

## Evaluating the Safety and Efficacy of the traditional use of Turmeric powder as Antihypertensive in Elderly

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### Abstract

**Background:** The Curcuma genus has a long history of medicinal applications. Curcuma longa L. (Turmeric) is the most popular cultivated plant. Curcumin, a polyphenolic yellow substance, is the major constituent of turmeric. Many studies have been done on curcumin and this substance has a variety of effects Carried out on animals. Curcumin reduced hyperlipidemia and insulin resistance.

The current study aimed to measuring this effect on humans.

**Objective:** To assess the effects and safety of taking turmeric powder as antihypertensive agent in elderly.

**Design:** Prospective, observational study. All subjects were selected from Beni Suef University Hospital. The current study includes hypertensive patients with age above 50 years old classified into 2 groups. Group I: Normal control group consists of healthy volunteers. Group II: Hypertensive group includes hypertensive patients. Each group includes 20 subjects (n=20) divided into ( male and female) subjects. In the current study, each group was taken a specific dose of turmeric powder for 8 weeks treatment.

**Results:** The present study revealed that a significant reduction in readings of systolic and diastolic blood pressure had happened for patients who took turmeric powder for two months. As well as a reduction in serum lipid profile including TG, cholesterol, HDL and LDL significantly over a p value of 0.05 or less ( $p \leq 0.05$ ) when compared to healthy group.

**Conclusion:** Our data support previous research, suggesting that turmeric powder intake engenders hypotensive and lipid-lowering effects.

**Keywords :** turmeric powder, hypertensive patients, lipid profile, phenolic compounds, curcumin .

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### Introduction:

Raised blood pressure is the most important reason for cardiovascular diseases and death (1) Because of the unhealthy lifestyles in modern society, the prevalence of hypertension is expected to raised .(2)

Hypertension is a main reason for stroke and heart disease(3) . poor health systems cannot efficiently identify or treat many patients have hypertension. Hypertension control still a major challenge for public health (4). Hypertension is also a magor cause for renal diseases and renal failure (5).

Economic costs of hypertension both direct and indirect costs.

Direct costs (medical costs) like costs of medical services and devices and medical products and drugs used to prevent, detect, or treat hypertention and complications. These costs include the hospitalization, emergency room visits, physicians , laboratory tests and scan tests, prescription drugs and home health care(6).

Turmeric powder is considered as a spice, natural coloring agent and preservative .  
It is used in the pharmaceutical industries.

Many studies for the safety evaluation for turmeric and curcumin show there are well tolerated at big doses without toxic side effects. Thus, both turmeric powder and curcumin have used for pharmaceutical industries for the treatment and protection of many diseases.

Curcuma Longa one of most important curcuma species because of the highest amount content of curcuminods (7).

Curcumin one of most important curcuminoids which has extensively studied. Curcumin has a biological activities (8). It is metabolized to form other products like tetrahydrocurcumin and hexahydrocurcumin which found in plasma and urine(9).

Goto et al. evaluated the efficacy of turmeric, Curcuma Longa (CL)and white turmeric, Curcuma zedoaria (CZ) on vasomotion and haemorheology in adult male hypertensive rats (SHR)(10).

The rats were fed with normal chow or chow fortified with 3% weight/weight (w/w) of turmeric powder, 1% w/w of Curcuma zedoaria CZ, 3% w/w of CZ or 100 mg/kg/day of captopril in drinking water, respectively for 12 weeks of study duration. It was reported that 3% w/w of CZ was more

hypotensive agent than CL. This is because of the CL merely showed a trend in reducing systolic blood pressure SBP while the former with a reduction of SBP compared to the control group. the ingestion of 3% w/w of CZ increases the endothelium dependent relaxation significantly following addition of acetylcholine (ACh). Captopril, a positive control has similar activities.

On the other hand, rats fed with 3% w/w of CZ diet showed a reduction in aortic contraction in response to xanthine oxidase. This enzyme is responsible for the production of reactive oxygen species (ROS). Both 3% w/w of CL and CZ groups showed a reduction in blood viscosity. However, this protective effect was not happen in the rats fed with captopril. Hypotensive and vasorelaxant activities of the methanolic extract of CL (MECL) were studied in male Wistar normotensive rats(11). The mean arterial pressure was significantly reduced at the given dosage of 20 mg/kg and 30 mg/ kg. Meanwhile, the heart rate was significantly reduced in a dose-dependent manner starting from 1 mg/kg to 30 mg/kg of MECL administered intravenously. The increasing concentration of MECL from 1 µg/mL to 1000 µg/mL attenuated the pre-contraction induced by phenylephrine (PE, 10 µM) and potassium chloride (KCl, 80 mM) in both the intact and denuded isolated superior mesenteric rings (12).

