



**ENDOCRINE HEALTH IN SCHOOL TEACHERS FROM PRIMARY, HIGH, AND
HIGHER SECONDARY SCHOOLS OF SOUTH TAMILNADU, INDIA**

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ABSTRACT

Introduction and Background: A rise in the incidence and prevalence of endocrine disorders has been attributed to lifestyle changes, environmental influences and stress. Interesting findings also indicate that educational systems evidence stress related endocrine dysfunctions in particular, in the teachers population. However, knowledge regarding the incidence and prevalence of endocrine disorders in teachers from south Tamil Nadu is limited/unavailable. Hence the present study aims to examine, identify population based endocrine disorders in school teachers. **Methods:** Primary, high, higher secondary school teachers belonging to five different schools were screened for general and endocrine health. Assessment of sociodemographic status, anthropometric measurements, and biochemical evaluations were carried out in order to identify the endocrine, endocrine related abnormalities in the chosen school teachers' population. In brief, age, sex, height, weight, blood count, Hb, blood pressure, fasting blood glucose, HbA1c, urea, creatinine, uric acid, serum calcium, lipid profile and FT4 (free T4), TSH (Thyroid stimulating hormone) were determined. **Results:** Cumulative clinical data analysis indicates that 16.93% of teachers were healthy without endocrine abnormalities, 30.31% of the teachers presented with dyslipidemia, 29.92% had thyroid dysfunctions, 16.14% had diabetes mellitus and 5.12% of the teachers had other endocrine abnormalities such as PCOS. Of note 22.4% of the dyslipidemic patients, 24% of the thyroid patients, 15% of the diabetic patients and 4.5% of the patients with other endocrine diseases were obese. Teachers in the age group of 40-60 represented the maximum percentage with obesity/abnormal BMI. The results further bring to light that about 2.76%, 6.10% of the teachers were identified/newly diagnosed with diabetes mellitus, thyroid dysfunctions by means of this study. Significant variations in the levels of triglycerides, HDL levels and was observed and interestingly, the primary school teachers exhibited the lowest percentage of incidence of thyroid, diabetes, dyslipidemia and other endocrine diseases when compared to high, higher secondary school teachers. **Conclusion:** The higher secondary school teachers tended to be relatively obese and present endocrine, multiple endocrine dysfunctions. The data strongly suggests that screening for endocrine health in school teachers would enhance performance, job satisfaction in teachers and procure a significant elevation in students' performance.

KEYWORDS: A rise in the incidence is limited/unavailable.

INTRODUCTION

Environmental, occupational and life style factors are identified to be the most important causatives associated with the rise in endocrine/metabolic diseases.^[1,2] Population based reports addressing endocrine dysfunctions in India are predominantly confined to diabetes and thyroid dysfunction assessments. In addition to the broadly recognized attributes such as urbanization, physical inactivity, stress and change in dietary pattern, a predisposition to insulin resistance.^[3] is also recognized to raise significant concerns in the incidence of a spectrum of endocrine diseases in India. Given the prevalence of endocrine dysfunctions, the economic and

social burden is observantly exponential and hence requires strategies for prevention and better management.

Health and well-being is a critical influencing factor in the quality, performance satisfaction of teachers, and their students. Very recent studies have started revealing the importance of understanding the dynamics and essentiality of endocrine health in employees such as teachers. In particular endocrine abnormalities such as diabetes, thyroid, metabolic syndrome, PCOS in teachers adversely affect teaching, teacher-student interactions, output and student performance.^[4,5,6] Of the several factors that precipitate endocrine dysfunctions, chronic

stress is recently evidenced to be critical and is adversely associated with endocrine health. Detailed research evidences point out that employees who are occupationally predisposed to chronic work stress related conditions experience twice the risk of incidence of endocrine abnormalities, particularly, metabolic syndrome.^[7] Further, repeated stress over a period of time seems to damage the Hypothalamo-Pituitary Axis (HPA) exacerbating the incidence and progression of endocrine diseases.^[8,9] Occupational stress in secondary school teachers has also been evidenced to be significantly associated with various health adversities as they handle the emotionally vulnerable group of students.^[4] Based on the available literature and on the necessity to understand the demographic trend in the endocrine dysfunctions, the present study aims to bring to light the incidence, prevalence and the necessity for ensuring endocrine well-being in the highly demanding professional setting such as teaching, in the south Indian population.

