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Study of Correlation of Life Style Patterns on Non Communicable Diseases in Urban Adolescents Area of Maharashtra (India)

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Abstract: ***Background: Adolescents are an investment for tomorrow's society. Their health and development through adolescence into adulthood will affect the future prosperity and stability of countries. Many times Adolescents health are a neglected and mistakenly been perceived as healthy. Fast growing economy, industrialisation and urbanisation has made lot of behavioural and lifestyle modification which are generally inculcated during adolescent period of life and continued same for rest of life. As a result of these changes NCDs are commonly seen since adolescent period of life. Material and methods: Cross-sectional study for duration of two years was carried out by Department of paediatrics in a tertiary care institute. Adolescents in the age group of 11-16 yrs of government and private schools were studied. Healthy and apparently asymptomatic were enrolled as study subjects. Adolescents suffering from endocrinal disorder, chronic diseases like cardiovascular, respiratory, musculoskeletal, renal disorders and whose parents not willing to get enrolled in the study were excluded. Anthropometric measures–weight, height, BMI, Waist & hip Circumference, WHR were performed. BP measurement was carried out. Results: More commonly found NCDs were overweight (19.41%), obesity (11.15%) and hypertension (9.4%). No major difference was found in government and private school adolescent. Almost 66.9% adolescents were having junk food, 74.3% have their meal in front of TV. Association between obesity, overweight and having meal in front of TV, high screen time, high use of mobile hours was statistically significant. Conclusion: lifestyle has huge impact on emerging NCDs among adolescent.***

Keywords: Adolescent, Determinants, NCDs, Prevalence

1. Introduction

Non Communicable Diseases (NCDs) resulting from lifestyle factors are sometimes called disease of affluence. NCDs such as obesity, diabetes mellitus, hypertension, coronary artery disease, and stroke in the later part of life have been related to the prevalence of risk factors in childhood and in adolescence.[1]

In today's world obesity is not only common among the middle aged, but is becoming increasingly prevalent among younger adults and adolescents.[2] Adolescents are an investment for tomorrow's society. Their health and development through adolescence into adulthood will affect the future prosperity and stability of countries.[3]

The World Health Organization has already warned of increasing NCDs among adolescents as a major public health problem 10. The importance of this age group also lies in the fact that many serious diseases in adulthood have their roots in adolescence.[4,5]

Adolescence is a unique phase of human development, in which the rapid biological and psychosocial changes affect every aspect of the adolescent experience and lay the foundations for the rest of their lives. Adolescent brains have capacity to change and adapt rapidly, which provides a chance to establish healthy habits, yet it also serves as a period of vulnerability to high risk behaviour, and in fact, risk behaviour and experimentation in this age group is understood as normative rather than pathological.[6]

Habits acquired during childhood remain throughout the life. With increasing urbanization, lifestyle of adolescents has changed drastically making them susceptible to NCDs. If healthy lifestyle behaviours such as healthy dietary habit, adequate physical activity, adequate sleep, and low screen time use are inculcated at this stage of life, then, in the long run, this could be the most effective prevention of NCDs. While adolescence is a time of great potential, it is also a time of considerable risk during which social environment exerts powerful influences. This makes them vulnerable to risk taking behaviours such as smoking and alcohol consumption which increase many folds due to peer pressure.[7]

Hence, there is a definite need to monitor the magnitude of these risk factors in this age group and plan appropriate, feasible, and effective intervention measures for the same.

It is well established that the co-existence of two or more risk factors is associated with increased risk of developing NCDs than would be expected on the basis of the sum of the separate effects.[8-10]it is thus important to investigate the co-existence patterns of preventable risk factors, which may help in developing and implementing integrated preventative strategies. With some exceptions, most previously reported work from various countries has either investigated the combination of biological and clinical risk factors for NCDs in the general population[9,10] or has studied specific groups of adults and elderly populations[11,12] thus missing adolescents, who represent more than one fifth of the world's population (more than 1.2 billion).[13] Hence, there is need to study the pattern of NCDs in adolescents with a view of instituting adequate preventive measures against them. Present study

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was carried out to study the prevalence of non-communicable diseases in adolescents, as well as to find out the correlation between life style patterns and non communicable diseases among adolescents in one of the corporation area of emerging smart metro city of India.

2. Materials and Method

Cross-sectional study for duration of two years was carried out by Department of paediatrics in a tertiary care institute. Study included adolescents in the age group of 11-16 yrs of both government and private schools in Pimpri Chinchwad Corporation Area (PCMC). Healthy and apparently asymptomatic adolescents in the age group of 11 to 16 years were enrolled as study subjects. Adolescents (age 11-16yrs) suffering from endocrinal disorder, chronic diseases like cardiovascular, respiratory, musculoskeletal, renal disorders and whose parents were not willing to get enrolled in the study were e excluded from the study. With reference to inclusion and exclusion criteria around 510 adolescents in the age group of 11 to 16 years were enrolled in the presents study.