This current study aimed at measuring and confirming the extent of this effect in humans, and evaluating the safety of using turmeric powder in treating hypertensive patients. So this experiment was designed to examine the effect of turmeric powder on blood pressure (BP), lipids and a range of related clinical analysis in the designed group of the hypertensive patients.

## MATERIALS AND METHODS

**Source of chemicals:** We use the commercially available enzyme kits for measuring Total Cholesterol, Triglycerides and HDL and other clinical measurements; all chemicals are 4 purchased form (Spectrum Diagnostics, Cairo. Egypt. MDSS GmbH, Schiffgraben 41, 30175 Hannover, Germany.)

**Experimental design:** This was a prospective, observational study. All subjects were selected from Beni Suef University Hospital suffering from hypertension with age above 50 years old and classified into 2 groups: Group I(gp1): Normal control group consists of healthy volunteers. Group II (gp2): Hypertensive group includes hypertensive patients. Each group

includes 20 subjects (n=20) divided into (male and female) subjects. In the current study, each group was taken a specific dose of turmeric powder for 8 weeks treatment. In the experiment, the hypertensive group and the healthy control group were given a specific dose of turmeric powder twice daily with a meal, one in the morning and the other in the evening, and advice on how hypertension may be ameliorated by an adequate lifestyle. Blood pressure were measured at baseline screening and after each week until the end of the study. blood glucose, blood lipids, kidney function tests and liver function tests was also measured at baseline screening, and after 8 weeks of treatment. Adverse effects were observed and if present, recorded during the study.

**Study population:** The study population consisted of 40 subjects aged between >50 and less than 75 years with an untreated blood pressure. Hypertensive patients' stage II (patients a systolic blood pressure (SBP)  $\geq$  140 mm Hg or diastolic blood pressure (DBP)  $\geq$  90 mm Hg according to new ACC and American Heart Association (AHA) guidelines 2017. All the patients gave written informed consent prior to the inclusion into the study.

**Biochemical measures:** Blood samples were drawn after a fasting of not less than 12 h. Blood samples for the measurement of liver function tests, kidney function tests and lipid profile concentrations were collected in tubes with no additives and allowed to coagulate at room temperature for 30 min. Blood samples were separated by centrifugation (10 min, 3000 rpm) and kept at - 20 °C until they were analyzed. Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), UREA, Creatinine , serum total cholesterol (TC), triglyceride (TG) and high density lipoprotein (HDL) were measured by a commercially available mentioned enzyme kit. Low density lipoprotein (LDL) was determined using the Friedewald equation:  $LDL = TCHDL - TG/5$  (Friedewald et al., 1972). Blood pressure was measured for all subjects using a cuff and analog sphygmomanometer and the patient comfortably seated for a 10 minutes before the first measurement. Blood pressure was measured for all participants three times, and the mean of it were recorded.

