

## EFFECT OF SUPPLEMENTATION OF PROBIOTIC CURD ON LIPID PROFILE AND BODY WEIGHT IN HYPERCHOLESTEREMIC SUBJECTS

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**Abstract:** *Considering various health benefits of probiotics on host in protecting against harmful microorganisms and lowering the cholesterol, the present study has been carried out to examine the effect probiotic curd (dahi) on the blood lipid profile and body weight in hypercholesteremic subjects. Study shows a significant reduction in the lipid profile parameters (TC, TG, HDL-C and LDL-C) and body weight upon supplementation of probiotic curd. Total Cholesterol levels decreased from  $206.50 \pm 21.59$  to  $189.30 \pm 18.96$  ( $p < 0.01$ ), Triglycerides from  $242.80 \pm 74.38$  to  $222.7 \pm 69.0$  ( $p < 0.01$ ) and LDL cholesterol non-significantly decreased from  $107.94 \pm 15.86$  to  $91.96 \pm 10.64$  whereas HDL cholesterol increased significantly from  $50.00 \pm 2.48$  to  $52.80 \pm 2.42$ . It also showed positive significant reduction in body weight from  $62.00 \pm 4.79$  kg to  $60.80 \pm 4.66$  kg. Thus, results of this study showed encouraging effects of specific probiotics as food supplements in altering the lipid levels in hypercholesteremic subjects.*

**Keywords:** Probiotic curd, Lipid profile, Hypercholesteremic subjects

### INTRODUCTION

Hyperlipidemia associated with high levels of cholesterol has been widely recognized as an influential risk factor for the development of cardiovascular diseases (CVD) such as atherosclerosis, coronary heart diseases, and hypertension [1]. It will remain the leading cause of death and will affect approximately 23.6 million people globally by 2030 [2]. It has been stated that even a 1% reduction in serum cholesterol could reduce the risk of coronary heart disease by 2-3% [3]. Hypercholesterolemia contributed to 45% of heart attacks in Western Europe and 35% of heart attacks in Central and Eastern Europe from 1999 to 2003 [4,5]. The WHO delineated that unhealthy diets such as those high in fat, salt, and free sugar and low in complex carbohydrates lead to an

increased risk of cardiovascular diseases [6].

Probiotics are “live micro-organism that when consumed in sufficient numbers provide health benefits to the host” now widely used in many countries by consumers and in clinical practice [7]. These probiotic micro-organisms modulate the activity of immune system. Moreover, Lactobacilli and Bifidobacteria is quite safe are well known for their survival and ability to adhere with gut wall make them potential probiotic conditions. Apart from this Lactobacilli species were known for a number of beneficial effects like improve immunity and protection against harmful microorganisms [8], synthesis of antihypertensive and antioxidative effects, anticarcinogenic properties [9,10] and prevention against gastrointestinal disease [11], synthesis of

vitamins [12] ability to deconjugate bile salts thus lowering cholesterol absorption [13].

The present study focuses on the effect of consumption of probiotic curd/*dahi* containing *Lactobacillus acidophilus* as a food supplement on lipid profile i.e. Total Cholesterol, Triglycerides Low and High Density lipoproteins (TC, TG, LDL and HDL-C) and body weight in normal and hypercholesteremic subjects.

## MATERIALS & METHODS

**Subjects:** Fifty hypercholesterolemic and normocholesterolemic male and female volunteers aged between 30 to 60 years were recruited from local population of Deesa city, Banaskantha district, Gujarat, India. They were randomly divided into two groups. First group i.e. experimental group consist of 40 subjects and the latter group consisting 10 subjects i.e. controlled group (Table 1). The subjects were explained about the risk of hypercholesterolemia and the beneficial role of the supplement *L. acidophilus* and the informed consent was obtained from all subjects before the commencement of the study. The subjects were advised not to take high cholesterol diet i.e. fried foods, butter, ghee, egg yolk, etc. During the experimental period they were restricted and to avoid smoking, consumption of alcohol. The subjects in experimental group were advised to continue their habitual diet along with 100g “Probiotic dahi” containing *Lactobacillus acidophilus* strain (Nesvita – Nestle India Limited product) as part of afternoon meal continuously for 30 days. Similarly, the subjects in controlled group were also supplemented with same quantity of “Slim dahi” (Product of Nestle India Limited) which is devoid of this strain. The subjects were also advised not take any hypocholesterolemic medication for 3 weeks and not to consume even fresh *dahi* for 2 weeks before the commencement of the study. The subjects having any secondary complications like hypertension, hypothyroidism and diabetes were excluded from the study. A structured dietary questionnaire was used to record their habitual dietary pattern, physical activity, smoking and drinking habits, etc.