METHODS

As a part of the health advocacy programs conducted by Alpha Health Foundation, Alpha Hospital and Research Center screening for endocrine health and associated abnormalities (IEC, AHRC) was carried out in school teachers belonging to various schools of an organization. The management and the teachers belonging to a total of five schools (elementary, high school and higher secondary schools) were initially briefed about the screening program for assessing endocrine health and well-being by means of an orientation program. All participants were informed and health assessment was carried out by collecting socio demographic, anthropometric data, and biochemical evaluations was carried out by means of collecting whole blood samples in appropriate time schedules.

The screening program included screening for endocrine health in teachers belonging to an elementary school (school 1), a high school (school 2) and three higher secondary schools (school 3, school 4, and school 5). A total of 420 female teachers and 89 male teachers participated in the screening program. Blood count, Hb, blood pressure and biochemical evaluations including fasting blood glucose, HbA1c, urea, creatinine, uric acid, serum calcium, lipid profile and FT4, TSH were carried out. Clinical diagnosis and report discussions were carried out in a one-to one basis with all the participants. Statistical analysis was carried out using a graph pad prism software version 7.04 for Windows, GraphPad Software, La Jolla California USA.

RESULTS AND DISCUSSION

Incidence and progression of endocrine disorders are being recognized as critical limiting factors in professional settings and hence health assessments that include identification of endocrine disorders is beginning to be recommended. Screening for endocrine dysfunctions and identification of the associated

problems in teachers is highly essential as endocrine abnormalities like hypo, hyperthyroidism creates negative outputs for the teachers as well as the students. However, knowledge and awareness pertaining to endocrine health, endocrine health and professional performance/satisfaction continues to be limited in the Indian population. The present health advocacy program included assessment of endocrine wellbeing in teachers handling primary/elementary, high and higher secondary school teachers. The diagnostic reports of the participants indicate that a significant number of teachers were obese and prevalently presented endocrine, multiple endocrine dysfunctions such as diabetes, thyroid and dyslipidemia.

Table 1, Table 2 represent that the total of 420 female teachers from all the five schools presented a mean age of 41.4 ± 2.1 and that 89 male teachers accounted for a mean age of 44.3 ± 3.2 . In an over-all 36, 64, 121, 56, 232 teachers belonging to School 1, School 2, School 3, School 4 and School 5 respectively participated in the study. The mean age of the male teachers were 50, 45.54 ± 9 , 41.3 ± 9 , 42.5 ± 10 , and 42 ± 9 and the mean age of the female teachers presented as 41.6 ± 8 , 44.5 ± 8 , 39.8 ± 7 , 38.4 ± 8 , and 42.6 ± 8 for School 1, School 2, School 3, School 4 and School 5 respectively. The sociodemographic data indicate that both the male and female population of the teachers fell in the age range of 30-54 that would call upon attention to health and exercise.

