Obesity among children is a major public health problem, both in developed and in developing countries. It was declared to be a disease by American Medical Association (AMA) in June 2013. The prevalence of obesity is estimated to be 17% in the US (CDC 2011-2014). In developing countries it is reported to be 41.8% in Mexico, 22.1% in Brazil, 22.0% in India and 19.3% in Argentina (Gupta N., Goel K., 2012). In India the prevalence of obesity in children has more than doubled in the last 10 years from NFHS3 (2005-6) to NFHS4 (2014-15). Obesity when associated with hypertension, low HDL-C, high TG and high FPG is defined by IDF as MS and is a well-recognized precursor of type-2 DM and CardioVascular disease (CVD) (Zimmet P., 2001). (Kong AS et al., 2012). Adults with MS have a twofold risk of developing atherosclerotic CVD and a fivefold risk of developing Type 2 Diabetes (Hadjyannakiss S., 2005). In a follow-up study of 771 children age 6–19 years, the Princeton Lipid Research Clinic found that children with clustering of MS risk factors were significantly more likely to have CVD 25 years later when compared with their peers (Morrison JA et al., 2007). It is important to identify high risk children early to be able to prevent MS and its complications later in life.

AN may serve as marker for identifying children at risk of developing MS. AN is characterized by dark, coarse, thickened skin with a velvety texture, symmetrically seen on the neck, axillae, antecubital and popliteal fossae and groin folds. The presence of AN is strongly associated with insulin resistance and obesity (Ice CL et al., 2009). Due to rising prevalence of obesity and Type 2 Diabetes, the prevalence of AN is increasing (Phiske M., 2014). The incidence of AN is reported in 35% (Calderon Z., 2009), 43% (Valery PC., 2009), 85% (Ice CL et al., 2009) and 54% (Ng HY YJ., 2012) of obese children. AN may serve as marker for identifying children at risk of developing MS. AN is characterized by dark, coarse, thickened skin with a velvety texture, symmetrically seen on the neck, axillae, antecubital and popliteal fossae and groin folds. The presence of AN is strongly associated with obesity (Phiske M., 2014). The incidence of AN is reported in 35% (Calderon Z., 2009), 43% (Valery PC., 2009), 85% (Ice CL et al., 2009) and 54% (Phiske M., 2014) of obese children.

RESULTS
100 children (64 male, 36 female) age 10-16 years were included in the study. The correlation between AN and MS is shown in Table 2. MS was found in 64% of obese children with AN as compared to 30% of obese children without AN. Low HDL-C was found in 70% cases and 64% of obese children with AN as compared to 30% of obese children without AN.

DISCUSSION
Cook S, Weitzman M et al (2003) reported MS in 4.2% of 12-19 years old obese children. Yashpal Singh et al (2013) reported MS in 46.4% obese children. A prevalence of 3.6% was reported by investigators from the Bogalusa heart study in adolescents of 8-17 years of age (Srinivasan SR et al., 2002). Ice CL et al (2009) reported a prevalence of MS in 57% obese children and 67.9% of morbidly obese children. The prevalence of MS in the present study was 47% (64% in cases and 30% in controls) which was comparable to studies by Yashpal Singh et al (2013) and Ice CL et al (2009). In a study of 113 obese children in Hungary, 58 with AN and 57 without AN, hyperinsulinemia was more marked in those with AN than in those without AN. TG were higher and HDL-C concentrations lower in the obese children with AN compared with those without AN (Felszeghy E et al., 2009). Similar to that study we found a higher TG and lower HDL-C levels in cases compared to controls. The prevalence of MS in obese Bolivian children with AN was

ABSTRACT
This was a prospective case controlled study to determine the association of Acanthosis Nigricans (AN) and Metabolic Syndrome (MS) in obese children 10–16 years of age. We recruited 50 obese children with AN (cases) and 50 obese children without AN (controls) attending the Pediatric OPD from May 2013 to August 2014 after obtaining informed consent from their parents. Children were defined as obese if their BMI was ≥ 95th percentile for age and sex (CDC). International Diabetes Federation (IDF) 2007 criteria were used to define MS. Detailed history, physical examination, anthropometry and blood sampling were done in each case. Samples for High Density Lipoprotein Cholesterol (HDL-C), Fasting Plasma Glucose (FPG) and Triglycerides (TG) were evaluated at the in-hospital NABL certified SRL laboratory. MS was found in 64% of obese children with AN as compared to 30% of obese children without AN which was highly significant. Therefore, AN is a significant marker of MS.

KEYWORDS
Acanthosis Nigricans, Metabolic Syndrome, Obesity in children
reported to be 59% by Carceras M et al (2008). Santoro N et al (2013) showed a strong association between AN and MS, odds ratio (OR) of obese Italian children with AN having MS being 1.87 at 95% confidence interval. Calderon Z et al (2009) showed a positive correlation between AN and MS in obese Mexican children. MS was present in 9% and AN in 35% children. The prevalence of MS in obese children with AN in our study was 64% which was statistically significant.

Conclusion:
With the growing prevalence of Obesity, Metabolic Syndrome and their Cardiovascular and type 2 DM risk later in life, screening for MS becomes essential particularly in obese children. AN is a reliable clinical marker of MS in obese children.

Table 2: Metabolic Syndrome in obese children with AN (Cases) and without AN (Controls)

<table>
<thead>
<tr>
<th>MS parameters</th>
<th>N (%)</th>
<th>MS n (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waist Circumference (&gt;90th percentile)</td>
<td>50</td>
<td>32 (64)</td>
<td>50</td>
</tr>
<tr>
<td>TG (≥ 150 mg/dl)</td>
<td>17 (53.12)</td>
<td>12 (24)</td>
<td>32 (64)</td>
</tr>
<tr>
<td>HDL (&lt; 40 mg/dl)</td>
<td>18 (56.25)</td>
<td>12 (24)</td>
<td>35 (70)</td>
</tr>
<tr>
<td>SBP (≥ 130 mm Hg)</td>
<td>11 (33.33)</td>
<td>7 (14)</td>
<td>13 (26)</td>
</tr>
<tr>
<td>DBP (≥ 85 mm Hg)</td>
<td>4 (12.5)</td>
<td>4 (8)</td>
<td>5 (10)</td>
</tr>
<tr>
<td>FBS (≥ 100 mg/dl)</td>
<td>6 (18.75)</td>
<td>7 (14)</td>
<td>18 (36)</td>
</tr>
</tbody>
</table>

Limitation:
This study has been performed at a private corporate hospital, hence the patient population may not be representative of the general population.

References: