Research Article

Assessment of Selected Serological Factors in Overweight Children of Lahore, Pakistan

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Abstract | Current prospective study was designed to evaluate the selective serological parameters in overweight children of 6-12 years (n=300) in Lahore, Pakistan. Anthropometric assessment was carried out. Blood samples were taken and lipid Profile, serum creatinine and Serum albumin analysis was done by using automated chemistry analyzer. Results concluded that the experimental subjects have shown a significant difference ($P<0.00$) in HDL level as compared to control subjects. Result of t test has shown significant increase ($P<0.00$) in total cholesterol and triglycerides level. Results have shown that there is highly significant correlation between body mass and serum creatinine level as $P < 0.05$. Serum albumin has also shown negative correlation with the weight of the children while serum creatinine has shown positive correlation with the weight of the children Pediatric obesity has reached to epidemic proportions in Pakistan. Overweight children usually become overweight adults which ultimately cause serious ailments including type 2 diabetes, renal diseases and hypertension in later age due to alteration of different serological parameters. In conclusion weight is associated with biochemical parameters. Any alteration in these parameters may cause health issues. Effective pediatric interventions are essential.

1. Introduction

Obesity among children has reached to an alarming level not only in prevalence but also in term of severity in many countries including Pakistan (Hruby and Hu, 2015). Glucose intolerance, Diabetes and Renal disorders are the main detrimental consequences that can be occurred when those obese children become adults. Pakistan is facing weight related issues are due to poor life style and malnutrition (Waghmare et al., 2022). It was estimated from WHO report that out of 2.3 billion people in the world are overweight while 700 million are obese (Chan and Woo, 2010). Pediatric obesity is an emerging problem in Pakistan (Ruminska et al., 2015) and it is facing doubled consequences of malnutrition simultaneously i.e., underweight and overweight (Anik et al., 2019). It has also been observed in other countries developing

countries such as Egypt and India (Warraich *et al.*, 2009). So it is need of the hour to discuss this issue to find solution (Delanaye *et al.*, 2017). One way to solve this issue to create awareness among people through teaching practices (Higgins and Adeli, 2017). Another main problem is that there is no proper universal consensus is present on a cutoff point for describing the term overweight. Mostly BMI is calculated for differentiation between normal, overweigh and obese children (Kelishadi, 2007). According to a survey prevalence of obesity in Pakistan among adults was 27% for rural areas and 27% -42% for urban areas, respectively (Ahmad *et al.*, 2005).

Increase in weight is related with abnormalities in many serological parameters like albumin, creatinine and lipid profile etc. All these are indicator of body health. Increase in weight cause increase in cholesterol and triglycerides and decrease in levels of HDL (McCrindle *et al.*, 2007). Serum creatinine is a marker that is generally utilized to reflect renal health because it is an easily measured by product of muscles metabolism that is excreted unchanged by the kidneys (Daugirdas and Depner, 2017). Its quantity is alterable with the change in muscle mass because it is a product of muscle catabolism Similarly serum albumin also an important indicator of nutritional status of individual (Delaney *et al.*, 2017).

Past examinations have demonstrated that albumin level and serum creatinine values are very corresponded with BMI in patients with type 2 diabetes, and these parameters changes altogether with the increase in BMI (Inker *et al.*, 2012). Some studies observed cardiac risk factors including higher triglyceride (TG) and low density lipoprotein (LDL) and lower high density lipoprotein (HDL) in obese children compared to children with normal weight (Warraich *et al.*, 2009)

It was hypothesized that serum creatinine, serum albumin and Lipid profile levels alter with the increase in weight. Fluctuation in these serological parameters can occur in overweight children too which can become harmful in their later age. So weight control is essential for healthy life not only for adults but also for children. Up till now, no work has been done so that the current study was conducted to assess the Serum albumin, serum creatinine level and lipid profile in children of 6-12 years and to investigate the effect of weight on creatinine, albumin and lipid level.

2. Materials and Methods

2.1 Study design

This prospective study was conducted on total 300 children (age 6-12 years) of Lahore from the period of February to July 2019. Various questions were asked in purposely designed questionnaire regarding anthropometric measurements, family history of disease and socioeconomic status. Parental Consent was obtained from each participants before enrolling them in the study. Children having missing consent letter, incomplete anthropometric information or any health issue were excluded from this study. Approved Consent was taken from ethical committee of Zoology Department, Lahore College for Women University, Lahore.