Based on the data presented in Fig.1A, it can be observed that in an overall, 30.31% of the teachers presented with dyslipidemia, 29.92% of the teachers presented with thyroid dysfunctions, 16.14% presented with diabetes mellitus, 11.02% of them presented abnormal calcium levels, 8.46% were anemic, 6.69% had abnormal uric acid levels, 5.12% had other endocrine diseases such as PCOS, and only 4.33% had hypertension. Further, as indicated in Fig.1B, about 51% of teachers were overweight, obese (normal 44%) and as presented in Fig.1C, 24% of the obese teachers presented thyroid dysfunctions, 22.4% of them were dyslipidemic, 15% were diabetic and 4.5% of them had other endocrine dysfunction manifestations such as PCOS. On a school wise basis, as presented in Fig.2A, 2B it can be evidenced that school 1 had none of the participants with an abnormal BMI falling in an age group of 20-30, and the percentage of people with an abnormal BMI falling in the age group of 20-30 falls in school 4 and 31-40, 41-60 was the maximum in school 3. Due to the fact that endocrine diseases are co-morbid, we further assessed the population of teachers presenting more than one endocrine dysfunction in concurrence with obesity. It can be evidenced from Fig.2B that 7.33% of the teachers were obese and presented dyslipidemia, thyroid dysfunctions. Around 2.67% of the obese population had dyslipidemia combined with diabetes; abnormal calcium and thyroid dysfunctions.

Data presented in Fig.3 highlights that the school 2, 1 teachers (primary, high school) presented the maximum percentage of teachers (23.44%, 22.86%) without any endocrine diseases. Further, the percentage of teachers who were obese/overweight (abnormal BMI) was pronounced in the higher secondary schools (school 3 - 72.03%, school 4 - 58.18). The Maximum percentage of teachers presenting dyslipidemia (33.19%), and endocrine dysfunctions such as PCOS (11.57%) was also observed in higher secondary schools (school 5, school 3 respectively). The data from Fig.3B further indicates that the primary school teachers (school 1) exhibited a higher percentage for anemia (14.29%) and hypertension (8.57%) rather than metabolic complications. Manifestations pertaining to conditions associated with endocrine disorders such as abnormal calcium levels/hypocalcemia (14.3%) was also observed in a maximum percentage in the higher secondary school 4.

Detailed analysis of the diabetic profile amidst the individual school teacher population (Fig.4A, 4B) indicate that in an overall 16.14% of the teachers were diabetic, and among them 13.39% were known diabetics. It can also be evidenced that about 2.76% of the teachers were newly diagnosed by means of this screening program. It can further be observed that amidst the schools, schools 4, 3 (school 4 - 7.14% and school 3 - 4.96%) had the maximum number of newly diagnosed patients. In parallel, we also looked at the prevalence/incidence of thyroid dysfunctions in the overall assessed teacher population and the individual school teacher populations. As presented in group 5A, 5B the screening program enabled a significant group of teachers to understand their thyroid dysfunction status. In an overall 29.92% of the thyroid patients, 6.10% of the teachers were newly diagnosed and as presented in Fig.5B, about 10.71%, 7.8% of the newly diagnosed thyroid patients belonged to schools 4, 5 (higher secondary schools). Fig.6 A depicts the total cholesterol profile, triglyceride profile among the schools. It is evidenced from Fig.6A that a significant population of the teachers from school 2 had higher triglyceride levels ($p < 0.001$). It can further be observed from Fig.6B that LDL levels are significantly elevated in school 5 teachers in comparison to other schools.

Taken together, several earlier studies have clearly pinpointed that obesity is strongly associated with dyslipidemia and that an abnormal lipid profile is more likely due to genetics, improper nutritional habits and life style changes.^[10,11,12,13] Other causatives such as stress.^[14,15,16] have also been documented by a few reports. One of these is a retrospective study that compares the incidence rates of endocrine disorders such as metabolic syndrome in the Indian service personnel.^[17] A largescale cohort study conducted in school teachers in Mysore, Karnataka, brings to light that teachers in India are exposed to chronic work related

stress and present an increased risk of incidence of endocrine disorders including metabolic syndrome.^[4] In conjunction with such findings the present data also brings to light that thyroid dysfunctions are more common in secondary school teachers. Although the sample size, pertaining data for the assessed groups of schools (primary/elementary, high school, higher secondary school) is limited in the present study, based on available literature it could be strongly proposed that lack of physical exercise/life style factors, unbalanced dietary habits and occupational stress could attribute for the observed elevated trend in the manifestation of endocrine dysfunctions amidst higher secondary school teachers.

