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THYROID AND LIVER PROFILE AMONG OBESE STUDENTS OF ASSAM DOWNTOWN UNIVERSITY

HIJAM CS, KANGUJAM DS. SOHLANG D, HIJAM LKS, KOTSO A, NATH S, LIPOKSENLA W, WANKHAR W*

Department of Medical Laboratory Technology, Faculty of Paramedical Science, Assam Downtown University, Panikhaiti, Assam, India

***Corresponding Author: Dr. Wankupar Wankhar: E Mail: wankuparwankhar@gmail.com**

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ABSTRACT

Obesity occurs when a person's body mass index is 25kg/m2 or above, and it is often associated with a higher risk of morbidity, disability, and death. The study comprised of 50 students, and their weight, height, Age, Random blood glucose, Transaminase enzymes, Thyroid hormone, Iron profile, and Cytological staining with Pap and PAS were determined. Increase random blood glucose level in obese II students (p0.001) when compared to the control, overweight and obese I. The liver profile showed a gradual increase in SGOT and SGPT in Overweight, Obese I, and Obese II. Cytomorphologic changes in Overweight students were 65% negative, 27% of the smears showed Dyskaryotic nuclear changes and 6.8% showed inflammatory. PAS smear shows 96.55% negative and 3.33% positive glycogen content. As recorded among obese PAS were 29% positive for the glycogen content and 71% negative. There was a statistical significance of pas smear difference between overweight and obese students ($p<0.05$*). Obesity is a common risk factor for several non-communicable diseases, and it's is observed that obesity in students is steadily rising especially the obese II group.

Keywords: BMI, Glucose, Serum Transaminase, Thyroid hormone, PAS, Iron profile

INTRODUCTION:

Overweight and obesity are defined by an excess accumulation of adipose tissue up to an extent that impairs physical, psychosocial, and physiological health **[1].** The body mass index (BMI) is a simple index to classify overweight and obesity in adults and is defined as weight in kg/height in m² **[2]**. According to the World Health Organization **[3]** 144.0 million children under 5 are suffering from stunting, 47.0 million children less than 5 are wasted, of which 14.3 million are severely wasted, and 38.3 million are overweight. Obesity is a risk factor for several non-communicable diseases like cardiovascular diseases, type 2 diabetes, hypertension, coronary heart diseases, cancers, thyroid, and liver **[4-5]**. The consumption of fast food by people of most age groups is also an important determinant of weight gain and obesity. Non-alcoholic fatty liver disease (NAFLD) is rapidly becoming the most common cause of chronic liver disease due to an increased prevalence of obesity **[6]**. On the other hand, weight gain, metabolic rate, and thermogenesis are frequently correlated with thyroid dysfunction. Studies on obese people with a normal thyroid gland tend to have activation of the hypothalamic-pituitary-thyroid axis with higher serum TSH and thyroid hormones in serum **[7]**. TSH levels are positively connected with BMI and are at the upper limit of the normal range or slightly elevated in obese children, adolescents, and adults **[8]**.

Thus, the economic and psychosocial costs of being overweight and obese, coupled with risk factors are detrimental to the person's health. This study will determine the prevalence of obesity in students of Assam down town University and evaluate its influence on the liver and thyroid profile.

MATERIALS AND METHODS

Study Area: A prospective study conducted at the Department of Medical laboratory technology of Assam down Town University, Guwahati, Assam. Institutional Ethical clearance of this study was obtained from an ethical clearance committee of Assam downtown University (Memo No:AdtU/Ethics/stdnt-lett/2022/ dt 24/6/2022)

Study Subjects: In this study, randomly 50 subjects which are overweight and obese by measuring their BMI levels were selected.

The BMI = Weight (kg)/Height^2 (m^2) = BMI (kg/m^2).

To determine the prevalence of overweight and obesity in Asian populations, the following cut-offs were used: overweight:

23.00-24.99kg/m2; obesity: 25.00kg/m^2 (WHO, 2002).

Inclusion criteria

- Students who were overweight or obese students.
- Students who were above 18 years.