2.2 Grouping

Participants were divided into two groups' i.e. Control and Experimental Group on the basis of their BMI. BMI was calculated by the formula: BMI = Weight in kg/Height m^2 (Kelishadi, 2007).

Weight of the children was measured by using weighing machine (Precision bathroom scale, HA-622, Tanita Corporation Tokyo, Japan). Height was measured by using measuring tape. Children having BMI below 18 Kg/m^2 were considered as healthy and categorized in control group while children having BMI ranges 18-24 kg/m2 were considered as overweight and placed in experimental group.

2.3 Blood sampling

Blood samples of children were collected by using sterilize disposable syringes. The skin was first cleaned with sterilized swab. Blood was drawn from vein from the inside of elbow or the back of hand.

Each sample was poured into the vial tube with the help of syringes and was left at room temperature till further analysis. Analysis of selected parameters of serum was done by automated Chemistry analyzer (URIT-800) as shown in (Figure 1).

2.4 Statistical analysis

Statistical analysis was done through SPSS (IBM SPSS Statistics, version 16). Demographic and clinical characteristics of the study population were expressed as means ± standard deviation. Student t-test to compare means of two groups. Value of $P \leq 0.05$ was considered as statistically significant.
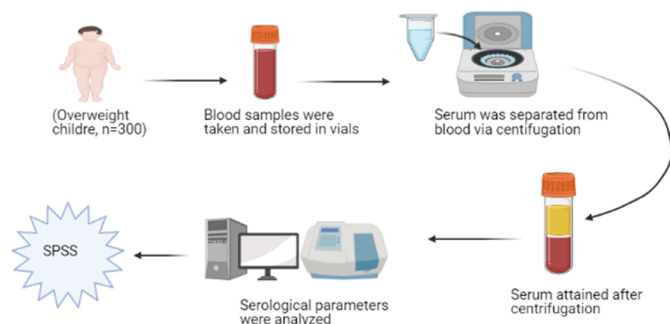
Figure 1: **Pictorial representation of protocol adopted.**

3. Results and Discussion

The mean serum creatinine level in males of experimental group was found to be 0.34±0.01 as compared to control males that had value 0.20± 0.0. The mean serum creatinine level in females of experimental group was found to be as 0.36±0.00 and that of control group females was 0.15±0.02. Result of *t*. test has shown that $P<0.001$ (Table 1).

The mean albumin level in experimental and control group males was (3.66± 0.15 g/dl) and (5.54±0.95 g/dl). The mean albumin level in experimental and control group females were (3.2± 0.14g/dl) and (4.37±0.13 g/dl). There is a highly significant decrease in albumin level in overweight children (Table 1).

The mean plasma total cholesterol levels in control group and experimental group males were 148.88±2.02 and 178.45±1.26, respectively. The mean plasma total cholesterol levels in control group and experimental group females were 149.67±2.09 and 178.06±1.16, respectively. The mean plasma HDL levels in control group and experimental group males were 46.95±0.67 and 39.65±0.25, respectively. The mean plasma HDL levels in control group and experimental group females were 47.35±0.58 and 39.83±0.22, respectively. The mean plasma triglyceride levels in control group and experimental group males were 158.66±1.41 and 173.85±0.63, respectively and the mean plasma triglyceride levels in control group and experimental group females were 157.83±1.39 and 173.69±0.67, respectively (Table 1).

A significant increase in plasma total cholesterol and triglyceride levels and BMI has been observed in experimental group as compared to control group, also a significant decrease in plasma HDL levels has been noticed in experimental group as compared to control group. These changes in lipid profile may indicate the risks associated with overweight in experimental subjects and may be useful in further diagnosis.

From the year 1980 to 2013 the tendency of pediatric overweight and obesity has risen by 47.1% between worldwide (Higgins and Adeli, 2017). Obesity can be a factor to the decline of kidney function (Chang *et al.*, 2018; Praga *et al.*, 2000, 2001). It was concluded from various studies that renal function get disturbed due to change in creatinine which fluctuates due to increase in weight and when weight decreases, this change revert usually. This case occurs in not only in human beings but also in dogs (Henegar *et al.*, 2001; Adelman *et al.*, 2001; Masuo *et al.*, 2011; Sheen and Sheu, 2011). Obesity is main factor for alteration in serological factors. Our study revealed that selected serum parameters were significantly directly correlated with BMI.