The screening study results emphasize that assessing for endocrine health is highly essential for performance output, satisfaction in the teacher population and the subsequent interpersonal relationships between students, teachers and student performance. As majority of the assessed population of teachers were in late 40's, had abnormal BMI and fell in the higher secondary school teaching category it can be deduced that counselling, advice on the importance of physical activities to reduce weight and improve overall health seems to be the critical need in the teachers population.

Fig.1

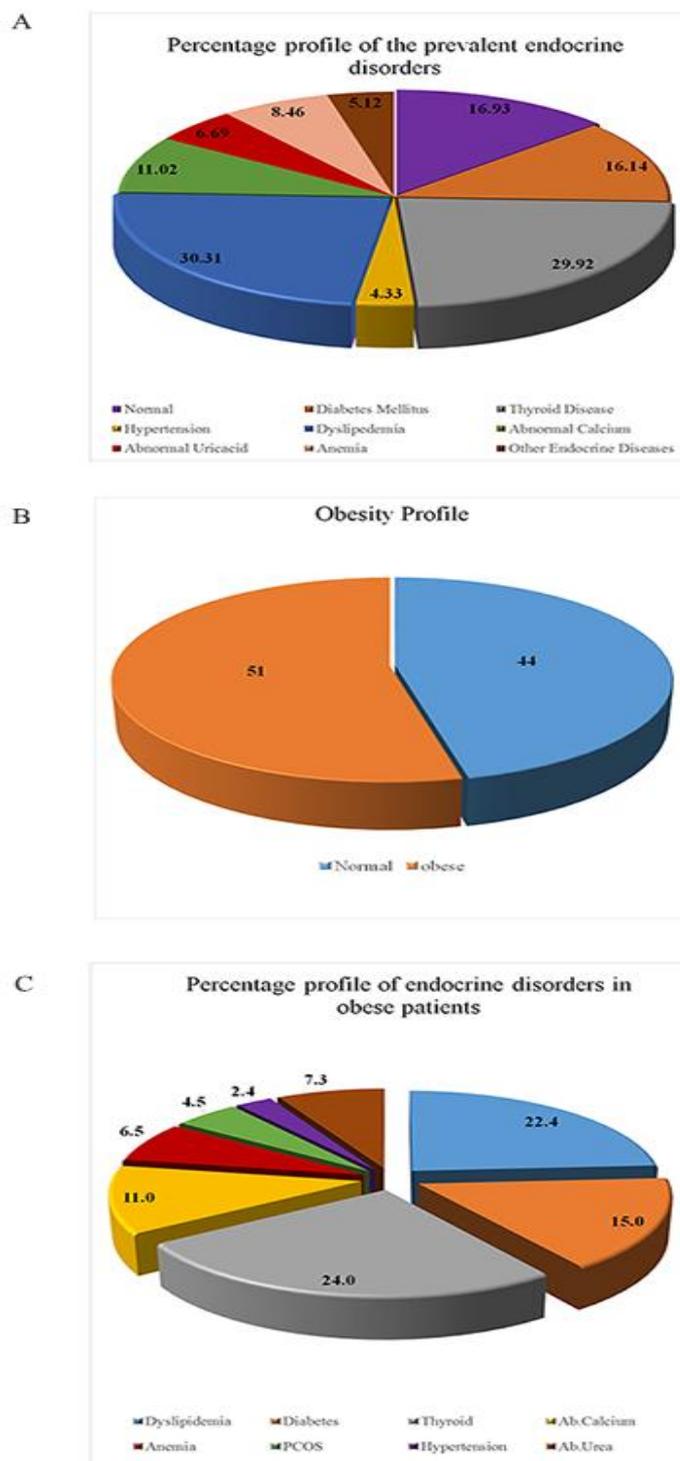
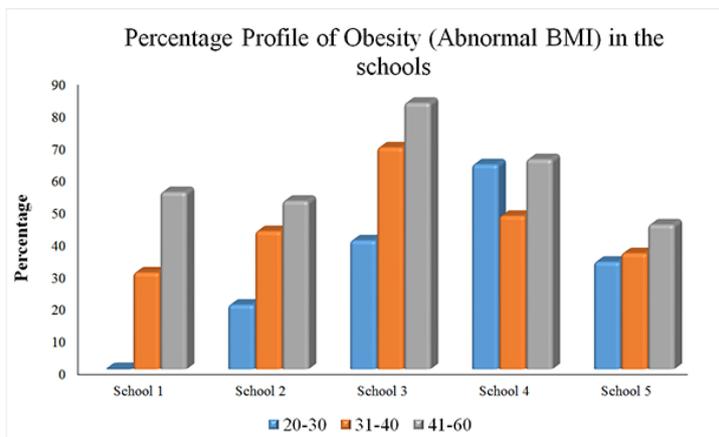