**Laboratory Investigations:** Fasting blood samples were collected for lipid profile analysis

at 0 and 30 days. Similarly body weight of the each subjects were also measured at the beginning and at the end of the study (after 30 days). Total cholesterol [14], triglyceride [15], high density lipoprotein cholesterol [16] were estimated using vitros® dt60 ii chemistry system and serum LDL cholesterol was calculated using formulae [17] body weight of the subjects was measured using a calibrated digital balance.

## RESULTS

The bodily examination and initial blood sample reports showed that all the subjects are free from problems like cardiovascular disease, diabetes and thyroid disorder (Table 1).

**Total cholesterol:** The results depicted in Table 2 revealed that supplementation of probiotic dahi containing *L. acidophilus* to experimental group for 30 days, the serum total cholesterol levels were significantly decreased by 11.28% ( $p < 0.01$ ). This decrease in trend was found to be similar to that of control i.e., subjects that was on Slim dahi which also resulted in a non-significant reduction (-6.9%) of total cholesterol (Table 3). Thus, the findings indicate that the daily consumption of probiotic dahi containing *acidophilus* strain is beneficial in reducing cholesterol but probiotic dahi has more potential to reduce total cholesterol concentration as compared to control dahi.

**Triglycerides:** The triglyceride levels were also significantly ( $p < 0.01$ ) lowered (9.16%) in the subjects of experimental group who consumed a probiotic dahi (Nesvita) for 30 days (Table 2). Similar non-significant trend of reduction (-3.45%) in serum triglyceride concentration was also observed in subjects of control group who were supplemented with Slim dahi (Table 3). Thus, results indicated the beneficial effects of both, probiotic curd and slim dahi but the Probiotic dahi (Nesvita) has more potential to reduce triglycerides levels than slim dahi.

**HDL-cholesterol:** A perusal of Table 2 with respect to HDL cholesterol indicates that the levels were significantly ( $p < 0.01$ ) increased (11.00%) in the experimental group supplemented with Probiotic Dahi for 30 days. Similarly, in subjects of control group, the HDL-

Group	Type of Supplementation	Number of subjects	Male	Female
Experimental	Probiotic curd*	40	15	25
Control	Slim curd*	10	6	04

**Table 1:** Base line characteristics of the subjects under the study. \* Nestle India Limited product

Measures	Baseline	After 30 days treatment	% Change
Total cholesterol	195.00±6.64	172.05±5.88**	-11.28±1.58
Triglycerides	139.05±9.08	124.20±8.17**	-9.16±2.53
HDL-cholesterol	44.23±1.67	48.23±1.40**	+11.00±2.14
LDL-cholesterol	122.97±5.79	98.99±4.96**	-18.66±2.45
Body weight	73.18±2.65	71.70±2.73**	-2.24±0.44

**Table 2:** Metabolic parameters of Lipid profile (mg/dL) and body weight (kg) of subjects supplemented probiotic dahi for 30 days. Values in the table represents the Mean ± SEM, P d\*\*0.05\*; Pd\*\*0.01\*\*

Measures	Baseline	After 30 days treatment	% Change
Total cholesterol	206.50±21.59	189.30±18.96	-6.90±4.31
Triglycerides	242.80±74.38	222.70±69.03	-3.45±9.03
HDL-cholesterol	50.00±02.48	52.80±02.42*	+5.97±1.83
LDL-cholesterol	107.94±15.86	91.96±10.64	-4.70±12.96
Body weight	62.00±04.79	60.80±04.66**	-1.88±0.41