Sampling Procedure

The list of schools in the Pimpri Chinchwad area was done using data obtained from district health education office and were categorized in to two groups viz government school and private school. One school each form the Government and Private Set up was selected randomly by lottery method. Prior permission was taken from the head of selected school for the study. All the adolescents fulfilling the inclusion and exclusion criteria were enrolled randomly by selecting few sections of the class fulfilling the specified age group. Thus a total of 510 adolescents were enrolled in the present study containing 256 from Government school and 254 from Private School.

Methodology

- A pretested, self-administered questionnaire in understandable language was used to collect data regarding Sociodemographic status, parental education and occupation, family history of NCDs, dietary habits, physical activity, screen time use, and sleep duration.
- The researcher was present throughout the survey and students were clarified of their doubts during the data collection.
- After finishing the questionnaire, height, weight, and blood pressure (BP) of each student were measured by the investigator following standard operative procedures. A female resident was present in examining the girls throughout the data collection.

The following parameters were recorded:

a) **Weight:** All adolescents were weighed (in kg) with minimum appropriate clothes using standard technique and electronic weighing scale with a precision of 10Gms. The weight is recorded to the nearest decimal fraction. Body mass index (BMI) is a measure used to determine adolescent overweight and obesity.

b) **Height:** It is measured (in cm) by standard technique using stadiometer, the subject shoes, bulky clothing and unbraid hair are made clear before measurement. The subject is made to stand with feet flat, together, and against the wall. The line of vision is straight and parallel to the floor, with head, shoulders, back, heels touching the flat surface.

c) **Blood pressure:** blood pressure was recorded using sphygmomanometer with accurate cuff bladder size. The student was instructed to rest quietly for 5 minutes in sitting position with arm and back supported and both feet flat on floor. The arm is positioned so that midpoint of arm is at the level of heart. Three consecutive readings were taken from the same arm & average of it was recorded. Second reading was done for obese and overweight adolescents after initial evaluation. The students were classified according to IAP centile charts with more than 95th centile as hypertensive.

d) **Body mass index:** It was calculated using IAP BMI charts and classified as follows:
<3th percentile as underweight
3th to 84th percentile as normal
85th to 94thpercentile as overweight
>95th percentile as obesity.

e) **Waist circumference:** It was measured (in Inch) midway between the lower margin of palpable rib and superior border of iliac crest at the level of umbilicus without compressing the skin at the end of normal expiration in standing position with weight equally balanced on both feet.

f) **Hip circumference:** It was recorded at the maximum girth or widest portion of hip with precautions similar to waist circumference (in Inch).

g) **Physical activity:** It was determined as per CDC69,140 guidelines as 60 min/day of aerobic activity like bicycle riding, brisk walking, playing games, on electronic media games requiring continuous movements are labelled as adequate physical activity, and those who perform less or infrequently as low physical activity.

h) **Waist hip ratio:** Classified using WHO Asian charts.

Waist hip ratio more than 95th centile was considered **Waist Hip ratio**		
Waist Hip ratio	Boys	Girls
Normal	<0.90	<0.85
Obesity	>0.90	>0.85

After screening of the adolescents those who were overweight, obese and having positive family history for hypertension, diabetes, cardiovascular disorders were noted.

Parents of these adolescents were counselled and advised to visit outpatient department for further investigations like hemogram, blood sugar level, lipid profile, liver function tests and USG to rule out fatty liver changes and was carried out along with detailed general and systemic examination. They were called to the hospital preferably in the morning hours, nill by mouth and were counselled regarding the procedure for sampling and use of the sample for the fore mentioned tests.

Parents and students were counselled and explained about the venipuncture procedure for blood sampling. Around 10 ml of venous blood taken under strict aseptic precautions and results were interpreted and parents counselled thereafter. The investigation costs were carried out by the institution and not by the participant. The results were

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carried out and data analysis was done and interpreted thereafter for correlation of lifestyle and major non communicable diseases.

Ethical Issues

The study protocol was approved by the Scientific and Ethical Committee of the Institution. All the participants were also informed about the study procedure and the information required from them for the study. A voluntary informed written consent was taken from the participant; those who consented were included in the study. A strict confidentiality was maintained about the personal details of the participants and information related to the study.

