INTRODUCTION

Obesity is recognized as a global epidemic (WHO Geneva 1997 report). Obesity is a common and preventable disease of clinical and public health importance. The population wide obesity prevention programs have a greater potential then clinic based treatments. The prevalence and incidence of obesity have been increasing in both developed and developing countries. World-wide obesity has nearly triple since 1975. Most of the world population lives in countries where overweight & obesity kills more people than underweight. The causes of obesity: -- varies by gender, socio economic position & nutritional status. Obesity is genetically classified in to three types, monogenic, common & syndromic. The primary cause of obesity is a chronic storage of excess energy. Physical inactivity is pivotal in its development.

Metabolic syndrome: it is a metabolic disorder which is affecting the people throughout the world and commonly caused by a combination of excessive food or energy intake, lack of physical activity, genetic susceptibility, endocrine disorders, medications, psychiatric illness. A few cases of obesity are caused by endocrine disorders- (Cushing’s syndrome, hypothyroid, polycystic ovarian syndrome etc.), medications Oral contraceptive pills, hormone replacement therapy, and steroid use on long-term & mental illness. Metabolic syndrome is a deranged condition of energy utilization and storage of the body, which promotes to develop some co-related medical conditions like, elevated fasting plasma glucose, central obesity, high serum cholesterol (Triglyceride) and low high density lipoprotein cholesterol level (HDL), elevated blood pressure and over time (estimated 3 to 10 years) strikes fatally as Cardiovascular Diseases and Type II Diabetes which are considered as twin global epidemic. It is estimated that 20-25% of the world adult population is suffering from this disorder. People with metabolic syndrome have five times greater risk of developing Type II diabetes. Diabetes is considered as fourth or fifth leading causes of death in the developed world and Cardiovascular Diseases represents the first leading cause of death in the world in men and women.

Table 1 World-wide obesity status (2016)

<table>
<thead>
<tr>
<th></th>
<th>Children (&gt;5 years)</th>
<th>Children (5-18 years)</th>
<th>Adults (18 year &amp; above)</th>
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<tbody>
<tr>
<td>Overweight/obese</td>
<td>41 million</td>
<td>340 million</td>
<td>1.9 billion</td>
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<tr>
<td>Obese</td>
<td></td>
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<td>650 million</td>
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</table>

As obesity increases mortality rates rises particularly if obesity is due to intra abdominal fat. In older adults excessive body
fat, especially if this accumulation is featured as abdominal obesity, is associated with a higher prevalence of cardiovascular and metabolic disease, cancer, and numerous other medical conditions.\(^{(17)}\)

Obesity is one of the main components of the metabolic syndrome, which is a cluster of risk factors for cardiovascular disease.\(^{(18)}\) People with metabolic syndrome have 5 times greater risk of developing DM2\(^{(19)}\) so, controlling obesity is critical for the reduction of future health problems & morbidity\(^{(20)}\), as it’s control is related to the reduction in the risk for diabetes & cardiovascular disease\(^{(21)}\).

Few non-invasive and non-pharmaceutical treatment options are available. Existing options that may be used alone or in combination are dietary habits, physical activity and behavioral modification.\(^{(22)}\) The American College of Sports Medicine (ACSM), & Centers for Disease Control (CDC) suggest moderately intense physical activity for obese subjects\(^{(25)}\) and yoga lifestyle modification (Hath yoga) is a moderate type of exercise, practice of yoga improve metabolic risk factors in obese, increase muscle strength & cardio-respiratory fitness, has limited side effects, cost effective because virtually requires no equipment.\(^{(24)}\) Yoga training may help obese to achieve the recommended levels of physical activity, and it may be an attractive alternative exercise training programs because it increases heart rate and muscle strength, has limited harmful side effects, and requires virtually no equipment\(^{(25)}\).

Regarding metabolic syndrome in overweight & obese patients & yoga exercise effects there is very limited information available. Therefore, I evaluated the effects of yoga exercise in these patients for a period of three months.