**Table 3:** Metabolic parameters of Lipid profile (mg/dL) and body weight (kg) of subjects supplemented slim dahi for 30 days consumption. Values in the table represents the Mean± SEM, P d\*\*0.05\*; Pd\*\*0.01\*\*

cholesterol concentration was also increased (5.97%) significantly ( $p < 0.05$ ) after application of slim dahi for 30 days (Table 3). Thus, findings of this study indicates that both, probiotic and slim dahi had shown positive impact on HDL-cholesterol but probiotic dahi had shown more potential to improve the HDL cholesterol level as compared to slim dahi.

**LDL-cholesterol:** LDL-cholesterol levels were also decreased (-18.66%) significantly ( $p < 0.01$ ) on supplementation of probiotic dahi for 30 days in experimental subjects (Table 2). This non-significant decrease (4.70%) in trend was found to be similar to that of control i.e., subjects that was on slim dahi for 30 days (Table 3).

Thus, the present study indicated a beneficial effect of probiotic dahi and slim dahi but more significant beneficial effect of supplementation was observed in probiotic dahi than slim dahi.

**Body weight:** Body weight of the subjects of both the group supplemented with probiotic and slim dahi for 30 days showed significant reduction of 2.24% ( $p < 0.01$ ) in experimental group (Table 2) and 1.88% ( $p < 0.01$ ) in control group (Table 3). Thus, it is clearly demonstrated that the supplementation of Probiotic dahi as well as slim dahi have a beneficial effects on body weight reduction in subjects.

## DISCUSSION

The present study advocate that serum cholesterol and triglycerides decreased significantly with a significant increase in HDL cholesterol. The reason for the hypocholesterolemic effect of *L. acidophilus* might be due to inhibition of 3-hydroxy, 3-methylglutaryl coenzyme A reductase, which is a rate limiting enzyme in endogenous cholesterol biosynthesis in the body and also by deconjugation of bile acids in the intestine which is an important mechanism in reducing the cholesterol concentrations [18]. Increased deconjugation of bile acids could also result in the greater excretion of bile salts from intestinal tract which stimulates the synthesis of replacement of bile salts from cholesterol, thus providing the potential to reduce the cholesterol levels in the body [19,20]. The effect of lactobacilli on triglycerides could be due to the action of lipase from the lactobacilli, which breaks the larger molecular fats into simple and easily digestible substrates i.e., fatty acids and glycerol [21]. The existing findings indicate that the observed hypocholesterolemic effect is somehow dependent on the presence of the bacteria in the product. An increase in HDL cholesterol may be due to fermentation of the microflora. An ability of certain strains of lactobacilli to assimilate cholesterol in the presence of bile acids has been demonstrated and suggests a

possible association between gut microflora and cholesterol absorption [22]. The viability of fermenting bacteria strain in the human gut and ultimately the ability to colonize the small intestine, where most of the absorption of cholesterol takes place, could be expected to be important for the effect.

Moreover, the results of the present study also indicates that the supplementation of Probiotic dahi as well as Slim dahi have a beneficial effects on body weight reduction in subjects. The reasons for the reduction in body weights may be due to leptin lowering effects of probiotic bacteria which leads to weight reduction in the subjects [23, 24].

### CONCLUSIONS

From this study, it can be concluded that supplementation of probiotic dahi containing *L. acidophilus* for a period of 30 days is beneficial but more effective and remarkable changes in serum lipid profile could be seen in longer period. Further studies are necessary to understand the effects of long time and sustaining supplementation of the *Lactobacillus* supplementation after withdrawing from subjects. Also such studies underline for the beneficial effects of supplementation of *L. acidophilus* as a food supplement to control the abnormal lipid levels of the hypercholesterolemic subjects. These observations along with physical exercise to the patients may prove beneficial in minimizing the rate of CHDs.

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