Fig. 1: Prevalence, Profile of Endocrine dysfunctions: 1A. The pie diagram represents the overall percentage profile of the prevalent endocrine disorders in the assessed school teachers. The prevalence of endocrine diseases was significantly higher ($p < 0.01$) when compared with the prevalence of other associated abnormalities using a two-way ANOVA with Tukey's multiple Comparisons post hoc test. 1B. The pie diagram presents the percentage of normal and obese people in the assessed population 1C. The pie diagram represents the percentage of obese people with endocrine disorders. A significant percentage of the assessed population were obese ($p > 0.05$).

Fig.2

A



B

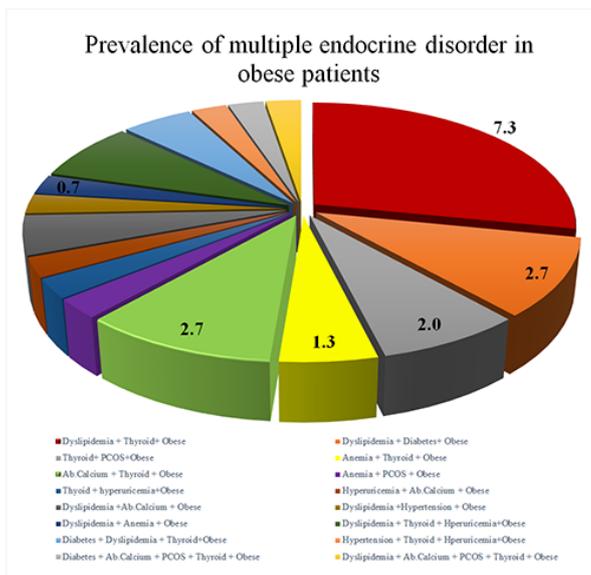
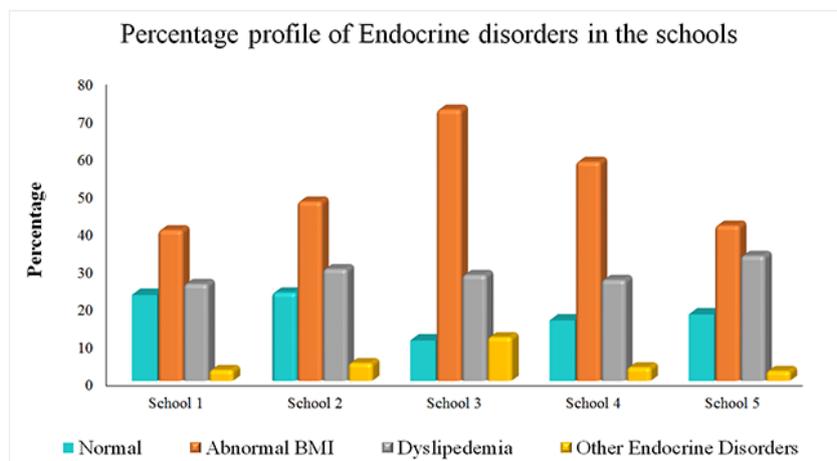


Fig. 2: Obesity profile in individual schools. 2A: Graphical presentation of the percentage of obesity in the age categorized population of the individual schools. School 3 presented the maximum percentage of obese teachers in the age range of 31-40 and 41-60. **2B.** Pie chart presentation of the prevalence of multiple endocrine disorders in the assessed obese population. About 7.3% of the entire assessed obese population was diagnosed with thyroid dysfunctions and dyslipidemia.