3. Statistical Analysis

Data analysis was done using the SPSS (Statistical Package for the Social Science) Version 17 for window. The life style questionnaire was validated with correlation of Food and physical activity scale with test reliability coefficient scores (>0.7). The demographic variables, life style pattern were calculated with number and percentage. Chi-square test was used to find the significance difference of age, gender between government and private school. The Z test was used to find significance difference of WHR, WC according to hypertension and ANOVA test according to BMI. The chi-square test was used to find correlation between life style pattern and obesity, hypertension in study group. Odd ratio and 95% confidence interval were calculated for risk factors associated with obesity and hypertension. A probability value of 0.05 was accepted as the level of statistical significance.

4. Results

Majority of the adolescents in the present study were in the age group of 13-14yeras (76.5%) followed by 15-16 years (18.98%) & 11-12 years (4.7%). Maximum adolescents in both private and government school were in the age group of 13-14 years comprising about 76.4%. The proportion of boys and girls was almost same in the present study. About diet pattern Students having mixed diet were 201 (39.4%) followed by non vegetarian 166 (32.5%) and vegetarian diet 143 (28%). It was seen that majority of the students were having breakfast daily (78.2%) while 12.5% were having breakfast 3-4 times per week only, and 66.9% adolescents habituated to junk food in unhealthy category.

Family history of hypertension was reported by 174 (34.12%) students, while history of obesity and diabetes was observed in 102 (20%) and 80 (15.69%) students respectively in the entire study group.

It was observed that half of i.e. 260(51%) adolescents were doing adequate physical activity and one forth i.e. 132 (25.9%) were not performing any physical activity. Adequate sleep (>7hrs) was reported by 211 (41.4%). The difference between physical activity (p value 0.56) and sleep pattern (p value 0.71) within private and government school adolescent was not statistically significant.

Screen time (>2hrs) was found in 324 (63.5%) adolescents and usage of mobile phone (>2hrs) found in 174 (34.15%) adolescents. The difference between screen time (p value 0.67) and mobile hours (p value 0.50) within private and government school adolescent was not statistically significant.

Most common observed NCDs among study group were obesity 156 (30.58%) and hypertension 48 (9.4%).

It was seen that normal BMI was seen 52% girls 48% boys. It was observed obesity was more in boys (73.6%) as compared to girls (26.4%) and in overweight category boys were 48.4% and girls were 51.6%. Out of 23 students who were underweight 56.5% were girls compared to 43.5% boys. (Chi-square = 13.66, **P =0.0034).** No difference in proportion of obese (as per BMI) within private and government school adolescent.

It was seen that the waist to hip ratio was increasing with the increasing BMI but the difference observed was not statistically significant. It was observed that the waist circumference was increasing form “25.80±1.946” (inch) in underweight students to “28.51±2.298” (in Inch) in overweight students and the rise observed was statistically significant **(P=0.0000055)**. The association between physical activity and sleep with obesity was statistically non-significant in this study.

It was observed that association between obesity and having meal in front of TV was statistically significant **(P <0.0001).** It was observed that association between obesity and high screen and there was no significant association between life style factors and evidence of hypertension among study group, but the risk of hypertension was 1.46 times higher in students with inadequate sleep (<7hrs), 1.55 times among 3-4times of breakfast at home, 2.31 times higher in having Meal in front of TV daily.

5. Discussion

The risk factors of NCDs include low education, stress, tobacco use, unhealthy diet, physical inactivity, overweight and obesity, and biological risk factors such as high blood glucose, high blood pressure and abnormal blood lipid profile.1[4]These factors are interlinked with each other and linked with urbanization, poverty and globalization 69. An increasing trend in NCDs risk factors has been observed globally during the two decades from 1990 to 2010; blood pressure (27% increase), smoking (3% increase), alcohol use (28% increase), low fruit (29% increase), high body-mass index (82% increase), and high fasting plasma glucose (58% increase). An increase in such risk factors may lead to raised NCDs’ burden. [15]

In present study it was seen that majority of the students in private and government school were in the age group of 13-14 years. Aparajita Dasgupta 151 studied 276 participants and their mean age was 14.3±1.08 years and was ranging from 12 to 17 years.

The proportion of male and female adolescents was almost same in the present study (50.8% boys and 49.2% girls). The proportion of male and female students in private and

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government school was comparable with statistically no significant difference.

It was seen that majority of the students were used to have mixed diet (39.4%) followed by non vegetarian (32.5%) and vegetarian diet (28%). Family history of hypertension was reported by 34.12% adolescents, while history of obesity and diabetes was observed in 20% and 15.69% adolescents respectively.

