



# Study on Cholesterol Lowering Effect of Triphala by Traditional Medicine Approach

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# Introduction

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- **Globally**, a third of ischemic heart disease is attributable to high cholesterol

{Ref: WHO Report on Noncommunicable Disease (2010)}

- **In Myanmar,**
- 30% of the patient with coronary heart disease have raised cholesterol as the major risk factor

(Ministry of Health, 2007)

- cardiovascular disease is sixth leading causes of morbidity, and second leading causes of mortality

(Annual Hospital Statistics Report, 2008)

# Introduction

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- According to the traditional medical concept, *Terminalia chebula* Retz. and *Terminalia belerica* Roxb. have a warm energy, while *Phyllanthus emblica* Linn. is cool in nature
- Therefore, Triphala is a completely balanced energetic formula, being neither too cold, nor too hot

# Introduction

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- This study aimed to approve the cholesterol lowering effect of Triphala in human healthy volunteers and to relate the research finding with traditional medicine concept

# Objectives

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1. To determine the chemical constituents of the aqueous extract of Triphala
1. To determine the serum total cholesterol level of human healthy volunteers at 4 weeks, 6 weeks and 8 weeks of oral administration of Triphala capsules

# Materials and Methods

- **Study design**

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Community Based Interventional study

- **Study area**

1. Research Division, University of Traditional Medicine, Mandalay
2. Department of Pharmaceutics, University of Pharmacy, Mandalay
3. Clinical Pathology Department, Mandalay General Hospital
4. Traditional Medicine Pharmaceutical Factory, Yangon
5. Clinical Research Division, Department of Medical Research (Upper Myanmar)



# Study Population

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- Fourty (40) subjects from State Pariyatti Sāsana University, Yadanarpon San Nunnery and UTM

## Study period

- The study period was started from May 2012 to October 2013

# Inclusion criteria

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1. Ages
  - between 30-60 years
2. Sex
  - both male and female
3. BMI
  - < 30 kg/m<sup>2</sup>
4. Total cholesterol
  - 200- 240 mg/dl
5. Those who do not smoke or drink
6. Those who are not taking cholesterol lowering drugs



# Exclusion criteria

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1. Moderate and severe hypertension
2. Diabetes mellitus
3. History of ischemic heart disease
4. History of liver or renal diseases
5. Person who are heavy smoker
6. Persons who are taking steroids, beta blockers and thiazide diuretics
7. Persons who are taking lipid lowering medications

Written informed consent was obtained from all subjects after thorough explanation about the purpose of this study

# Sample Size Calculation

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The sample size is calculated by using Epi-Info software (Version 3.4.1)

- Power = 80%
- Confidence level = 95%
- Effect size (percent reduction) = 25%

Then, required amount is 35. The present study will be done on 40 subjects.

# Preparation of Triphala

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- The three kinds of Triphala fresh fruits were collected from Mandalay Division during the period of August to October 2012
- The authentic identification of the fruits was carried out by the botanist from UTM
- The seedless dried pericarps of Triphala were prepared as 1:1:1 ratio

# Freshly Triphala



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19.02.2013



# Weighting and Crushing



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# Extraction of Triphala

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- Aqueous extraction of Triphala was done by 150gm of prepared Triphala with 600ml of distilled water using reflux extractor for 3 hours for three times at 60°C
- The liquid extract was filtrated and filtrate was concentrated by using vacuum rotary evaporator

Extraction



Concentration



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# Freeze drying process

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- Freeze dryer (model FD-1, Japan) was used
- The 100ml of Triphala extract filled flasks were immersed and turned in the ethanol 95% pre-freeze bath (minus 50°C) to get the layer of frozen solution inside the flask

# Freeze drying process

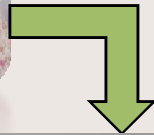
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- The flasks containing layer of frozen solution were immediately attached the drying chamber through the vacuum pumps
- This process took at most **eight hours** to get the dry layer
- The dried layer was scraped and made powder

# Freeze drying process



Shelling at Ethanol -50°C



Attach the flasks to the drying chamber and white frost appear



The dried product forming

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## Making Powder



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# Phytochemical analysis of Triphala

- Phytochemical screening of Triphala freeze-dried powder was carried out as stated in physiochemical standards of **UNANI formulations**

# Dose Estimation

- Based on Pilot study,

Raw 100gm..... 29.3gm Ext (yield%)  
(Thet Thet May, 2008)

Raw 2gm.....?

$$= 2 \times 29.3/100 = 0.586 \text{ gm}$$

Raw 2gm = 0.586 gm Extract/50kg = 600 mg

- Thus, dose of the aqueous extract of Triphala for each subject was 600mg.

