International Journal of Food Science and Nutrition
ISSN: 2455-4898; Impact Factor: RJIF 5.14
Received: 15-11-2019; Accepted: 16-12-2019
www.foodsciencejournal.com
Volume 5; Issue 1; January 2020; Page No. 75-81

Comparative study on the health status of diabetic patient and non- diabetic people, age group of (40-55 years) after Intake garlic as a Probiotic

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Abstract
Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Several pathogenic processes are involved in the development of diabetes. Garlic is one of the oldest cultivated plants all over the world, and is regarded as food as well as traditionally a medicine. Garlic extract is a compound of various biological activities, and proved to be beneficial for human bodies due to its antimicrobial, antioxidant, anticarcinogenic, antimutagenic, antiasthmatic, immunomodulatory, and prebiotic effects. Previous studies have already demonstrated that it can reduce the level of blood pressure and cardiovascular events in severe hypertensive patients. Also, it might play positive roles in the primary prevention of colorectal cancer and cardiovascular mortality, although the effects were not completely confirmed. Currently, garlic extract is becoming one of the most extensively studied drugs, and the positive effects of garlic supplements on blood glucose control and liquid regulation were further reported, which attracted more and more attention from researchers. A series of randomized controlled trials (RCTs) of high quality were designed to investigate its efficacy in the management of T2DM during last the decades. As a promising traditional food and medicine, together with its potential advantages of multiple targets, wide distribution, low cost, and rare complications, garlic would have a very important and significant influence on current clinical management of T2DM if its efficacy were confirmed. However, due to the limited sample size and verified outcomes, there is not yet a comprehensive and quantitative analysis with high reliability. Therefore, a meta-analysis through identifying all available RCTs was conducted to evaluate systematically the efficacy and safety of garlic supplements in the management of T2DM on blood glucose, as well as blood liquids including total cholesterol, triglyceride, high density lipoprotein (HDL), and low density lipoprotein (LDL) regulation

Keywords: diabetes, health status, LDL, HDL, TG, garlic, probiotic

Introduction
Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Several pathogenic processes are involved in the development of diabetes.

According to the analysis results of global data, the prevalence of diabetes mellitus in adults was about 153 million in 1980 and 347 million in 2008. It is estimated to increase to 439 million in 2030, with a 69% increase in developing countries and 20% in developed countries. Among those cases, type 2 diabetes mellitus (T2DM) typically occurred in overweight young adults as well as aged populations, with the underlying mechanism a relative deficiency of insulin due to abnormal insulin sensitivity and insulin resistance involving various transport pathways and key molecules. As a common chronic disease, T2DM easily induces age-matched disabilities and multiple organ dysfunctions or failure. Meanwhile, the problem of T2DM-induced depression is also proposed and focused on in recent years. It was reported that one in four patients suffered clinically significant depression, and that the depression could even adversely affect the course and increase the risk of T2DM-related complications. In most standard guidelines for T2DM medical care, comprehensive treatment including diet control, exercise, drug intake, insulin injection, and sometimes bariatric surgery were recommended, with confirmed efficacy. However, taking hypoglycemic drugs would be still a major and popular choice due to its flexibility and low cost for a long time, especially in developing countries where more and more newly diagnosed T2DM may emerge.

Garlic and diabetes
Garlic is one of the oldest cultivated plants all over the world, and is regarded as food as well as traditionally a medicine. Garlic extract is a compound of various biological activities, and proved to be beneficial for human bodies due to its antimicrobial, antioxidant, anticarcinogenic, antimutagenic, antiasthmatic, immunomodulatory, and prebiotic effects. Previous studies have already demonstrated that it can reduce the level of blood pressure and cardiovascular events in severe hypertensive patients. Also, it might play positive roles in the primary prevention

of colorectal cancer and cardiovascular mortality, although the effects were not completely confirmed.