Association between life style patterns and adolescents in this study

While studying the life style pattern it was seen that majority of the adolescents were doing adequate physical activity (51%). Physical inactivity is estimated to cause approximately 3.2 million deaths globally each year.[16] Individuals with inadequate physical activity had 20-30 % higher risk of various kinds of NCDs than those performing moderate physical activity.[17]

It has been well reported from various parts of the world that a general trend in physical inactivity has increased over time in both adults.[18,19] and adolescents.[20,21] A communities – based survey by Khuwaja AK et al,[22] reported that the majority of adults were physically inactive, and this finding was stronger in women than in men. In the present study as well, most of the adolescents, especially girls, were physically inactive. There are several possible explanations for this high proportion of physical inactivity, such as increased interest in watching television and movies and spending more time on computer and video games[19,20] generally, there is also a lack of safe outdoor playgrounds and walking tracks in major cities in developing countries, particularly for girls and women.

Comparison of life style pattern between private and government school:

There was no significant difference between physical activities, sleep pattern with type of school. Also there was no significant difference between type of school with Breakfast at home, Junk food, Meal in front of TV, Eat outside and Family dinner, screen time and mobile hours.

Association of physical examination, lifestyle pattern with obesity:

The distribution of students according to BMI showed that majority of the adolescents (64.9%) was having normal BMI. 11.18% and 19.41% students were obese and overweight & 4.51% were underweight. Kadilkar et al[23] observed overweight in 19.9% students while obesity in 5.7% students. Similarly Chhatwal et al[24] observed overweight and obesity in 14.2% and 11.1% adolescents in their study. Aparajita Dasgupta[25] in their study reported overweight in nearly 23.6% adolescents.

In present study it was observed that obesity was more in male students as compared to females. Reason could be socio-cultural practices like more attention is given towards the male adolescents as compared to female. A study by Misra A. et al[26] conducted in 5 cities in India to find prevalence and compare with respect to age, gender, type of school and city of residence. It was found that the prevalence of overweight and obesity in 8- to 18-year-old children, respectively, was 18.5 and 5.3% by WHO cut-offs. The prevalence of overweight and abdominal obesity was significantly higher in girls than boys ($p < 0.001$). High socioeconomic status and residing in cities with a population greater than 4 million were independently associated with overweight and abdominal obesity ($p < 0.001$).

According to the laws of thermodynamics, the only way to accumulate excess body weight is through a positive energy balance, that is, when the input into the system exceeds the output. The difference in excess energy intake and reduced energy expenditure is the mechanism by which obesity occurs. The factors that cause obesity are those that promote excessive energy intake, reduce expenditure or impair the regulation of energy imbalance. Consumption of high energy food 2-3 times per week or more was significantly associated with obesity.[27]

In present study it was seen that out of total 156 adolescents with obesity 101 were having high screen time and the association was statistically significant. Increased use of mobile hours and having meal in front of TV were statistically significant p value ($p<0.05$). According to Aparajita Dasgupta[25] high screen time has 3.56 times risk of obesity as compared to low screen time in students. The high screen time is indirectly increasing the physical inactivity and leading to obesity.

In present study low Physical activities, inadequate sleep, having meal in front of TV, never having dinner with Family members and high screen time were the common risk factors associated with the obesity in adolescent. According to Aparajita Dasgupta[25]high screen time has 3.56 times risk of obesity as compared to low screen time in students, inadequate sleep 0.71 times, 3-4 times Meal in front of TV 1.87 time's risk of obesity.

Association between lifestyle patterns with hypertension in this study:

Hypertension was labelled in 9.4% adolescents. According to Sorof, J. M[28] the prevalence of hypertension among adolescents is 4.5%. Aparajita Dasgupta[25] in their study reported that 18.8% children were having prehypertension. In a study by Deshpande et al[29], prehypertension was observed in 15.9% adolescents.

There was no significant association between life style factors and evidence of hypertension among study group, but the risk of hypertension was 1.46 times higher in students with inadequate sleep (<7hrs) compared to adequate sleep, 1.55 times risk of hypertension with students having 3-4 times of breakfast at home. The risk of hypertension was 2.31 times higher in students; having Meal in front of TV daily. While the risk of hypertension was 1.11 times higher in students with rare interaction with family members; and 1.39 times higher with no interaction with friends.

Preventive strategies like awareness about NCD's in community especially school going adolescents and their parents is required to change the course of NCD's in the country. Early screening during school health check-up can

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help for early diagnosis and interventions in management of NCD's

Limitation: This was a study with limited sample size and single locality. Further multicentric studies with larger sample size are required for better evaluation and significant results. The evaluation of NCDs like cancer, chronic obstructive pulmonary disease and asthma (major non communicable diseases) was not observed in this study population.