## Preparation of Triphala as capsule dosage form

- With the purpose of easy to administration and to obscure the **bitter and astringent** taste of dried powder of Triphala, the capsules dosage form was prepared
- Triphala freeze-dried powder (**300mg**) was filled in each **0-size capsules** and done the quality tests





Weigh  
powd

Triphala capsules

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## Determination of serum total cholesterol level

- Based on the pilot study on 2 gm Triphala raw powder, two capsules of Triphala ( $300\text{mg} \times 2 = 600\text{mg}$ ) were administered to all subjects daily in the morning (about 7-9 am)
- Before giving the Triphala capsules (0 week), 4-6 hours fasting, 3ml of blood from each subjects was collected by using the sterile disposable syringe and in the sterile test tubes

## Determination of serum total cholesterol level

- The blood samples were labeled with code numbers and were carried in an icebox from the site of sample collection to the laboratory of **Mandalay General Hospital** (MGH) to analyze STC by using the **ABX Pentra 400 Fully Automated Analyser**
- STC levels were determined at the end of **4 weeks, 6 weeks and 8 weeks** after intervention



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# ABX Pentra 400 Fully Automated Analyser



# Data collection and data analysis

- Data analysis was performed by (SPSS) version 11.5
- Results were reported as Mean  $\pm$  SD
- Paired “t” test was used
- A significance level of p value was 0.05

# RESULTS

- The result of yield percentage (w/w) of aqueous extract of Triphala was 33.33 %

# RESULTS

- Qualitative phytochemical analysis of Triphala freeze-dried powder revealed that carbohydrates, reducing sugar, glycosides, flavonoids, tannins, amino acids, steroid, phenols and saponin were present



# RESULTS

- The uniformity of Triphala capsules weight (n=20) was  $307.75 \pm 7.1963\text{mg}$
- All capsules (n=5) disintegrated in  $27.866 \pm 1.5\text{min}$



# Determination of serum total cholesterol level in human healthy volunteers

Age distribution of study population (n=40)

Age	No.	Mean	Percentage
30-39 years	23	34.4	57.5%
40-49 years	12	45.3	30%
50-60 years	5	55.2	12.5%
Total	40	-	100%

## Sex distribution of study population (n=40)

Sex	No.	Percentage
Male	23	57.5%
Female	17	42.5%
Total	40	100%

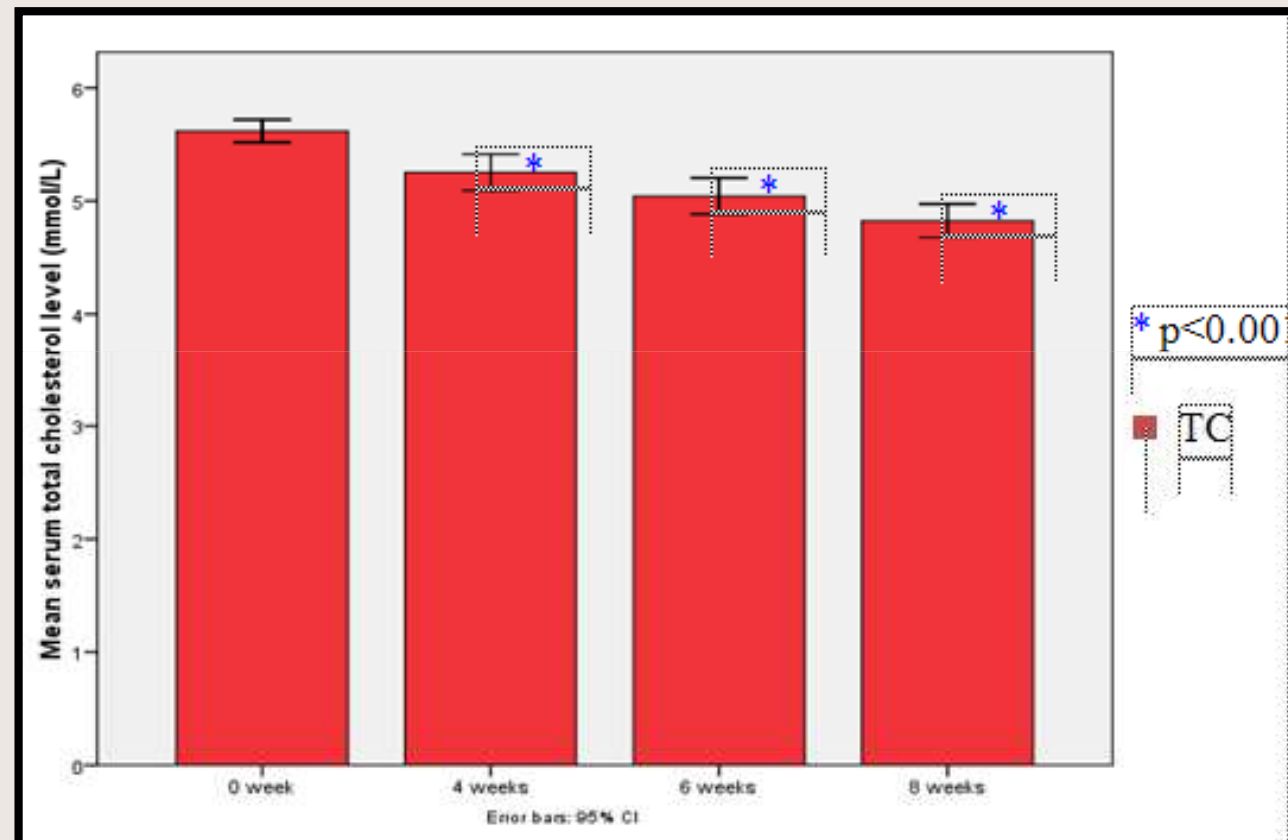
## Physical status of study population (n=40)