Currently, garlic extract is becoming one of the most extensively studied drugs, and the positive effects of garlic supplements on blood glucose control and liquid regulation were further reported, which attracted more and more attention from researchers. A series of randomized controlled trials (RCTs) of high quality were designed to investigate its efficacy in the management of T2DM during last the decades. As a promising traditional food and medicine, together with its potential advantages of multiple targets, wide distribution, low cost, and rare complications, garlic would have a very important and significant influence on current clinical management of T2DM if its efficacy were confirmed. However, due to the limited sample size and verified outcomes, there is not yet a comprehensive and quantitative analysis with high reliability. Therefore, a meta-analysis through identifying all available RCTs was conducted to evaluate systematically the efficacy and safety of garlic supplements in the management of T2DM on blood glucose, as well as blood liquids including total cholesterol, triglyceride, high density lipoprotein (HDL), and low density lipoprotein (LDL) regulation

A new study has found that consuming garlic could help reduce levels of blood sugar in people suffering from type 2 diabetes, as well as offering other benefits in the treatment of the metabolic condition. Although the research recommends using garlic for reducing blood sugar levels only under the guidance of your doctor, it could provide a range of benefits for diabetics in conjunction with their usual treatments of insulin and diet.

It is know that garlic contains more than 400 chemical components, many of which can help prevent and treat a diverse range of health problems, but it is compounds including allici, allyl propyl disulfide and S-allyl cysteine sulfoxide that raise insulin levels in the blood through the prevention of the liver's inactivation of insulin, so that more insulin is available in the body.

The scientists found that moderate amounts of garlic supplements could offer benefits to diabetes patients, and that raw or cooked garlic or aged garlic extract can help to regulate blood glucose and potentially stop or lower the effects of some diabetes complications, as well as fighting infections, reducing bad cholesterol and aiding blood flow.

Diabetes mellitus refers to a group of diseases that affect how your body uses blood sugar (glucose). Glucose is vital to your health because it's an important source of energy for the cells The underlying cause of diabetes varies by type. But, no matter what type of 0diabetes you have, it can lead to excess sugar in your blood. Too much sugar in your blood can lead to serious health problems. Chronic diabetes conditions include type 1 diabetes and type 2 diabetes. Potentially reversible diabetes conditions include pre-diabetes when your blood sugar levels are higher than normal, but not high enough to be classified as diabetes and gestational diabetes, which occurs during pregnancy but may resolve after the baby, is delivered.

Aims and objectives

The aims and objectives of this project are

- To compare the health status between diabetic patient and normal people.
- To study the effect of garlic on blood glucose level and lipid profile.

Study area of the project

The survey was conducted in two different places, one in a rural area in Ranichalk, Haldia, Purba Medinipur, West Bengal and the other one in Haldia Township, Purba Medinipur, West Bengal. Among the two catagories the subject of group1 are non-diabetic patient (village) betiding in a rural area of Ranichalk and the subject of group2 are diabetic patient in Haldia Township, age group of 40-55years. Township has an excellent postral script which an attract in for people for many years. Township situated Haldia Municipality and also industrial belt. It surrounding weather has been the main cause for its population among the industries and tourist screipt area.

Materials and Methods

Blood pressure and Pulse Rate

The blood pressure measurements were made of after the complication of the anthropometric measurements. Left arm blood pressure was taken with a Sphygmomanometer and Stethoscope after the participate has been seated in a released position for 5 minutes. Prior to taking measurements, subjects were instructed to lie on the bed and then the left arm was placed at the inside of the body. Two former measurements were recorded and average for analysis. A 5 minute relaxation period between the two measurements was maintained for all subjects, systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) were recorded to the nearest mm of Hg as the appearance (Phase-I) and disappearance (Phase-II) of Karat off sounds respectively.

Questionnaire methods for measuring food intake

Health status measurement of nutritional status of brick industrial worker questionnaire method a diet survey may also includes data collection to dietary habits and practices. The data that is collected to have translated into.

Mean intake (grams of food interms of cereals, pulses, vegetables, fruits, milk, meat, fish and eggs).The mean intake of nutrients per individual consumption unit this diet survey provides information a dietary intake patterns, specific foods consumed and estimated intakes. Thecaloriefic and nutritive values of different food stuffs consumed by the workers were estimated using the tables of nutritive value of Indian food and compared with the quantity of the Recommended Dietary Allowance (RDA) for the Indians by ICMR 2010. The survey was carried out during a period of 7 days.

Analysis of data

The data of each anthropometric parameter and food intake of workers were used for calculating the mean and standard deviation. The standard errors of means are also calculated. These mean values were compared with the standard data published by ICMR and NCHS.

Statistical Analysis

The calculated data was analyzed by the mean value, standard Deviation, standard Error and T-Test with the help of computer package.