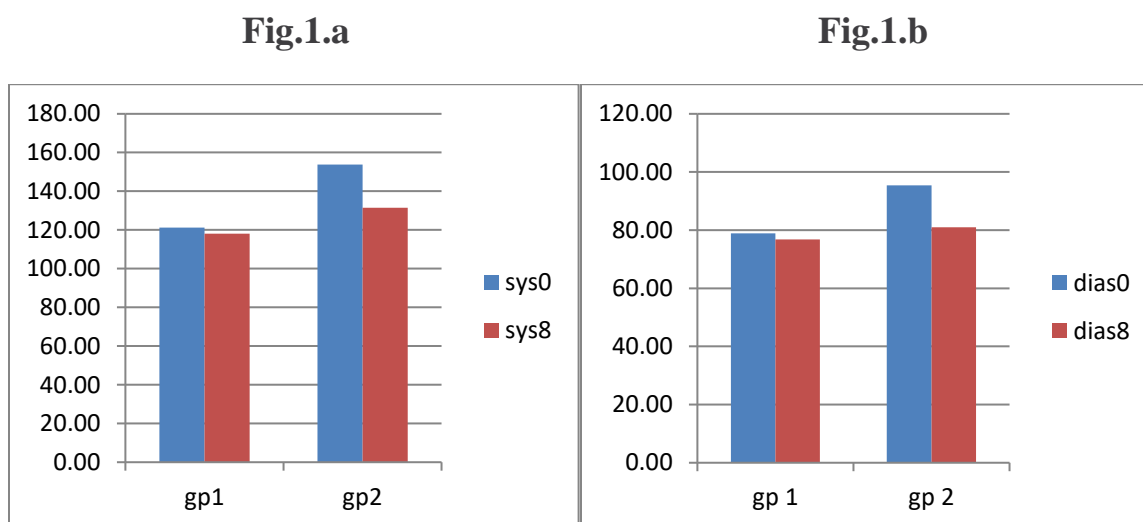


**Statistical methods:** All analyses were done using SPSS statistical software package version 25 (IBM) and graphics utilizing MS Excel. All continuous data were expressed as mean  $\pm$  SD, categorical data were expressed as frequency in tables. P-value  $<$  0.05 is considered significant i.e. 95% confidence interval is used. All key variables were varied through standard deviations or reasonable ranges. The analyses were performed using Microsoft Excel 2010 program.

## Results:

### Effect of turmeric powder on blood pressure:

During the study period, blood pressure changed significantly. The mean systolic (sys.) difference reached up to 3.05 mmHg for the control healthy group (Gp.1), up to 22.4 mmHg for the hypertensive group (Gp.2) after 8 weeks of treatment (Fig.1.a).



(Fig. 1): The change in blood pressure (mmHg) during the study.

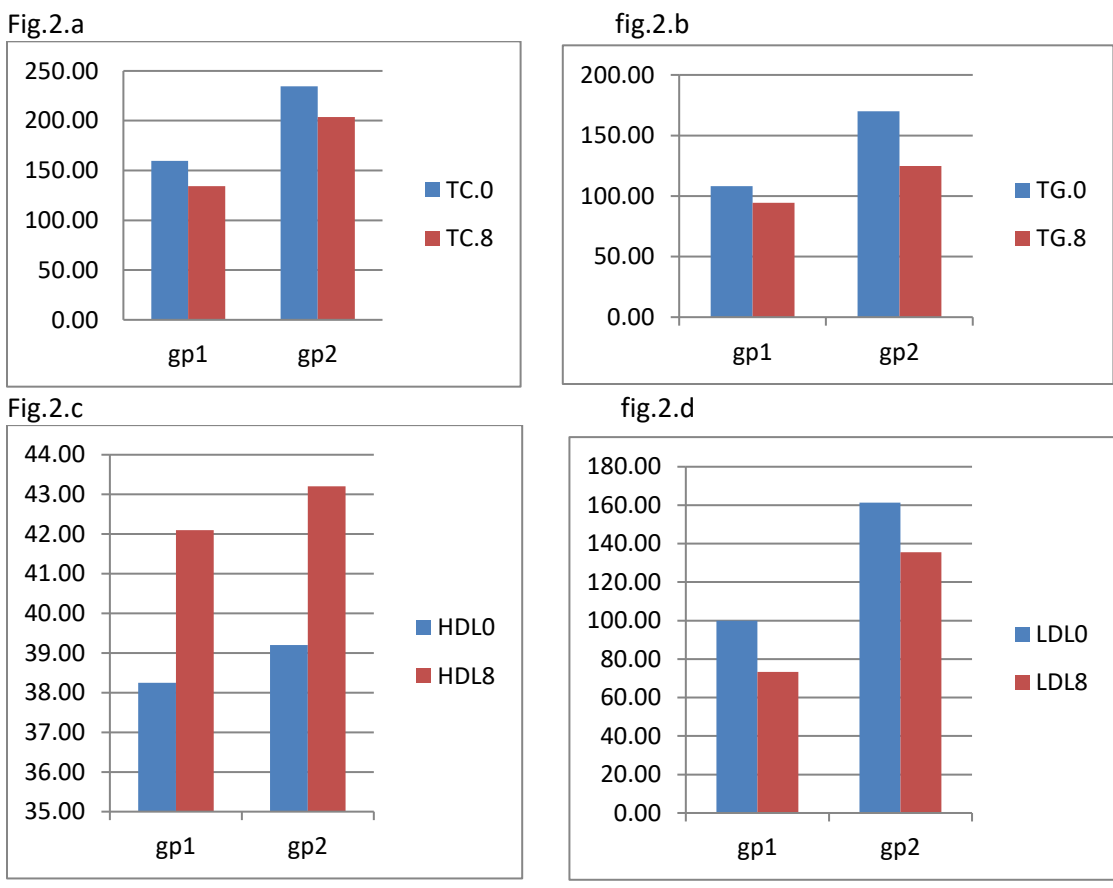
0: At the beginning of the experiment. 8: At the end of experiment. GP1: Group 1, GP2: group 2  
Sys. : Systolic blood pressure , dias. : Diastolic blood pressure