Fig.3

A



B

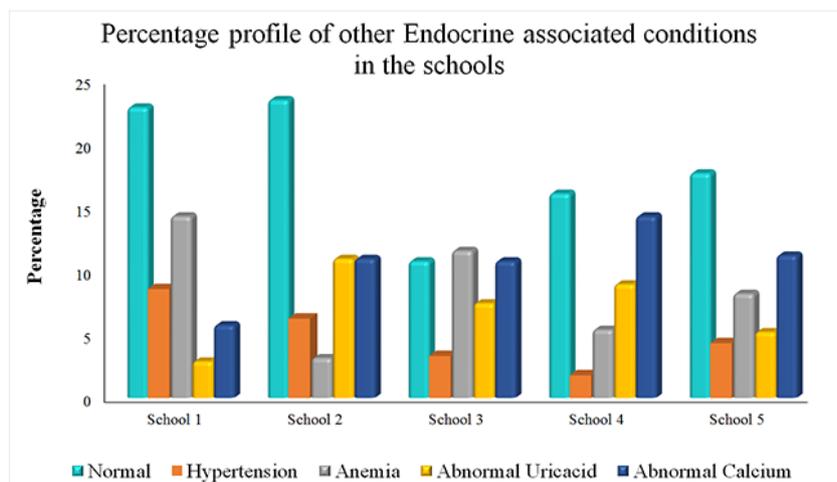
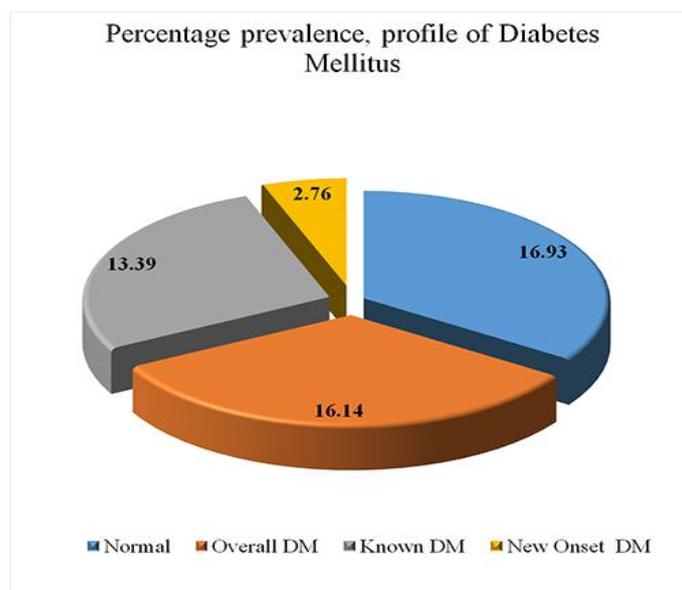


Fig. 3: Profile of the endocrine disorders in the assessed individual school teachers. 3A. Graphical presentation of the percentage prevalence of endocrine dysfunctions in the assessed schools. School 3 had the maximum percentage of obese teachers and school 5 had the maximum percentage of teachers with dyslipidemia. **3B:** Graphical presentation of the percentage prevalence of other endocrine associated dysfunctions in the assessed schools. School 1 had the maximum percentage of teachers with hypertension and school 4 had the maximum percentage of teachers with abnormal calcium.