Mean

It is arithmetic average of the observed scores. The sample means is represented by the symbol X, where X represents each individual scores of samples, OX is the sum of all

scores and n is the sample size or the total frequency of cases in the samples.

$$\bar{x}=\frac{\sum x}{n}$$

Standard Deviation (SD)

Standard Deviation (SD) is positive square root of the mean of squared deviation of all the scores from the mean. It is an absolute measurement of deviation and is expressed in the same unit as the original scores. Standard of a sample is donated by

$$SD=\sqrt{\frac{\sum(x-\bar{x})2}{n-1}}$$

Standard Error (SE)

Standard Error (SE) of a statistic is a measure of the deviation of the statistic from the corresponding parameter and consequently serves as an index of the sampling error of that statistic. It is standard deviation of the sampling distribution of the relevant statistic.

$$SE=\frac{SD}{\sqrt{n}}$$

T-test

To test the significance of the different between the means of two smalls samples that different ($x,-x^2$) is converted to student q s T score which is than interpreted with the reference to the appropriated distribution.

The t-values is computed as follows

$$t=\frac{\overline{x1}-\overline{X2}}{\sqrt{\frac{s1^2+s2^2}{n}}} \text{ or } t=\frac{\bar{D}}{SE}$$

Result and discussion

Table 1: General profile of non-diabetic patient, age group of (40-55 years) and measurement of blood pressure and hemoglobin in non-diabetic patient in the age group of (40-55 years)

Case Study	Age	Sex	Blood Pressure		Haemoglobin (gm/dl)
			SP(mm/Hg)	DP(mm/Hg)	
Case study-1	55	F	145	86	12.85
Case study-2	45	F	192	122	13.15
Case study-3	40	F	127	73	15.00
Case study-4	45	M	116	60	16.56
Case study-5	41	F	105	71	15.36
Case study-6	50	M	137	97	14.75
Case study-7	40	F	116	89	12.75
Case study-8	42	M	137	95	15.93
Case study-9	41	F	142	117	14.09
Case study-10	52	M	121	80	13.5
Case study-11	54	M	120	81	16.91
Case study-12	45	M	137	109	15.35
Case study-13	48	F	145	91	13.51
Case study-14	47	F	137	92	15.1
Case study-15	40	F	133	89	12.09
MEAN			133.8461538	90.07692308	14.59308
SD			21.60187551	18.11289383	1.39983
SE			5.581879977	4.680334324	0.361713

Table 2: General profile of diabetic patient, age group of (40-55 years) and measurement of blood pressure and hemoglobin in non-diabetic patient in the age group of (40-55 years)

Case Study	Age	Sex	Blood Pressure		Haemoglobin (gm/dl)
			SP(mm/Hg)	DP(mm/Hg)	
Case study-1	55	F	180	130	14.5
Case study-2	54	M	145	74	13.91
Case study-3	45	F	130	87	12.54
Case study-4	42	F	114	84	12.3
Case study-5	49	F	154	84	12.3
Case study-6	45	M	125	79	13.1
Case study-7	52	M	120	90	14.5
Case study-8	45	F	113	75	11
Case study-9	55	M	160	110	13.5
Case study-10	54	M	159	83	13.3
Case study-11	41	F	130	85	11.39
Case study-12	55	M	157	105	13.0
Case study-13	53	M	105	70	13.81
Case study-14	45	F	135	90	11.77
Case study-15	52	M	125	80	14.0
MEAN			136.8	88.4	12.99467
SD			21.41828	15.68348	1.089901
SE			5.53444	4.052578	0.38

Comparison of Systolic Blood Pressure (mm/hg) between diabetic patient and normal people

Parameters	Diabetic patient (Mean± SEM)	Normal people (Mean± SEM)
Systolic Blood Pressure (mm/hg)	136.8±5.53	133.84±5.58

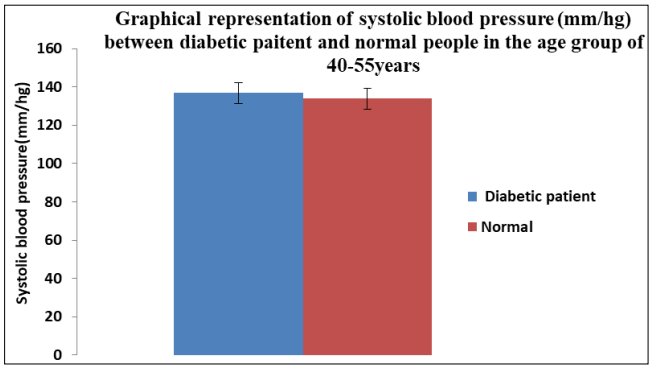

Fig 1: levels of significance, two-tail critical t scores (DF=28) are quoted below-$t_{.05\ (28)}$ =2.048, $t_{.02\ (28)}$ =2.467, $t_{.01\ (28)}$ =2.763, $t_{.001\ (28)}$ =3.674