Exclusion Criteria

- Subjects who were below 18 years of age.
- Those who were suffering from any acute/chronic disease illness.

Method of Collection: Blood sample were collected in plain and sodium fluoride vial in 5 ml of venous and buccal smear was collected orally using a sterile wooden spatula and transfer into a clean and dry glass slide.

Biochemical estimation and Cytology:

Estimation of Random blood glucose by (Glucose oxidase peroxidase) GOD-POD method according to Biolab Diagnostics (I) Pvt. Ltd, transaminase activity like Serum Glutamic Oxaloacetic Transaminase (SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT) by MOD International Federation of Clinical Chemistry (IFCC) method according to Beacon Diagnostics Pvt. Ltd. Thyroid hormone level (TSH, T3 and T4) by ELISA method and iron profile was estimated according to kits from Tulip diagnostic(P) Ltd. Two cyto-smears for Pap and PAS stain were obtained according to Sahil *et al*. **[9]**.

Statistical analysis:

All the statistical analyses were done using the Graph Pad Prism 8.3 (Graph Pad Software, Inc, San Diego, CA). One way analysis of variance (ANOVA) and t-test was used for significance between the different study populations.

RESULTS AND DISCUSSION

BMI and blood glucose

Obesity has been associated with an increased risk of several chronic diseases, including type 2 diabetes **[10]**. In our study **(Table 1 & 2)** we have classified individuals into overweight and obese according to their height, weight, and age. Our finding reported the prevalence of overweight was 60% and obese was 40% and it can relate to the unhealthy and sedentary lifestyle among the students. Chaudhari *et al*. **[11]** reported a positive correlation between blood sugar levels and obesity. Increase in random blood glucose level **(Figure 1)** was observed in the obese II groups by **101.4%** when compared to the control. Obesity is known to cause peripheral resistance to insulin-mediated glucose uptake and decrease the sensitivity of the beta-cells **[12]**. This could increase the susceptibility to developing type II diabetes. Weight loss is often associated with a decreased risk of type 2 diabetes.

Thyroid profile and obesity

The relationship between thyroid and weight has gained tremendous importance. Hyperthyroidism can lead to weight loss and hypothyroidism is often associated with weight gain **[13]**. However, the mechanism is not fully understood. T3 and T4, thyroid disorders are major health issues in an individual who is obese in developed countries. Unni Krishnan *et al*. **[14]** reported that 42 million people in India suffer from thyroid diseases. Data summarized In **Table 3** showed no significant changes in the TSH, T3, and T4 in the experimental group. However, in the obese II groups, the T3 level was significantly decreased by -194.45% when compared to the control group. On the contrary, TSH levels were increased in overweight by 33.39% and obese II by 67.11% when compared to control. This data indicate that the obese II are at borderline risk of thyroid dysfunction, especially in TSH level. Severe iron deficiency could interfere with thyroid hormone synthesis and decrease thyroid peroxidase activity. It may also reduce circulating levels of T4-5'deiodinase, resulting in the diminished conversion of T4 to T3 **[15]**. Data summarized in **Table 3** showed no significant change in TIBC and Serum Iron when compared to the control group. However, a significant increase in obese II group by **70.6%** when compared to the control. Similarly, a gradual increase in serum iron level by **12.3%** in obese II when compared to the control.

Liver profile and obesity

Visceral or general obesity is associated with nonalcoholic fatty liver disease (NAFLD), one of the primary factors contributing to chronic liver illness **[16]**. A major cause of elevated morbidity and mortality is NAFLD. The prevalence of NAFLD is directly proportional to growing age **[17]**. According to this study, male and female students have normal transaminase enzymes (SGOT). The data in **Figure 2** reported no statistically significant difference in SGOT and SGPT in the experimental group. Though no significant changes were observed, a gradual increase of **4.93% in** overweight, **10.**1% in obese I, and **16.1%** in SGOT level when compared to control. Similarly, a gradual increase of **29.9% in** overweight, **35.84**% in obese I, and **40.1%** in obese II in SGPT level when compared to control.