The average diastolic (dias.) difference in these groups also reached a maximum, amounting to 2.05 mmHg for the control healthy group (Gp.1), up to 14.4 mmHg for the hypertensive group (Gp.2) after 8 weeks of treatment (Fig.1.b).

After 8 weeks of treatment, the mean blood pressure had decreased from baseline in the control healthy group gp1 (systolic:  $118.1 \pm 3.042$  vs.  $121.15 \pm 4.004$ ,  $p < 0.05$ ; diastolic:  $76.8 \pm 3.518$  vs.  $78.85 \pm 1.531$ ,  $p < 0.05$ ;  $n = 20$ ), also significantly decreased in the hypertensive group gp2 (systolic:  $132.9 \pm 5.2$  vs.  $153.8 \pm 6.075$ ,  $p < 0.05$ ; diastolic  $80.95 \pm 3.3$  vs.  $95.35 \pm 4.428$ ,  $p < 0.05$ ;  $n = 20$ ) So there is a significant difference in the blood pressure measurement before and after treatment for the hypertensive group.

**Effect of turmeric powder on Lipid profile:**

Lipid profile levels showed a decrease in its values during the course of the experiment in the two groups (Fig. 2).



**(Fig. 2) The change in Lipid profile (mg/dl) during the study**

- A: The change in total cholesterol (TC) (mg/dl) during the study
- B: The change in triglycerides (TG) (mg/dl) during the study
- C: The change in high-density lipoprotein (HDL) (mg/dl) during the study
- D: The change in low-density lipoprotein (LDL) (mg/dl) during the study

The mean lipid profile measurement had decreased from baseline in the control healthy group (gp1) as follow (Total cholesterol  $134.35 \pm 24.69$  vs.  $159.75 \pm 21.648$ ,  $p < 0.05$ ; TG:  $94.5 \pm 11.423$  vs.  $108.05 \pm 8.562$ ,  $p < 0.05$ ; LDL  $73.35 \pm 25.58$  vs.  $99.89 \pm 22.668$ ,  $p < 0.05$ ;  $n = 20$ ), an increase in HDL by ( $42.10 \pm 4.229$  vs.  $38.25 \pm 4.216$ ,  $p < 0.05$ ).

group (gp2) (Total cholesterol  $203.75 \pm 29.399$  vs.  $234.45 \pm 40.613$ ,  $p < 0.05$ ; TG:  $124.9 \pm 16.824$  vs.  $169.95 \pm 40.887$ ,  $p < 0.05$ ; LDL  $135.57 \pm 27.846$  vs.  $161.26 \pm 35.646$ ,  $p < 0.05$ ;  $n = 20$ ), and an increase in HDL by ( $43.2 \pm 3.888$  vs.  $39.2 \pm 5.709$ ,  $p < 0.05$ ).

### Effect of turmeric powder on Liver function tests:

Fig.3.a

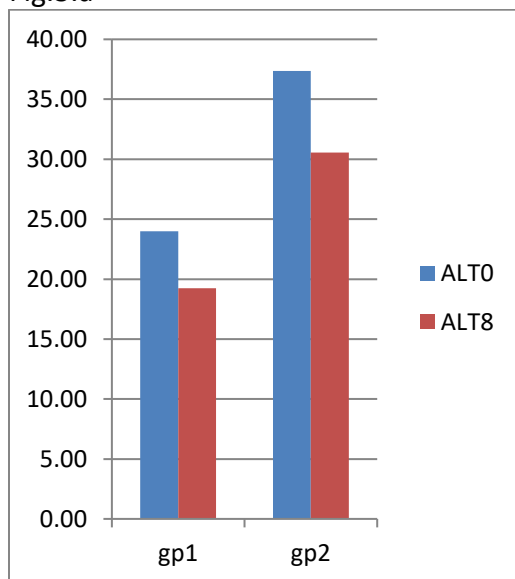
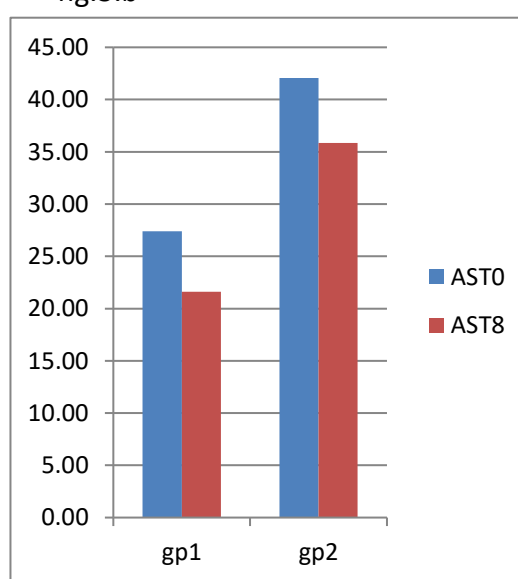


