of in vitro digestion exist. Studies on diabetes using high fibre, high legume diets have almost uniformly noted improvements in glycemic control and blood lipid profile. The reasons for the altered rates of digestion include fibre, food form, the nature of the starch, antinutrients etc. Through reducing the rate of digestion of starchy foods post prandially "slow release" starchy foods blunt many gut hormone responses, and prolong free fatty acid and ketone body suppression. In addition, increased starch losses to the colon may enhance production of short chain fatty acid. All these events may modify carbohydrate and lipid metabolism. Many foods which produce these effects are traditional starchy foods. Ample of vegetables other than potato and sweet potato must be consumed instead of red meat [28]. Choosing fruits over juices and other soft drinks is also required here. Among the fruits *Amalaki* [29] (Indian

gooseberry) is best opted here. Milk [30] and buttermilk [31] can also be considered. Milk has a good amount of anti-oxidants. Ayurveda has clearly explained the action of buttermilk on *Medas*. It reduces both *Kapha* and *Medas* due to its qualities like *Kashaya Rasa* (Astringent flavour), *Rooksha Guna* (~capacity to produce dryness/remove fat); corrects *Agni*; removes *Ama* due to its *Laghu* (~capacity to cause lightness) – *Rooksha* qualities. Apt quantities of macronutrients have to be consumed based on one's need and digestive capacity. Excess macronutrients, if not used as energy form, gets deposited as fat thus disturbing the lipid levels. Inclusion of deep fried foods in diet ought to be stopped. Eating at right time and avoiding dietary irregularity [32] is very much needed. Consumption of alcohol in moderation though increases HDL-C and its subfractions, excessive consumption of it is a time tested cause for cardiovascular disease by its destructive effect on liver cells. This risk increases with increasing daily intake. Drinking alcohol outside mealtimes and drinking multiple different alcoholic beverages both increase the risk of developing alcohol induced liver damage [33]. Thus this has to be avoided.

Rasayana is a gift of Ayurveda to the field of preventive medicine. It not only prevents diseases but also promotes health. It will also act as medicine in treatment of disease. Thus it acts both as promotive/preventive and curative [34]. Adoption of *Rasayana* wisely on daily basis gives longevity, enhances memory, intellect, vitality, colour, complexion, vigor, strength and capacity of body and sense organs [35]. It prevents quite a number of diseases including cardiovascular diseases. It has been also proved beneficial in dyslipidemia. Some of the *Rasayana* have a very high anti-oxidant activity34 due to presence of flavonoids and tannins. *Rasayana* those can be included in daily food are *Amalaki* [36], [37], [38] and milk [39] regularly.

Every one should have a physically active life. Exercise reduces *Kapha* and *Medas*. During exercise, there is oxidation of triglycerides and the exercising muscle will use up the free fatty acid. The level of triglycerides is inversely related to HDL levels. Endurance exercises have a greater impact on controlling dyslipidemia. Yoga is a kind of endurance exercise that can be easily adopted on daily basis. Research studies have proved Yoga has a beneficial effect in dyslipidemia. Practice of *Asana* like *Uttanasana*, *Mandukasana, Ustrasana, Yogamudrasana, Matsyendrasana, Paschimottanasana, Bhujangasana, Sarvangasana, Halasana, Uddiyana, Ardhamatsyendrasna, Dhanurasana, Shalabhasana, Sarpasana* and *Chakrasana* for 40 minutes; *Pranayama* like *Rechaka-Puraka, Rechaka Puraka* with *Kumbhaka, Suryabedha Chandrabedha, Suryabedha Chandrabedha* with *Kumbhaka,* and *Kapalabhati* for 10 minutes each, and at the end *Shavasana* for another 10 minutes have proved beneficial in dyslipidemia [40]. It increases HDL and decreases triglycerides. The reduction in triglycerides and increase in HDL could be due to hydrolysis of triglyceride rich lipoproteins that simultaneously replace intramuscular fat used during *Pranayama* and Yogic practices.