The computed t of 0.37 is higher than even the critical t for the 0.05 level of significance. The probability p of correctness of the H_0 is not being correct exceeds 0.05 and is considered to low. So the H_0 can be rejected. It is inferred that the mean systolic score have differ significantly ($p< 0.05$).

Comparison of Diastolic Blood Pressure (mm/hg) between diabetic patient and normal people

Parameters	Diabetic patient (Mean± SEM)	Normal people (Mean± SEM)
Diastolic Blood Pressure (mm/hg)	88.4±4.05	90.07±4.68

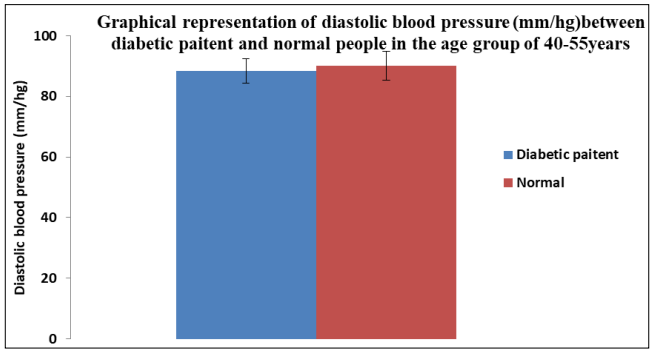

Fig 2: levels of significance, two-tail critical t scores (DF=28) are quoted below-$t_{.05\ (28)}$ =2.048, $t_{.02\ (28)}$ =2.467, $t_{.01\ (28)}$ =2.763, $t_{.001\ (28)}$ =3.674

The computed t of 0.27 is higher than even the critical t for the 0.05 level of significance. The probability p of correctness of the H_0 is not being correct exceeds 0.05 and is considered to low. So the H_0 can be rejected. It is inferred that the mean diastolic score have differ significantly (p< 0.05).

Comparison of hemoglobin level (gm/dl) between diabetic patient and normal people

Parameters	Diabetic patient (Mean± SEM)	Normal people (Mean± SEM)
hemoglobin level (gm/dl)	12.99±0.28	14.59±0.36

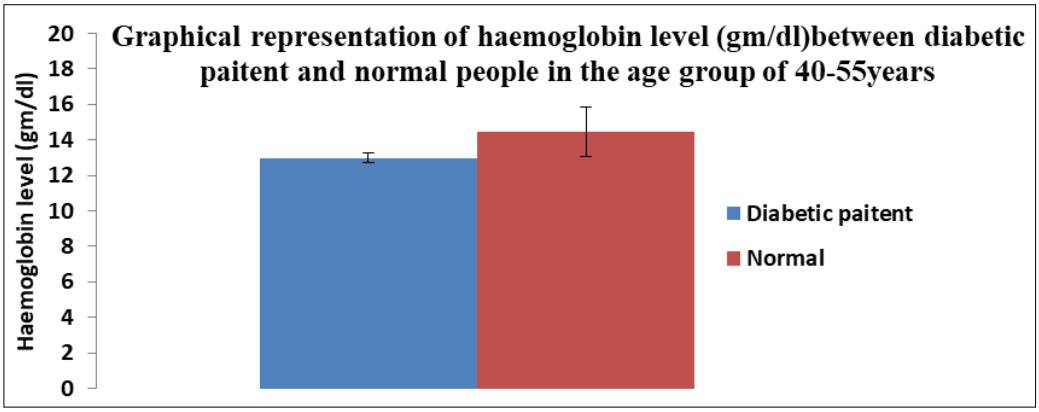

Fig 3: levels of significance, two-tail critical t scores (DF=28) are quoted below-$t_{.05\ (28)}$ =2.048, $t_{.02\ (28)}$ =2.467, $t_{.01\ (28)}$ =2.763, $t_{.001\ (28)}$ =3.674

The computed t of 3.63 is higher than even the critical t for the 0.01 level of significance. The probability p of correctness of the H_0 is not being correct exceeds 0.01 and is considered to low. So the H_0 can be rejected. It is inferred that the mean hemoglobin score have differ significantly (p< 0.01).