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Tables:

Table 1: Demographic characteristics of study subjects

Variables	Frequency	Percentage
Age (Years)		
11 – 12	24	4.7
13 – 14	390	76.5
15 – 16	96	18.8
Gender		
Boys	259	50.8
Girls	251	49.2
Diet		
Vegetarian	143	28
Non vegetarian	166	32.5
Mixed	201	39.4
Family history		
Hypertension	174	34.12
Obesity	102	20
Diabetes	80	15.69
Asthma	24	4.71
Don't know	154	30.2
BMI		
Obese	57	11.18
Overweight	99	19.41
Normal	331	64.9
Underweight	23	4.51
Hypertension		
Yes	48	9.4
No	462	90.6

Table 2: Comparison of lifestyle parameter in government and private school

Life style parameter	School		p value
	Private	Government	
Physical activity			
Low	58	60	0.56
Adequate	135	125	
No	61	71	
Sleep			
Inadequate	151	148	0.71
Adequate	103	108	
Breakfast at home			
Daily	204	195	0.5
3 – 4 times	28	36	
Rare	22	25	
Meal in front of TV			
Daily	181	198	0.27
3 – 4 times	61	47	
Never	12	11	
Eating outside			
Daily	72	73	0.74
3 – 4 time	87	80	
Rarely	95	103	
Screen time			
High(>2hrs)	163	161	0.67
Low	54	62	
No	37	33	
Usage Mobile phone			
High(>2hrs)	89	85	0.5
Medium	20	19	
Low	117	132	
No	28	20	

Table 3: Risk factors associated with obesity

Life style parameter	Pattern	Obesity		Odds Ratio	95%CI
		Yes (n=156)	No (n=354)		
Physical activity	Low	40	78	1.17	0.74 - 1.87
	Adequate	79	181	1	-
	No	37	95	1.13	0.73 - 1.76
Sleep	Inadequate	95	204	1.15	0.78 - 1.68
	Adequate	61	150	1	-
Breakfast at home	Daily	125	274	1	-
	3 - 4 times	19	45	0.93	0.52 - 1.65
	Rare	12	35	0.75	0.38 - 1.50
Junk food	Unhealthy	104	237	0.99	0.66 - 1,47
	Healthy	52	117	1	-
Meal in front of TV	Daily	92	288	0.54	0.24 - 1.23
	3 - 4 times	54	49	1.87	0.78 - 4.48
	Never	10	17	1	-
Eating outside	Daily	39	106	0.72	0.45 - 1.15
	3 - 4 times	50	117	0.84	0.54 - 1.30
	Rarely	67	131	1	-
Family dinner	Daily	117	290	1	-
	3 - 4 times	21	38	1.37	0.77 - 2.43
	Never	18	26	1.72	0.91 - 3.25
Screen time	High	101	223	3.28	1.22 - 4.82
	Low	44	72	2.43	1.56 - 6.90
Mobile hours	High	45	129	0.09	0.04 - 0.19
	Medium	13	26	0.12	0.05 - 0.33
	Low	58	181	0.08	0.04 - 0.17

Table 4: Risk factors associated with hypertension

Life style parameter	Pattern	Hypertension		Odds Ratio	95%CI
		Yes (n=48)	No (n=462)		
Physical activity	Low	10	108	0.8	0.37 – 1.71
	Adequate	27	233	1	-
	No	11	121	0.78	0.37 – 1.64
Sleep	Inadequate	32	267	1.46	0.78 – 2.74
	Adequate	16	195	1	-
Breakfast at home	Daily	38	361	1	-
	3 – 4 times	9	55	1.55	0.71 – 3.39
	Rare	1	46	0.2	0.03 – 1.54
Junk food	Unhealthy	33	308	1.1	0.58 – 2.09
	Healthy	15	154	1	-
Meal in front of TV	Daily	36	343	2.31	0.30 – 17.64
	3 – 4 times	11	97	2.49	0.30 – 20.35
	Never	1	22	1	-
Eating outside	Daily	9	136	0.56	0.25 – 1.26
	3 – 4 times	18	149	1.02	0.52 – 1.98
	Rarely	21	177	1	-
Family dinner	Daily	45	398	1	-
	3 – 4 times	3	44	0.6	0.18 – 2.02
	Never	0	20	-	-
Screen time	High	29	295	0.59	0.27 – 1.27
	Low	9	107	0.5	0.19 – 1.31
Usage of Mobile phone	High	20	154	0.91	0.34 – 2.41
	Medium	4	35	0.8	0.21 – 3.06
	Low	18	231	0.55	0.20 – 1.45

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