### MATERIAL AND METHODS

The study was conducted in the department of medicine of Major S D Singh medical college & hospital, Farrukhabad, January 2015 to March 2015. A total of 100 participants were recruited in the study of which total 92 completed the study in three month period. Similar number of matching control (n=94) were taken. They were as under: - Group A-study group: - patients practicing YOGA and taking usual medical treatment. Group B- control group: - patients on routine standard treatment for not practicing yoga. The strict balanced diet intake advised to both the groups.

#### Inclusion criteria
1. Patients fulfilling criteria.
2. Age between 18 years to 40 years. Written or informed consent.
3. Written or informed consent.
4. Any contraindication to do yoga practice. 4. Patient not giving consent.

All the participants in the yoga groups were instructed to practice yoga asana daily early morning hours for 60 minutes. patients were trained in yoga asana helpful in obesity.

#### Table 2

<table>
<thead>
<tr>
<th>Time</th>
<th>Intervention type</th>
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<th>Intervention type</th>
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<tr>
<td>10 min</td>
<td>Warming exercise</td>
<td>10 min</td>
<td>Breathing exercise</td>
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<tr>
<td>10 min</td>
<td>Pranayam</td>
<td>30 min</td>
<td>Asana</td>
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<tr>
<td>10 min</td>
<td>Jogging</td>
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<td>30 min</td>
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<td></td>
<td>Rel training</td>
<td>7.Shavasana</td>
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</table>

### RESULTS

The present study involved the assessment of the effects of yoga therapy on metabolic syndrome risk factors in overweight & obese. The present study showed that the patients with metabolic risk factors significantly reduces their body weight (BMI), abdominal obesity (WHR), blood pressure (SBP & DBP) and blood sugar (FBS & HBA1C). The analysis has been done using SPSS 12 statistical software.

#### RESULTS

1. Group A shows 18 mg/dl more decline of FBS & HBA1c 1.29 % more decline then group B. (P<0.0001)
2. Group A shows 10 mmHg decline of SBP & 17 mmHg decline of DBP then group B.(P<0.0001)
3. Group A shows 03 kg/m² more decrease in BMI then group B.(P<0.0001)
4. Group A shows overall decline of 3, 5, 10, 7, 6 mg/dl in TC, TG, LDL, VLDL, and increase in HDL then group B. (P < 0.0001).

### DISCUSSION

The significant reduction in all the components of metabolic syndrome are recorded in our study which are supported by following previous studies. Seo D.Y. et al 2012, 2 month yoga, 1 hour three times weekly, body weight & BMI significantly reduced (p<0.05). Annapurna K. et al 2014, 3 month yoga results reduction in all the parameters, BMI reduced by 2kg/m², SBP reduced by 11mmhg, DBP by 7mmhg. P/R reduced by 12/min\(^{(21)}\). Dhananjai S.et al 2011, yoga practice 12 weeks with meditation, pranayam, asana average weight loss of 4.8% of baseline reported and fasting blood glucose reduced by 8%. TC, TG, VLDL, LDL decrease by 13.5%, 15.7%, 15.7%, 24.6% respectively, HDL improved by 22%.\(^{(28)}\) Das T. et al 2015, shows similar decrease in Body weight, BMI, SBP, DBP, FBS.\(^{(29)}\) Analysis of results of our study shows reduction in FBS after 3 months of yoga practice indicates the improvements in the biochemical functions in obese subjects which are supported by following three previous studies, Damodaran A. et al 2002, 3 month yoga training significantly decreased plasma glucose.\(^{(30)}\)

CONCLUSION

The results support the hypothesis & the research question that yoga therapy supplements with usual medical care is more effective than the medical care alone. Therefore, is recommended that yoga therapy is safe and may be considered in metabolic syndrome for treatment.

Abbreviations

FBS (Fasting blood sugar), SBP (systolic blood pressure), DBP (diastolic blood pressure), BMI (body mass index), TC (total cholesterol), TG (triglycerides), LDL (low density lipo protein), VLDL (very low density lipoprotein), HDL (high density lipoprotein).

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Annapoorna K, Vasantlaxmi K, Effect of yoga therapy on obesity and quality of life in women: a longitudinal study ; International journal of yoga and allied sciences, volume 2,issue 1. ISSN :2278-5159

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