Table 3: Measurement of blood glucose level in diabetic patient in the age group of (40-55 years)

Case Study	Age	Sex	Gluc0se Level	
			Fasting(MG/DL)	Post Prandial (MG/DL)
Case study-1	55	F	255	380
Case study-2	54	M	152	211
Case study-3	45	F	96	124
Case study-4	42	F	84	100
Case study-5	49	F	89	181
Case study-6	45	M	135	177
Case study-7	52	M	102	131
Case study-8	45	F	94	115
Case study-9	55	M	127	153
Case study-10	54	M	109	146
Case study-11	41	F	119	170
Case study-12	55	M	150	186
Case study-13	53	M	115	160
Case study-14	45	F	155	221
Case study-15	52	M	107	136
Mean			125.9333	172.7333
SD			42.48439	66.75057
SE			10.97788	17.24821

Table 4: Blood glucose level in diabetic patient in the age group of (40-55 years), after intake garlic as prebiotic in their diet

Case Study	Blood Glucose Level			
	Recent		Before	
	Fasting (MG/DL	Post Prandial (MG/DL)	Fasting (MG/DL	Post Prandial (MG/DL)
Case study-1	152	211	170	220
Case study-2	102	131	102	131
Case study-3	109	146	120	165
Case study-4	150	186	165	188
Case study-5	115	160	140	155
Case study-6	155	221	150	180
Case study-7	107	136	107	136
Case study-8	84	100	90	105
Case study-9	255	380	232	443
Case study-10	96	124	111	182
Case study-11	89	181	94	202
Case study-12	135	177	135	177
Case study-13	94	115	102	130
Case study-14	127	153	100	182
Case study-15	119	170	169	205
MEAN	125.9333	172.7333	132.4667	186.7333
SD	42.48439	66.75057	39.22256	77.73165
SE	10.97788	17.24821	10.13503	20.0857

Comparison of blood glucose level (gm/dl) in fasting condition between recent value and before value in diabetic patient

Parameters	Recent value (Mean± SEM)	Before value (Mean± SEM)
Blood glucose level(gm/dl)	125.93±10.97	132.46±10.13

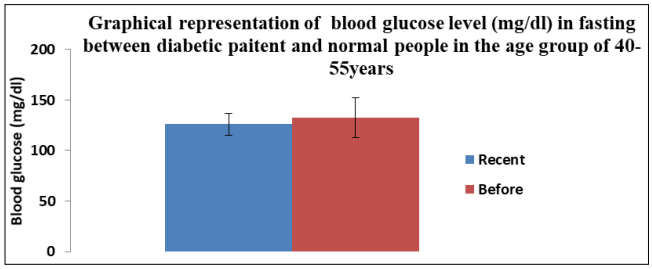

Fig 5: levels of significance, two-tail critical t scores (DF=28) are quoted below-$t_{.05\ (28)}$ =2.048, $t_{.02\ (28)}$ =2.467, $t_{.01\ (28)}$ =2.763, $t_{.001\ (28)}$ =3.674

The computed t of 2.29 is higher than even the critical t for the 0.05 level of significance. The probability p of correctness of the H_0 is not being correct exceeds 0.05 and is considered to low. So the H_0 can be rejected. It is inferred that the mean blood glucose score have differ significantly ($p< 0.05$).

Comparison of blood glucose level (gm/dl) in postprandial condition between recent value and before value in diabetic patient

Parameters	Recent value (Mean± SEM)	Before value (Mean± SEM)
Blood glucose level (gm/dl)	172.73±17.24	186.73±20.08

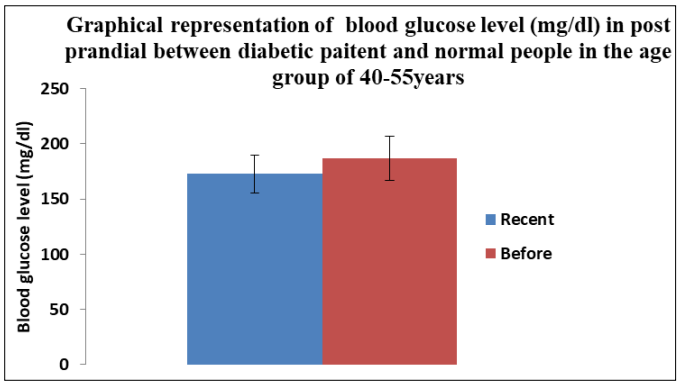

Fig 6: levels of significance, two-tail critical t scores (DF=28) are quoted below-$t_{.05\ (28)}$ =2.048, $t_{.02\ (28)}$ =2.467, $t_{.01\ (28)}$ =2.763, $t_{.001\ (28)}$ =3.674