Fig.4

A



B

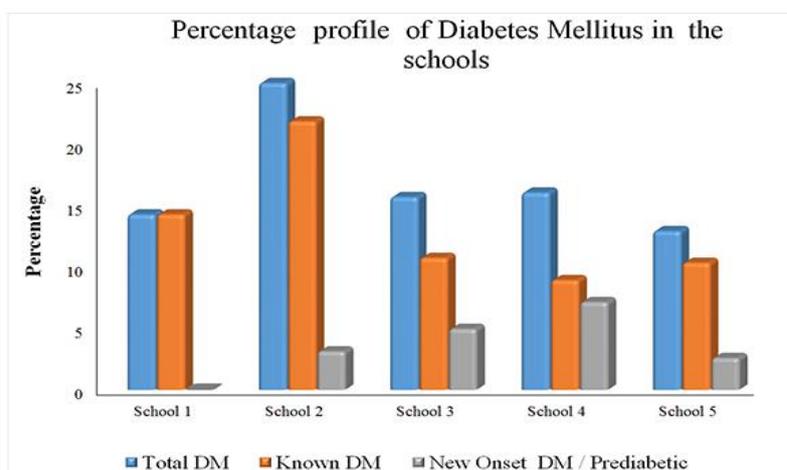
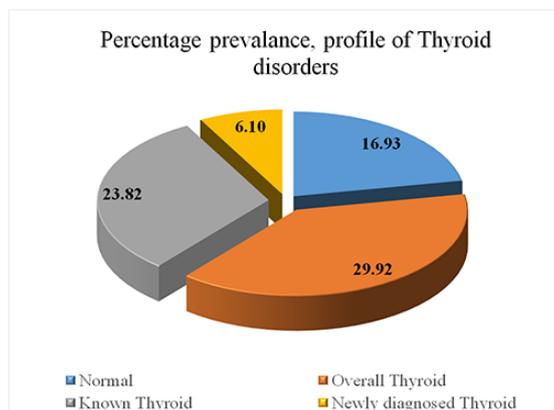


Fig. 4: Percentage Profile of Diabetes Mellitus in the assessed population 4A: Pie graph represents percentage of normal, total DM patients, known DM patients and patients with Newly Diagnosed DM. **4B.** Graphical presentation of the percentage of total, known and new onset DM teachers from the assessed schools. Teachers from school 2 had the maximum percentage of total and known DM patients. Teachers from school 4 had the maximum number of new onset DM patients.

Fig.5

A



B

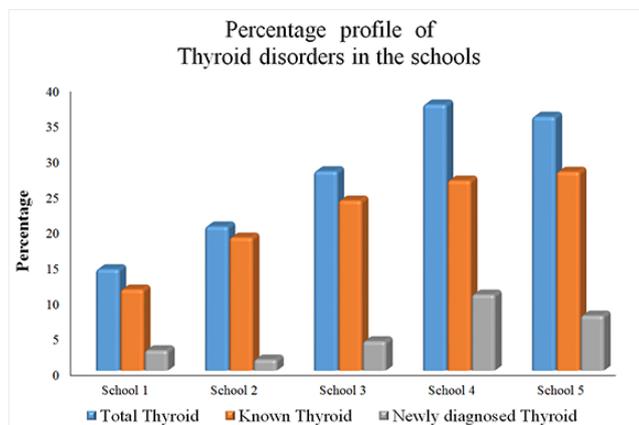
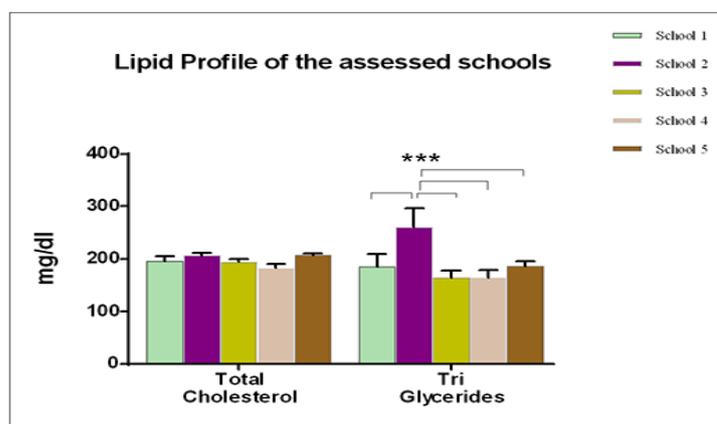