CONCLUSION

Dyslipidemia, a health condition and important modifiable risk factor for cardiovascular diseases, is greatly influenced by behavioural factors like diet and lifestyle. Appropriate dietary habits, adoption of regular exercise practice, avoidance of too much of alcohol consumption all play key role in reversal of pathology. Lifestyle intervention at population level to those with dyslipidemia prevents the formation of atherosclerotic flakes in arteries. It is also expected to reverse the formation of atherosclerosis. It will have profound beneficiary effects in preventing and controlling cardiovascular diseases.

REFERENCES

[1]. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

[2]. Participants at the 6th Global Conference on Health Promotion. The Bangkok Charter for health promotion in a globalized world. Geneva, Switzerland: World Health Organization, 2005 Aug 11. [Cited 2013 Jan 6] Available from: http://www.who.int/healthpromotion/conferences/6gchp/hpr_050829_%20BCHP.pdf

[3]. Mohiuddin SM et al. Efficacy and safety of ABT-335 (fenofibric acid) in combination with simvastatin in patients with mixed dyslipidemia: a phase 3, randomized, controlled study. Am Heart J. (serial on the Internet) 2009 [Cited 2013 Jan 4]; 157:195-203. Available from http://www.ncbi.nlm.nih.gov/pubmed/19081418

[4]. Yingying Liu et al. The characteristics of dyslipidemia patients with different durations in Beijing: a cross-sectional study. Lipids in Health

and Disease (serial on the Internet) 2010 [Cited 2013 Jan 2]; 9:115. Available from: http://www.lipidworld.com/content/9/1/115

[5]. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart (British Cardiac Society) (serial on the Internet) 2008 [cited 2013 jan 6]; 94(1):16-26. Available from: http://ukpmc.ac.uk/abstract/MED/18083949;jsessionid=675A30EE4915FE3BA1DF4889F2F17DC6.jvm4 .

[6]. Whittemore R et al. Translating the diabetes prevention program to primary care: A pilot study. Nurs Res (serial on the Internet) 2009 [Cited 2013 Jan 5]; 58:2-12. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2689783/?tool=pubmed

[7]. Kori J. Kingsbury, Greg Bondy. Understanding the Essentials of Blood Lipid Metabolism. Medscape news. [Cited 2013 Jan 9] Retrieved from http://www.medscape.com/viewarticle/451762_7

[8]. BMJ Group (Homepage on the Internet). Hypercholesterolaemia. [Updated 2013 Jan 18; cited 2013 Jan 19]. BestPractice; [about 30 screens]. Available from: http://bestpractice.bmj.com/best-practice/monograph/170/basics/pathophysiology.html

[9]. Elena Citkowitz. Hypertriglyceridemia. Medscape Reference (Updated 2012 Aug 2; Cited 2013 Jan 7). Retrieved from http://emedicine.medscape.com/article/126568-overview

[10]. Vibhuti N Singh. Low HDL Cholesterol (Hypoalphalipoproteinemia). Medscape Reference (Updated 2011 Dec 29; Cited 2013 Jan 7). Retrieved from http://emedicine.medscape.com/article/127943-overview

[11]. Sharirasthana; Garbhavyakarana Adhyaya: Ch.4, Verse 12-13. in: Shastri A, (ed,11th ed.), Sushruta Samhita of Sushruta. Varanasi: Chaukhambha Sanskrit Sansthan, 1997; 30.

[12]. Sutrasthana; Doshadhatumalakshayavruddhi Vijnaneeya Adhyaya: Ch.15, Verse 37. in: Shastri A, (ed, 11th ed.), Sushruta Samhita of Sushruta. Varanasi: Chaukhambha Sanskrit Sansthan, 1997; 62.