Physical Status (BMI)	No. of Patient	Mean	Percentage
Normal	27	21.46	67.5%
Overweight	13	26.53	32.5%
Obese	-	-	-
Total	40	-	100%

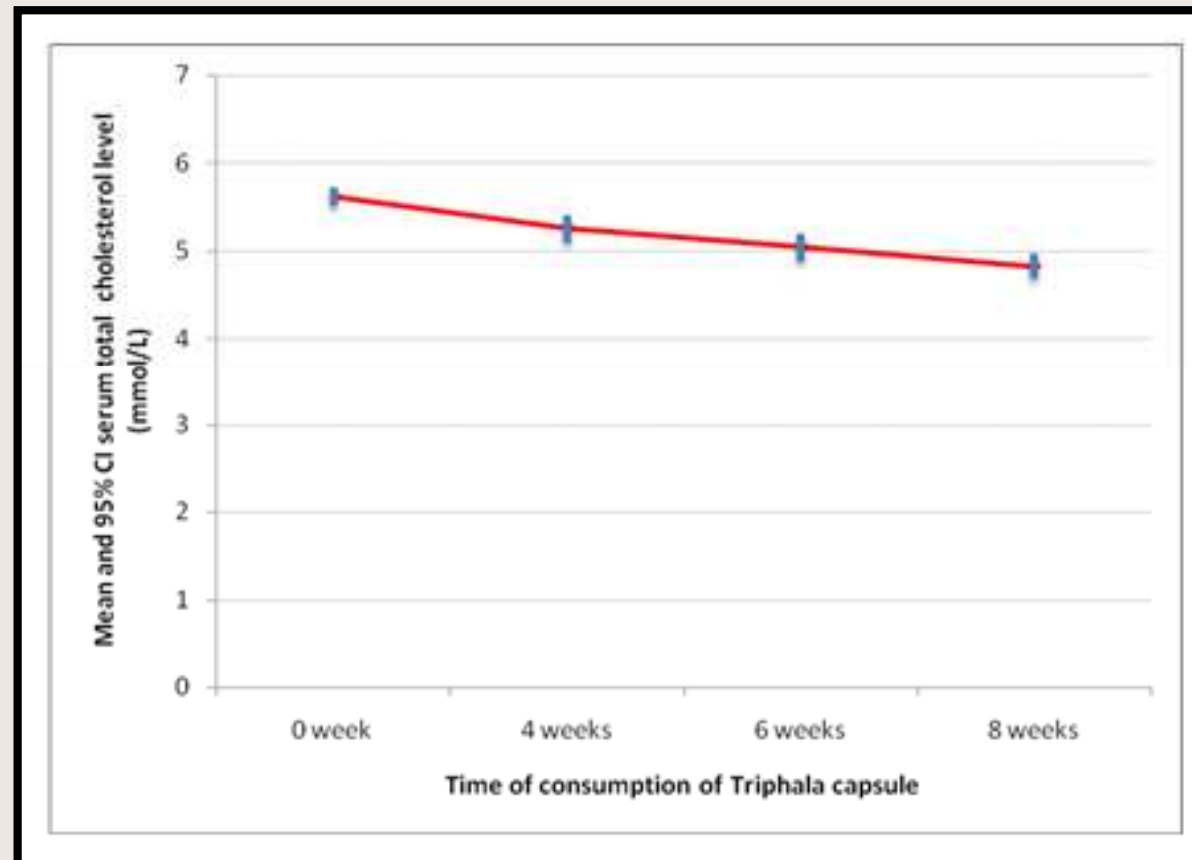
## Comparison of serum total cholesterol levels during the intervention with Triphala capsules (n=40)