Papanicolaou-stained (Pap)

PAP stain showed well-stained nuclear chromatin and cytoplasmic transparency. The method's distinctive features include cellular transparency and crisp nuclear staining, attained through specialized cellular fixation and cytoplasmic labeling using different dye

and pH combinations **[18]**. According to the morphologic feature, examined Papanicolaou-stained (Pap) smears are classified into three categories: inflammatory, dyskaryotic, and negative **(Figure 3a-c).** Cytomorphologic changes **(Table 4)** indicated that 65% were negative in overweight, 27% were Dyskaryotic nuclear changes, and 6.8% showed inflammatory. 85% of the obese groups were negative, 4.7% showed dyskaryotic nuclear and 9.5% showed inflammatory changes.

Periodic acid-Schiff stain (PAS)

The current investigation revealed a statistically significant difference between the number of PAS-positive exfoliative cytology smears from the obese and overweight groups. We looked for a correlation between RBG and the amount of PAS-positive cells to see if we could determine the blood-glucose level based on PAS staining. However, no significant correlation was established. A similar result was obtained by Ravindran *et al***. [19]**. Smears were categorized as positive or negative based on the glycogen content evaluated using the PAS stain, with the positivity scored as +, ++, and +++. Data summarized in **Table 5** showed the statistical significance of pas smear between overweight and obese students ($p<0.001$**). The study showed 96.55% of the overweight were Pas negative and 3.33% were Pas positive. Similarly, 71% of the overweight were Pas negative and 29% were pas positive **(Figure 4)**. Statistical significance of pas smears difference between overweight and obese student. We also performed a Spearman's correlation test **(Table 6)** between a random blood glucose level and the number of PAS-positive cells of an overweight and obese group of students to determine whether we could relate blood glucose level with the number of PAS-positive cells. However, neither overweight nor obese showed any evidence of a significant correlation.

Table 1: The Anthropometric variables among the overweight and obese student

Anthropometric variables	Male (n=32)	Female (n=18)	P-value
Height(cm)	169.30±8.31	159.33±7.41	0.001
Weight(kg)	86.53±7.77	78±11.62	0.001
BMI(Kg/m^2)	Male (n=32)	Female (n=18)	P-value
Overweight	29.02±2.25	29.0±3.02	ns
Obese	32.2±2.12	32.1±1.26	ns

Data are expressed as Mean ± SD and Percentage; p value set @ p<0.05

Table 2: Prevalence of overweight and obesity among the students of AdtU (n=50)

	Male (N=32)	Female (N=18)	Total (N-=50)
Overweight	21(65.70%)	9(50%)	30(60%)
Obese	11(34.30%)	9(50%)	20(40%)

Data are expressed as Percentages

Table 3: Distribution of participants according to their serum thyroid profile (TSH, T3 and T4), TIBC and serum iron. Data are expressed as Mean ± SD and Percentage; p value set @ p<0.05

Characteristics	Reference	Normal	Overweight	Obese Class I	Obese Class II
T3 (nmol/l)	0.80–2.0 nmol/l	1.59±0.43	0.90±0.35	1±0.27	0.62±0.32*
T4 (mcg/dl)	4.5 to 11.2 mcg/dl	11.2±2.28	8.57±3.46	6.91±2.23	8.75±2.82
TSH (mIU/l)	0.5 to 5.0 mIU/l	3.32±1.53	4.46±1.94	4.43±2.44	5.55±2.22
TIBC	240 to 450mcg/dl	248.33±81.00	317.62±96.50	350.5±0.707	423.66±42.19
Serum Iron	60 to 170 mcg/dl	77.75±29.30	90.9±43.06	69.5±0.707	87.33±60.38

Table 4: Distribution of cytomorphologic changes among the overweight and obese students

Cytomorphologic changes	Overweight N/%	Obese N/%	Total N/%	P- value
Negative smear	19 (65.51%)	18 (85.71%)	37(74%)	ns
Dyskaryotic nuclear	8(27.58%)	1(4.7%)	9(18%)	ns
Inflammatory smear	2(6.89%)	2(9.5%)	4(8%)	ns
Total N/%	29(58%)	21(42%)	50(100%)	