Fig. 5: Percentage Profile of thyroid dysfunctions in the assessed population **5A:** Pie graph represents the percentage of healthy teachers, percentage of teachers with thyroid dysfunctions, percentage of teachers already diagnosed with thyroid dysfunctions, and percentage of teachers newly diagnosed with thyroid disorders. **5B.** Graphical presentation of the percentage profile of thyroid dysfunctions in the assessed schools. The total percentage of teachers with thyroid abnormalities, teachers with a known history of thyroid dysfunctions were higher in Schools 4 and 5. The percentage of teachers who were newly diagnosed with thyroid abnormalities were higher in School 4.

Fig.6

A



B

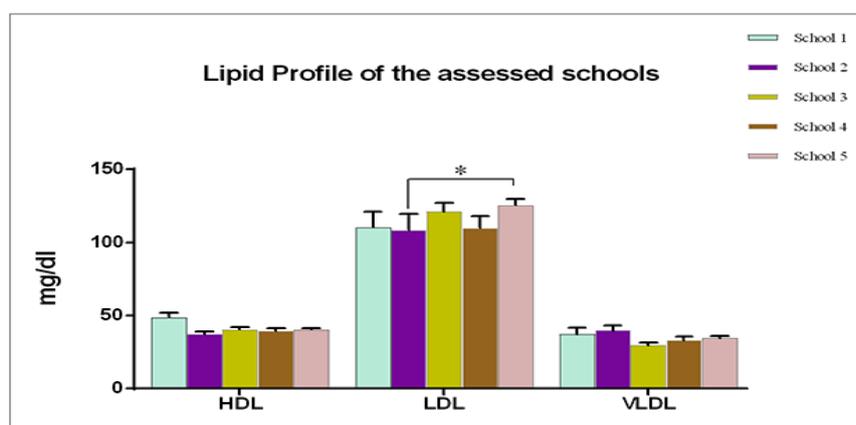


Fig. 6: Lipid Profile in the assessed school teacher population. All values are mean \pm SEM. Correlation analysis/linear regression analysis was performed for association of BMI and individual lipid profile parameters ($p < 0.001$ for triglycerides and $p < 0.05$ for HDL) **6A**. Graph represents the total cholesterol and triglycerides value of assessed schools. Statistical analysis was carried out using a two-way ANOVA with Tukey's multiple Comparisons post hoc test. The mean of the triglyceride values were significantly higher in the teachers from school 2 ($***p < 0.001$) when compared to the mean values of teachers from other schools. **6B**. Graphical presentation of the means of the HDL, LDL and VLDL values of assessed schools. Statistical analysis was carried out using a two-way ANOVA with Tukey's multiple Comparisons post hoc test, and school 5 teachers presented a significantly higher mean value for LDL for school 2.

Table 1: Gender and Mean age of the assessed schools.

Table.1		
Characteristics	Male	Female
Sex (n)	89	420
Age	44.3 \pm 3.2	41.4 \pm 2.1

Table 2: Demographic Characteristics of study population.

Table.2					
	School 1	School 2	School 3	School 4	School 5
Sex					
Male (n)	1	22	23	11	32
Female (n)	35	42	98	45	200
Overall	36	64	121	56	232
Age					
Male	50.0	45.54 ± 9	41.3 ± 9	42.5 ± 10	42 ± 9
Female	41.6 ± 8	44.5 ± 8	39.8 ± 7	38.4 ± 8	42.6 ± 8
Overall	45.8 ± 5.89	45 ± 0.71	40.6 ± 1.08	40.5 ± 2.91	42.3 ± 0.48

CONCLUSION

Screening programs in order to assess and improve endocrine health among teachers would drastically improve job satisfaction, teaching output and student performance in the south Indian/Indian population.

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