Measures (mmol/L)	Comparison during process					
	0 week& 4 weeks	0 week& 6 weeks	0 week& 8 weeks	4 weeks& 6 weeks	4 weeks& 8 weeks	6 weeks& 8 weeks
Means	5.62±0.32 & 5.25±0.5	5.62±0.32 & 5.04±0.5	5.62±0.32 & 4.83±0.46	5.25±0.5 & 5.04±0.5	5.25±0.5 & 4.83±0.46	5.04±0.5 & 4.83±0.46
Mean Differences	0.365	0.575	0.792	0.210	0.427	0.217
p values	p<0.001	p<0.001	p<0.001	p=0.002	p<0.001	p=0.003

Comparison of mean serum total cholesterol levels during the intervention with Triphala capsules in human healthy volunteers (n=40)



Comparison of mean and 95% CI serum total cholesterol levels on 0 week, 4 weeks, 6 weeks and 8 weeks consumption of Triphala capsules (n=40)



# Discussion

- **The tastes of Triphala in traditional texts...**

*madhura, amla, katu, kasa`ya, tikta*

sweet, sour, pungent, astringent, bitter

ချိုချဉ်စပ်ဖန်ခါး

- Those tastes were likely to be the presence of carbohydrates, Vitamin C, polyphenolic compounds, flavonoids and tannins

- **Triphala had**
  - *ushna virya* (warm energy)
  - *laghu* and *ruksha guna* (light and dry properties)
- **According to the concept of Desana Medicine,**  
*ushna virya, laghu and ruksh guna*

The balancing effect of increased **internal *Pathivi*** and increased **external *Apo*** (*Apo Abhandana*) due to *Sita Tejo* (the causative factor) which caused the hypercholesterolaemia

*ushna virya, laghu and ruksh guna*



detoxified the *Ama* in the arteries

The principle of traditional medicine approach to hypercholesterolemia

- to increase the *Agni* (digestive fire),
- to digest the *Ama* (the product resultant of improper functioning of *Agni*),
- regulating assimilation and elimination and controlling the causative factors



## STC levels of normal apparently healthy subjects in Myanmar

Investigators and year	<u>SubjectsNo.</u>	Age (yrs)	STC level (mmol/L)
Thin-Thin-Hlaing <i>etal</i> (1990)	149	30 – 80	4.4 ± 1.6
Min-Swe (1991)	67	30 - 80	4.4 ± 0.6
Pyone-Pyone-Than (1994)	37	16 - 45	4.5 ± 0.2
Khin-Win-Sein (2000)	30	21 - 61	4.6 ± 0.1
Soe-Han (2001)	34	31 - 34	4.4 ± 0.2
Thin-Thin-Tun (2008)	28	25 - 40	4.5 ± 0.1
Present study (2013)	104	30-60	5.4 ± 0.9

# Conclusion

- The result of the present study proved the cholesterol lowering effect of Triphala by relating with the traditional medicine concept

# Conclusion

- Triphala can be used as **evidence-based traditional cholesterol lowering agent** in the treatment of hypercholesterolemic patients who are predisposed to a combination of risk factors such as ---
  - *Kamma Smuthana* (genetic susceptibility and sedentary habits, use of tobacco and alcohol),
  - *Citta Smuthana* (stress),
  - *Utu Smuthana* (seasonal factors) and
  - *Ahara Smuthana* (dietary habits).

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