Table 5. Distribution of glycogen content among overweight and obese students

Gylcogen content	Overweight	Obese	Total	P value
Pas Negative	28 (96.55%)	15 (71%)	43 (86%)	0.05*
Pas Positive	1 (3.33%)	6 (29%)	7 (14%)	
Total N/%	29 (60%)	21 (40%)	50(100%)	

As regards the glycogen content assessed using PAS stain, smears were classified as negative or positive with the positivity graded as 1, 11m a n d 111

Table 6: Correlation between Random blood glucose and the total PAS-positive cells among the overweight and obese students using Spearman's correlation (*r*)

Group	R	p
Overweight/obese	-0.408	0.363

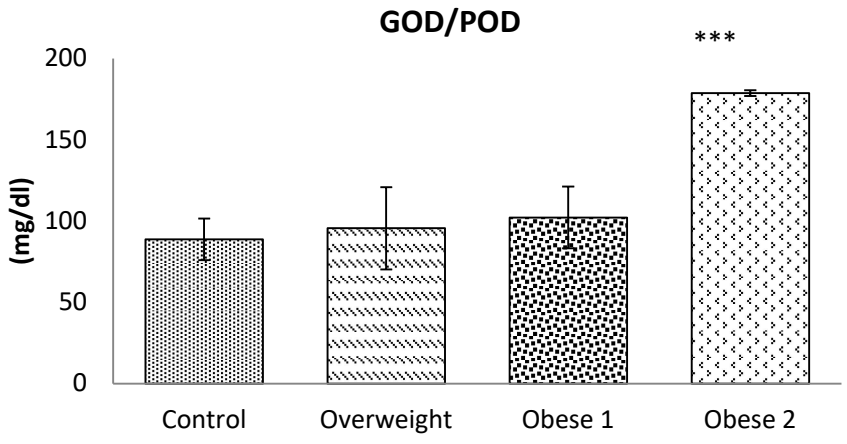


Figure 1: Random blood glucose among students of Assam down town University

Data are expressed as Mean ± SD. The significance level was fixed at "*" p < 0.05; "" p < 0.01, "***" p < 0.001**