The computed t of 4.75 is higher than even the critical t for the 0.001 level of significance. The probability p of correctness of the H_0 is not being correct exceeds 0.001 and is considered to low. So the H_0 can be rejected. It is inferred that the mean blood glucose score have differ significantly ($p< 0.001$).

Table 5: Lipid level in diabetic patient in the age group of (40-55 years), after intake garlic as prebiotic in their diet

Case Study	Lipid Profile Level					
	Recent			Before		
	HDL	LDL	TG	HDL	LDL	TG
Case study-1	85	135	120	90	135	150
Case study-2	46	125	112	30	175	112
Case study-3	31	68	157	40	68	150
Case study-4	55	76	110	68	90	150
Case study-5	46	125	130	55	145	160
Case study-6	35	120	120	60	150	120
Case study-7	48	120	145	55	135	145
Case study-8	56	160	63	56	140	65
Case study-9	85	184	80	95	190	70
Case study-10	40	76	110	68	90	140
Case study-11	56	140	63	56	175	89
Case study-12	35	130	150	45	185	145
Case study-13	49	144	177	49	138	165
Case study-14	48	140	174	47	154	170
Case study-15	50	165	150	65	185	160
Mean	51	127.2	124.0667	58.6	143.6667	132.7333
SD	15.77521	33.0264	36.02869	17.20797	37.18423	34.00938
SE	4.076281	8.533953	9.30974	4.446504	9.608327	8.787954

Comparison of HDL level (mg/dl) in diabetic patient between recent value and before value in diabetic patient

Parameters	Recent value (Mean± SEM)	Before value (Mean± SEM)
Lipid profile	51±4.07	58.6±4.44

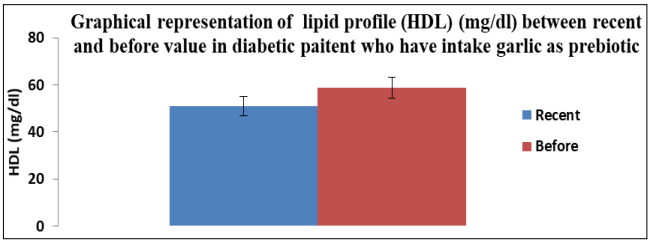

Fig 7: levels of significance, two-tail critical t scores (DF=28) are quoted below-$t_{.05\ (28)}$ =2.048, $t_{.02\ (28)}$ =2.467, $t_{.01\ (28)}$ =2.763, $t_{.001\ (28)}$ =3.674

The computed t of 1.30 is higher than even the critical t for the 0.05 level of significance. The probability p of correctness of the H_0 is not being correct exceeds 0.05 and is considered to low. So the H_0 can be rejected. It is inferred that the mean HDL score have differ significantly ($p< 0.05$)

Comparison of LDL level (mg/dl) in diabetic patient between recent value and before value in diabetic patient

Parameters	Recent value (Mean± SEM)	Before value (Mean± SEM)
Lipid profile	127.2±8.53	143.66±9.60

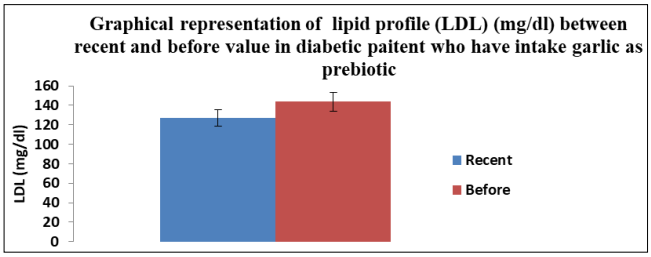

Fig 8: levels of significance, two-tail critical t scores (DF=28) are quoted below-$t_{.05\ (28)}$ =2.048, $t_{.02\ (28)}$ =2.467, $t_{.01\ (28)}$ =2.763, $t_{.001\ (28)}$ =3.674

The computed t of 1.28 is higher than even the critical t for the 0.05 level of significance. The probability p of correctness of the H_0 is not being correct exceeds 0.05 and is considered to low. So the H_0 can be rejected. It is inferred that the mean LDL score have differ significantly ($p< 0.05$).