[13]. Oxford dictionaries [Internet]. Oxford University Press. (Cited 2013 Jan 4). Available from: http://oxforddictionaries.com/definition/english/lifestyle

[14]. Almost 95% Diseases Caused by "Faulty Lifestyle". Oneindia news [Internet]. 2006 May 29 [Cited 2013 Jan 5]. Available from: http://news.oneindia.in/2006/05/28/almost-95-per-cent-diseases-caused-by-faulty-lifestyle-1148881966.html

[15]. Manfredi Rizzo et al. Atherogenic dyslipidemia and oxidative stress: a new look. Translational Research, May 2009 [Cited 2013 Jan 6]; 153(5):217-223. Available from: http://www.translationalres.com/article/S1931-5244(09)00013-9/abstract

[16]. Sutrasthana. Santarpaneeyamadhyaya; Ch.23, Verse 3-4. in: Acharya J T, (ed, 4th ed). Charaka Samhita of Agnivesa. Varanasi: Chaukhamba Surbharati Prakashan, 1994; 122.

[17]. Ascherio A, Katan MB, Zock PL, Stampfer MJ, Willett WC. Trans fatty acids and coronary heart disease. N Engl J Med [Serial on internet] 1999 Jun [Cited 2013 Jan 9]. 340 (25): 1994–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/10379026

[18]. Yen PL, Chen BH, Yang FL, Lu YF. Effects of deep-frying oil on blood pressure and oxidative stress in spontaneously hypertensive and normotensive rats. Nutrition. [Serial on internet] 2010 Mar [Cited 2013 Jan 9]; 26(3):331-6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19592221

[19]. Welsh JA et al. Caloric sweetener consumption and dyslipidemia among US adults. JAMA [Serial on internet] 2010 April [Cited 2013 Jan 6]; 303(15): 1490–7. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3045262/

[20]. Catherine Guthrie. Food habits that Age You. Experience life [Serial on internet] 2008 July-Aug [Cited 2013 Jan 6]. Available from: http://experiencelife.com/article/food-habits-that-age-you/

[21]. National Council on Strength & Fitness [home page on the Internet]. Converting Carbohydrates

to Triglycerides. [Cited 2013 Jan 9]. Retrieved from http://www.ncsf.org/enew/articles/articles-convertingcarbs.aspx

[22]. Catherine Guthrie. Food habits that Age You. Experience life [Serial on internet] 2008 July-Aug [Cited 2013 Jan 6]. Available from: http://experiencelife.com/article/food-habits-that-age-you/

[23]. Sutrasthana.. Santarpaneeyamadhyaya; Ch.23, Verse 4-5. in: Acharya J T, (ed , 4th ed.), Charaka Samhita of Agnivesa. Varanasi: Chaukhamba Surbharati Prakashan, 2000; 122.

[24]. Dennys E.C. Cintra et al. Lipid profile of rats fed high-fat diets based on flaxseed, peanut, trout, or chicken skin. Nutrition [Serial on internet]. 2006 Feb [cited 2013 Jan 13]; 22(2):197-205. Available from: http://www.nutritionjrnl.com/article/S0899-9007(05)00293-5/abstract

[25]. Charles R.H. et al. Flaxseed Oil Increases the Plasma Concentrations of Cardioprotective (n-3) Fatty Acids in Humans. J Nutr [Serial on internet]. 2006 Jan [Cited Jan 13] 136(1): 83-87. Available from: http://jn.nutrition.org/content/136/1/83.long

[26]. Bhaskaran S, Santanam N, Penumetcha M, Parthasarathy S. Inhibition of Atherosclerosis in Low-Density Lipoprotein Receptor-Negative Mice by Sesame Oil. J Med Food [Serial on internet]. 2006 winter [cited 2013 Jan 13]; 9(4): 487-490. Available from: http://online.liebertpub.com/doi/abs/10.1089/jmf.2006.9.487

[27]. Jenkins DJ et al. Starchy foods and fiber: reduced rate of digestion and improved carbohydrate metabolism. Scand J Gastroenterol Suppl [Serial on internet]. 1987 [cited 2013 Jan 13], 22(129): 132-141. Available from: http://informahealthcare.com/doi/pdf/10.3109/00365528709095867

[28]. Azadbakht L and Esmaillzadeh A. Red Meat Intake Is Associated with Metabolic Syndrome and the Plasma C-Reactive Protein Concentration in Women**.** J Nutr [Serial on internet]. 2009 Feb [cited 2013 Jan 13]; 139 (2): 335-339. Available from: http://jn.nutrition.org/content/139/2/335.short

[29]. Sutrasthana. Astouninditeeyamadhyaya; Ch.21, Verse 26. in: Acharya J T, (ed, 4th ed.), Charaka Samhita of Agnivesa. Varanasi: Chaukhamba Surbharati Prakashan, 1994; 117.