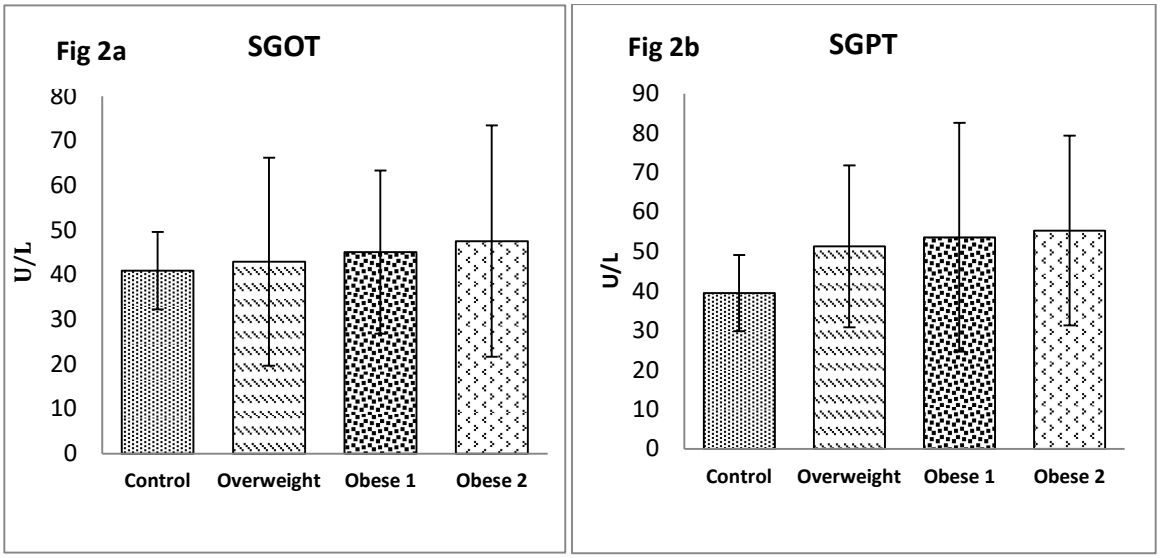
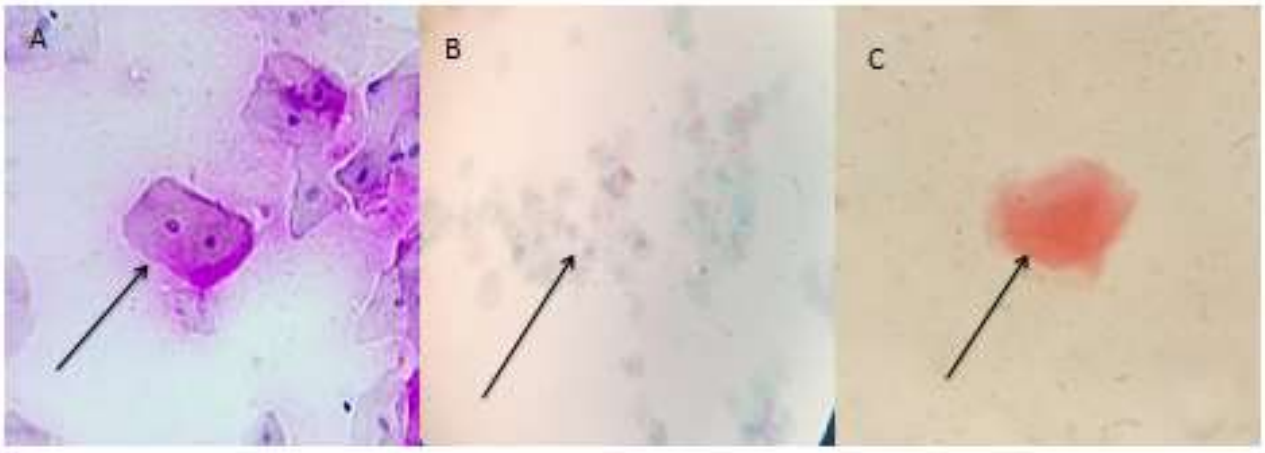
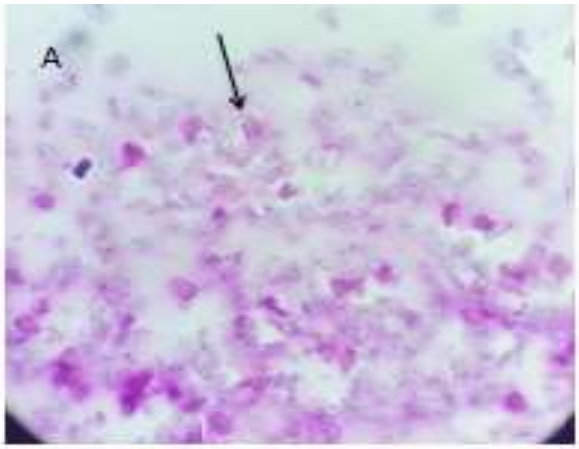


Figure 2: Liver profile of students among students of Assam down town University
Data are expressed as Mean ± SD, significance level was fixed at "*" p < 0.05



(A): Pap smear showing Bi-nucleation (B): Inflammatory Pap smears (C): Pap smear showing enucleated cell.
Figure 3: Papanicolaou-stained (Pap) of buccal smear



Smears were categorized as positive or negative based on the glycogen content evaluated using PAS stain, with the positivity scored as +, ++ and +++.
Figure 4: PAS staining showing Glycogen accumulation (40×Magnification)

CONCLUSION:

Obesity is a common risk factor for several non-communicable diseases, and it's rising in an alarming situation. It was observed that most of the subjects who are obese II are at borderline risk of thyroid dysfunction, especially in TSH level. Cytomorphologic changes in oral epithelial cells can alter the physiological mechanism by which obesity affects the cellular mechanism of the cells. We have also reported that young obese students displayed no significant difference in SGOT and SGPT in all the experimental groups. However, there is a need for well-planned and large-scale studies with participants from different regions.

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