Comparison of TG level (mg/dl) in diabetic patient between recent value and before value in diabetic patient

Parameters	Recent value (Mean± SEM)	Before value (Mean± SEM)
Lipid profile	124.06±9.30	132.73±8.78

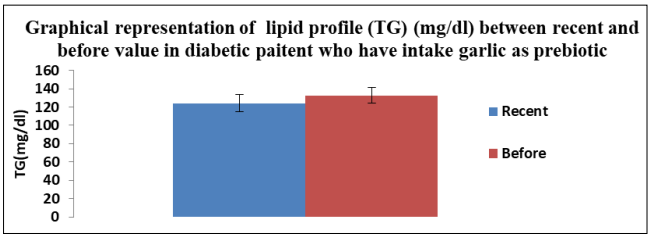

Fig 9: levels of significance, two-tail critical t scores (DF=28) are quoted below-$t_{.05\ (28)}$ =2.048, $t_{.02\ (28)}$ =2.467, $t_{.01\ (28)}$ =2.763, $t_{.001\ (28)}$ =3.674

The computed t of 0.95 is higher than even the critical t for the 0.05 level of significance. The probability p of correctness of the H_0 is not being correct exceeds 0.05 and is considered to low. So the H_0 can be rejected. It is inferred that the mean TG score have differ significantly ($p< 0.05$).

The presence study monitored effects of garlic in comparison with placebo and a standard antidiabetic agent "meltformin " on fasting blood sugar and postprandial blood sugar and Hb $A1_c$ in patient with type2 diabetes mellitus with respect to its ability to prove a decrease in fasting blood sugar level. The presence study is unique from previous clinical trials as this is the first time that effect of garlic were observed in a dose dependent and duration dependent manner in type2 diabetes mellitus . Garlic was reported to be effective in reducing blood glucose in diabetic patient. It was reported that ingestion of garlic juice and aqueous garlic extract resulted in better utilization of glucose in glucose tolerance test perform in diabetic patient. Two of the previous study reported that allicien, a sulpher containing amino acid in garlic has a potential to reduce diabetic condition in human . The presence study confirms the hypoglycemic effect in garlic in patient with type2 diabetes mellitus. The effect of garlic preparation used in the presence study were found to produce the similar changes in the fasting blood glucose level

Conclusion

A recent increase in the popularity of alternative medicine and natural products has renewed interest in garlic and their derivatives as potential natural remedies. This review may be useful to increase our knowledge of garlic therapeutic effects and improve our future experimental and clinical research plans. Although it is shown that garlic may have a significant clinical potential either in their own right or as adjuvant therapy in different disorders, however, due to some issues, such as methodological inadequacies, small sample sizes, lack of information regarding dose rationale, variation between efficacy and effectiveness trials, the absence of a placebo comparator, or lack of control groups more standard experiments and researches are needed to confirm the beneficial effect of garlic in various diseases. Future trials on the effect of garlic should include information on the dosage of active ingredients of standardized garlic preparations for better comparison of trials. It would also be interesting to explore the effect of different forms of garlic extract on standard drug therapy, especially when used as adjuvant therapy. A new study has found that consuming garlic could help reduce levels of blood sugar in people suffering from type 2 diabetes, as well as offering other benefits in the treatment of the metabolic condition. Although the research recommends using garlic for reducing blood sugar levels only under the guidance of your doctor, it could provide a range of benefits for diabetics in conjunction with their usual treatments of insulin and diet.

It is know that garlic contains more than 400 chemical components, many of which can help prevent and treat a diverse range of health problems, but it is compounds including allici, allyl propyl disulfide and S-allyl cysteine sulfoxide that raise insulin levels in the blood through the prevention of the liver's inactivation of insulin, so that more insulin is available in the body.

The scientists found that moderate amounts of garlic supplements could offer benefits to diabetes patients, and that raw or cooked garlic or aged garlic extract can help to regulate blood glucose and potentially stop or lower the effects of some diabetes complications, as well as fighting infections, reducing bad cholesterol and aiding blood flow. However, it is advised that the consumption of garlic could cause side effects for some people, or for those taking it in extreme amounts.

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