[30]. Artym J. A remedy against obesity? The role of lactoferrin in the metabolism of glucose and lipids. Postepy Hig Med Dosw (Online) {Serial on the internet]. 2012 Nov [cited 2013 Jan 13]; 22(66):937-53. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23175349

[31]. Sutrasthana. Dravadravyavidhimadhyaya**;** Ch 45, Verse 84. in: Acharya J T, Acharya N R, (Eds). Sushruta Samhita of Sushruta. Varanasi: Chaukhambha Surbharati Prakashan, 2003; 203

[32]. Anju. P. R, Shyam Prasad. M, Chandola H.M. A comprehensive survey study on impact of demographic, genetic, dietary and other lifestyle factors on the incidence and prevalence of Kapha-medo Margavarana (Hyperlipidemia). Indian Journal of Ancient Medicine and Yoga [serial on the internet]. 2011 April – June [cited 2013 Jan 13]; 4 (2):77-87. Availabe from: http://rfppl.com/subscription/upload_pdf/art%205_43e.pdf

[33]. Bellentani S. et al. Drinking habits as cofactors of risk for alcohol induced liver damage. *Gut* [serial on the internet]. 1997 [cited 2013 Jan 13]; 41:845-50 Available from: http://gut.bmj.com/content/41/6/845.short

[34]. Chikitsasthana; Rasayanadhyaya; Prathama Pada; Ch.1, verse 5. in: Acharya J T (ed, 5th ed.). Charaka Samhita by Agnivesha. Varanasi: Chaukhambha Sanskrit Sansthan, 2001; 376.

[35]. Chikitsasthana. Rasayanadhyaya; Prathama Pada; Ch.1, verse7-8. . in: Acharya J T (ed, 5th ed.). Charaka Samhita by Agnivesha. Varanasi: Chaukhambha Sanskrit Sansthan, 2001; 376.

[36]. Govindarajan R., Vijayakumar M., Pushpangadan P. Antioxidant approach to disease management and the role of 'Rasayana' herbs of Ayurveda. J Ethnopharmacol [serial on the internet]. 2005 June [cited 2013 Jan 13]; 99 (2):165–78. Available from:http://www.sciencedirect.com/science/article/pii/S037887410500228X

[37]. Khopde S.M. et al. Characterizing the antioxidant activity of amla (Phyllanthus emblica) extract**.** Current Science [serial on the internet].

2001 July 25 [cited 2013 Jan 13]; 81(2): 185-190. Available from:http://www.iisc.ernet.in/currsci/jul252001/185.pdf

[38]. Antony B, Merina B, Sheeba V, Mukkadan J. Effect of standardized Amla extract on atherosclerosis and dyslipidemia. Indian J Pharm Sci [serial on the internet]. 2006 [cited 2013 Jan 24]; 68:437-41. Availablefrom: http://www.ijpsonline.com/text.asp?2006/68/4/437/27814

[39]. Helena L-Månsson and Åkesson B. Antioxidative factors in milk. Br J Nutr [serial on the internet]. 2000 Nov [cited 2013 Jan 13]; 84(Suppl 1):103-10. Available from: http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=886956.

[40]. Prasad K.V.V., Madhavi Sunita, Sitarama Raju P., Venkata Reddy M., Sahay B.K., Murthy K. J. R. Impact of Pranayama and Yoga on Lipid Profile in Normal Healthy Volunteers**.** Journal of Exercise Physiology (online) [serial on the internet]. 2006 Feb [cited 2013 Jan 13]; 9(1):1-6. Available from:http://faculty.css.edu/tboone2/asep/PrasadV2.pdf