Table 1: **The clinical and biochemical characteristics of Children (normal weight and Overweight).**

Parameters	Control group	Experimental group	p-value	Control group	Experimental group	P-value
	Males (n=150)			Females (n=150)		
Age (yrs)	7.9±0.36	8.36±0.31	0.37	7.36±0.29	9.13±0.37	0.00
Height (cm)	126.18±1.72	131.8±1.9	0.04	125.8±1.77	132±2.32	0.01
Weight (kg)	24.73±0.7	31.6±1.0	0.00**	24.4± 0.76	31.9 ± 1.19	0.00
BMI (kg/m^2)	15.41±0.15	18.4±0.17	0.00**	15.42± 0.14	18.40 ± 0.19	0.00
Total cholesterol (mg/dl)	148.88 ±2.02	178.45 ± 1.2	0.000**	149.67± 2.09	178.06 ± 1.16	0.00
HDL (mg/dl)	46.9 ±0.67	39.65 ±0.25	0.000**	47.35 ± 0.58	39.8 ±0.22	0.000
LDL (mg/dl)	158.6± 1.41	173.8 ± 0.63	0.000**	157.83 ± 1.39	173.69± 0.67	0.000
Creatinine (mg/dl)	0.2±0.009	0.34±0.01	.000**	0.15 ±0.01	0.36 ± 0.0	.00
Albumin (mg/dl)	5.54± 0.95	3.36 ±0.15	.06*	4.37 ±0.13	3.2 ±0.14	0.00

Data are expressed as means ± SEM. BMI, body mass index; TC, Total Cholesterol; LDL-C, Low Density LipidD; HDL, High density lipid. * shows significant differences; ** shows highly significant differences.

According to the current study the plasma cholesterol and triglyceride levels were higher in experimental group as compared to the control group in both males and females while HDL concentrations are lower in experimental group than control group. This showed that the BMI is associated with the lipid profile concentrations of blood. The abnormal lipid concentrations are associated with increased cardiovascular risks in adulthood. In this study it is that overweight and obesity is a risk factor for changing the plasma lipid concentrations. This results in risk factors for cardiovascular diseases.

Results of a Muscatian study has shown that lipid and cholesterol values are directly related to their BMI. Also The Bogalusa study reported that the probability of overweight children developing high TG, LDL and HDL concentration is more as compared to normal children. Our results are in accordance with this study (Falaschetti *et al.*, 2010).

In current study, assessment of serum creatinine was also done. Our results has shown that the value of serum creatinine is more in males as compared to females. As muscle mass in males is more as compared to females so they have more creatinine in serum. This finding is quite close to a work done on Japanese children in which it is reported that gender and age can effect significantly to value of serum creatinine (Uemura *et al.*, 2011). Correlation between BMI and serum creatinine level was also supported by another study (Li *et al.*, 2014). As creatinine is product of muscles catabolism so greater the muscle mass, greater will be the value of creatinine. Compared with previous studies investigating the association of BMI and serum creatinine, our study has several strengths.

According to the current study the average serum albumin levels in experimental group females has been lower as compared to the control groups. Similarly, the average serum albumin levels in experimental group males is lower as compared to the control group males, this aspects of the study have been supported by the study (Chien *et al.*, 2017) who has studies that serum albumin concentration is influenced by age and gender. The current study is also in accordance with the study in which it was shown that albumin level is associated with BMI (Toto *et al.*, 2010). To our knowledge, our work is the unique prospective study which is conducted on children of Lahore. This issue should be discussed to prevent our children from fatal diseases which can occur due to negligence.

Conclusions and Recommendations

In conclusion weight is associated with biochemical parameters. Any fluctuation in these parameters may cause health issues so effective pediatric interventions are essential. It is recommended that follow up studies with large sample size should be conducted to study the risk compilations associated with Lipid profile, creatinine and albumin levels in children.

Acknowledgments

Novelty Statement

Obesity begins with the problem of being overweight which further leads to multiple diseases. It's important to discuss and highlight the roots of diseases. Overweight is often neglected so it's important to explore this topic.

Author's Contribution

FA: Presented the idea and finalize the work.
AK: Designed methodology and performed experimental work.
SF, SA and AA: helped in the collection of data.
MBK, FM and SR: Edited manuscript and performed statistical analysis.

Conflict of interest
The authors have declared no conflict of interest.

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