fig.3.b



(Fig. 3): The change in liver function tests during the study

A: The change in ALT (Alanine aminotransferase) for group 1& group2.

B: The change in AST (Aspartate aminotransferase) for group 1& group2.

Figure (3) divided into A: The change in ALT (Alanine aminotransferase): (The mean difference was 4.75, 6.8 U/L for gp1, gp2 respectively) and B: The change in AST (Aspartate aminotransferase): (The mean difference was 5.8, 6.2 U/L for gp1, gp2 respectively).

**Effect of turmeric powder on Kidney function tests:**

Fig.4.a

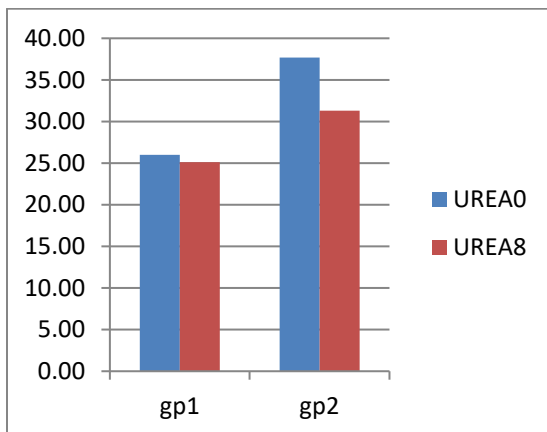
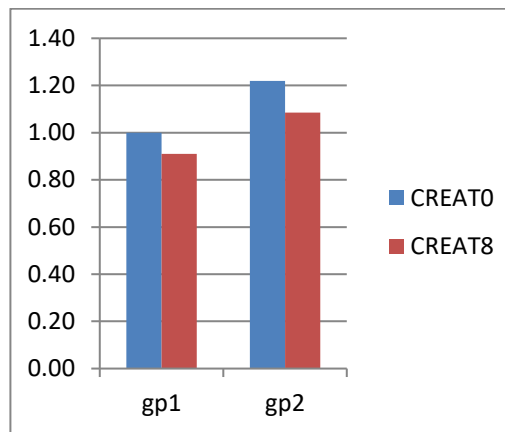


fig.4.b

**(Fig. 4) The change in kidney function tests during the study**

A: The change in Urea for group 1& group2.

B: The change in(creat.) Creatinine for group 1& group2.

Figure (4) consists of

A: The change in Urea: (the mean difference was 0.9, 6.4 mg/dL for gp1, gp2 respectively) and

B: The change in Creatinine: (the mean difference was 0.09, 0.13 mg/dL for gp1, gp2 respectively) during this study.

## Discussion

### Effect of turmeric powder on blood pressure:

There is a significant difference in the blood pressure measurement before and after treatment for the hypertensive group.

This study confirmed the antihypertensive effect of turmeric powder as previous studies

39 healthy middle aged , older adults mostly Caucasians were divided into placebo (n = 19) and curcumin supplemented groups (n = 20) for 12 weeks by Santos-Parker et al. Ingestion of 2000 mg/day of curcumin



(Longvida® pill) improved endothelial function of resistance and conduit arteries in these healthy middle-aged and older adults. Intake of curcumin was shown to reverse the reduction in forearm blood flow following infusion of ACh in the presence of L-NAME, a NOS inhibitor. In addition, 12 weeks of curcumin reduced oxidative stress-mediated suppression of endothelium-dependent vasodilatation in response to co-administration of antioxidant vitamin C. The protective action may be due to the ability of curcumin to increase NO bioavailability and reduce oxidative stress.

However, there was no difference in BP between placebo and curcumin treated groups. The possible reason is curcumin has no hypotensive effect on normal healthy subjects.

Choi et al. (2018) analysed data from the Korean National Health and Nutrition Examination Survey (KNHANES) 2013 to investigate the effect of curry consumption in reducing hypertension.

This cross-sectional study involving 1350 relatively healthy subjects were divided into curry intake group (n = 603) which had consumed a curry dish more than once a month over the previous year, and non-curry intake group (n = 747). The most common curry powder available in the market of South Korea is 10% of total 20 g portion per person. This amount equivalent to about 2 g of CL with 1 mg to 11.5 mg of curcumin present in the curry powder.

### **Effect of turmeric powder on Lipid profile:**

With the more pronounced effects than on blood pressure, turmeric powder intake was also associated with an improvement in lipid profile with a significant physiologically reductions in total cholesterol (TC), Low-density lipoprotein cholesterol (LDL) and triglycerides (TG).

Turmeric lowers bad cholesterol (LDL) and increases vit E which an antioxidant, keeping the liver safer by lowering lipid oxidation and increasing blood cholesterol levels.

Hypercholesterolemia happens if there is high cholesterol in the blood. High cholesterol increases the risk of heart disease, heart attack, and stroke. Chattopadhyan L et al (2014).

Several studies have shown that turmeric helps to lower the body's high level of cholesterol.

In earlier study, mice fed HFD treated with different doses of curcumin (500, 1000, and 1500 mg/kg) lowered blood lipids resulting in decreasing in lipid concentrations and then decreased fatty acid transport protein expression in peritoneal macrophages.

Curcumin in the liver stopped cAMP levels from being suppressed and increased CREB phosphorylation.

Curcumin increased the level of cAMP in cell lines, activated the factor CREB transcription and the human promoter CD36 by a sequence containing a CREB component response of consensus.

Fatty acid, Cholesterol, and triglycerides biosynthesis is followed by Regulating expression of gene via sterol regulatory element-binding proteins (SREBPs).

Fatty acid, Cholesterol, and triglycerides biosynthesis is followed by gene expression by binding proteins (SREBPs) by elements of sterol regulatory.

Curcumin has suppressed of SREBP factors and decreaseing of cholesterol and fatty acid biosynthesis and improvement of HFD-induced weight gain and accumulation of fats in liver, and increased levels of serum lipid and sensitivity of insulin in HFD-induced obese mice Ding L, Li J, Song B, Xiao X, Zhang B, et al. (2016).

The Results of Watanabe and Fukui's research explained that curcumin induced alteration in healthy subjects' serum lipid profile. The decreased Total Cholesterol and increased HDL-C levels; while the TG serum level was unchanged. The serum rates of TC, TG, and LDL Can slightly increase the levels of HDL if compared with control group in another long-term curcumin daily intake (30 days).

Curcumin has been shown to induce Apo-A1 expression mediates the transfer of cholesterol from cells to HDL particles.

Curcumin, also, was found to increase liver SR-BI expression and to modulate removal of HDL-C hepatocyte. Aggarwal YH, Surh S et al(2007).

#### **Effect of turmeric powder on Liver function tests:**

Good improvement in the liver functions had noticed in the two groups.

There is an improvement in AST and ALT liver function enzymes by the end of study so turmeric powder has good effect on liver so it is useful for hepatic patients.

This study agreed with other study that Curcumin has beneficial properties in liver damage carried out by diverse experimental models in rats.( Yadira Rivera-Espinoza and Pablo Muriel et al 2009).

#### **Effect of turmeric powder on Kidney function tests:**

There is an improvement in the kidney function tests had noticed in the two groups.

#### **Conclusion :**

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Turmeric powder compounds have many interesting effects on the human body systems such as, antihypertensive and hypo-cholesterolemic effects. The present study may strengthen the evidences that Turmeric powder has the ability to favorably modify blood pressure and lipid profiles. The dietary factors and modifying our life style had a good impact in this study towards the primary prevention of hypertension and raised cholesterol. Daily consumption of Turmeric powder can result in lowering blood pressure and serum lipid profiles, and also in favorable improvements in several CVD risk factors, making it a preferable addition to a healthy diet and lifestyle.

#### **Ethical Approval:**

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Ethical approval was granted by the Research Ethical Committee at Faculty of Medicine, Beni-Suef University, (FWA#: FWA00015574). The consent forms were obtained from all groups participants.

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