J. Indian Dietetic Association Volume 40, No.1, pp. 1-9, 2017

TEMPORAL CHANGES IN PREVALENCE OF OVERWEIGHT AND UNDERWEIGHT AMONG ADOLESCENT GIRLS HAILING FROM DIFFERENT SOCIOECONOMIC STATUS

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INTRODUCTION:

Heredity and environment have a combined influence on physical growth. In general, children living under better socio-economic conditions have consistently exceeded in growth and maturation than their counterparts living under worse conditions. The economic transition has changed the lifestyle and resulted in double burden of obesity and under nutrition in developing countries (Bovet et al., 2006). The WHO in 1998 designated obesity as a global epidemic. India is also facing the epidemic of obesity and its associated diseases especially in children and adolescents (Fall and Barker, 1997). NFHS (National Family Health Survey) data reveals that problem of obesity is substantial in the adult population residing in urban areas with high standard of living, where 25% were found to have a BMI > 25 and 6-7% had BMI > 30 (NFHS-2000). Results from the 2003-2004 National Health and Nutrition Examination Survey (NHANES), indicate that an estimated 17 percent of children and adolescents aged 2-19 years are overweight. According to two studies conducted by Ogden et al. (2008), obesity prevalence among children and adolescents showed no significant changes between 2003-2004 and 2005-2006. Based on the study, in the combined years of 2003-2006, 16.3% of children and adolescents aged 2–19 years were obese, at or above the 95th percentile of the 2000 BMI-for-age growth charts. In most developed countries the prevalence of obesity has increased in children among minorities and low socioeconomic groups. A study by Wang (2001) on prevalence of obesity across nations concluded that relationship between obesity and socioeconomic status varies across countries. Higher socioeconomic status subjects were more likely to be obese in China and Russia, but in the U.S.A, low socioeconomic groups were at higher risk.

Though more studies are needed to understand the precise prevalence of overweight in India, school based data demonstrates an increasing trend of obesity range. According to a large survey on middle to high income school children in Delhi (Kapil et al., 2002) about 30% of adolescents were found to be overweight and in a study conducted on Chennai school children,26.4% rich students were found

obese(**Jagadesan et al.,2014)**. A study on affluent school children in Amritsar, Punjab concluded that overweight in affluent children was higher or as high as in some developed countries (Sidhu et al., 2006). Another study conducted on affluent adolescent girls of Bengal (9-18 years) found 13.1 % and 4.3% girls overweight and obese respectively (Sood et al., 2007). The nutritional status of the future mothers contributes significantly to the nutritional status of the community.

Two large longitudinal studies from England (Power and Moynihan 1998 & Wang 2001) on childhood obesity predicted the development of obesity in adult life. Moreover, many studies have suggested that overweight children have higher chances of having hypertension in childhood or in adult life (Singh et al., 2007; Sidhu and Prabhjot, 2007; Taksande et al., 2008; Badaruddoza et al., 2009; Costanzi et al. 2009;Jagadesan et al. 2014). There is a limited data from this region of India regarding assessment of temporal changes in nutritional status of children; hence the present study was carried out in the city of Ludhiana in Punjab. Ludhiana is one of the fastest growing cities of north India. Rapid growth of industry and trade has increased the per capita income of the citizens translating into higher levels of disposable income in the hands of high and middle income groups where as the lower income group is still struggling hard for better nutrition. Also known as the 'Manchester of India', this industrial city has seen a paradigm shift in the lifestyle and eating habits of its populace especially children and youth in the last decade or so. This change has unfolded an era of easy availability and affordability of high calorie junk food and ever decreasing physical activity. Though rich materially, there is a mental block in the minds of people regarding preference of children as evidenced by decreasing ratio of girls as compared to boys in this region. Hence, the present study was designed to study 10-16 year old school going urban girls with following objectives:

1. To compare the prevalence of overweight, obesity and underweight among urban adolescent girls from different socioeconomic backgrounds.
2. To compare data collected in 2007 and in 2014 and to investigate the temporal changes in the prevalence during this period.

METHODOLOGY:

The data was collected in the year 2014 from 10-16 year old urban school going girls from Ludhiana, Punjab. For this cross sectional study a random sample of 831 girls was chosen comprising of upper socioeconomic status (USES) girls from schools with higher fee structure (monthly fee more than 1500 Rs.) and low socioeconomic status (LSES) girls from government schools. The height and weight of both the groups were recorded and BMI was calculated. On the basis of BMI, prevalence of overweight, obesity and underweight was assessed with the help of latest IAP (2015) guidelines.Overweight and obesity was assessed from BMI tables where adult equivalent of 23 and 27 cut-off values are provided for ages between 5-18 years. Girls below 5th percentile of BMI were considered underweight and below 3rd percentile were placed in severely underweight category. This

data was compared with the findings of a similar study conducted in 2007 on 1049 USES and LSES girls. Temporal changes in prevalence of overweight, obesity and underweight in seven year period were investigated by comparing the prevalence of overweight and underweight in 2007 and in 2014 in both groups.

RESULTS AND DISCUSSION:

Table 1 shows the comparison ofBMI of USES and LSES girls. The BMI of USES girls ranged from 19.82 to 23.28 between 10-16 years. The BMI of these girls increased from 10 to 13 years and decreased at 14 years, increased at 15 and stabilized at 16 years. Maximum average BMI (23.28) was recorded in the 15 years age group.

Table1: Comparison of BMI of USES and LSES girls

The BMI of LSES girls increased steadily from14.23 to 19.31at 16 years. The BMI of USES girls is significantly high as compared to LSES girls at all age groups between 10-16 years. The average BMI of USES girls at 10 years is more than BMI of LSES girls at 16 years.

Table 2 shows the prevalence of overweight, obesity and underweight among 10-16 year old girls hailing from USES and LSES.According to Khadilkar et al. criteria (2015) the USES girls are heavier and possess higher BMI as compared to their coevals. A significantly higher proportion of USES girls are overweight or obese as compared to their poorer counterparts.

Table2: Comparison of prevalence of Overweight, obesity and underweight among USES and LSES girls According to latest IAP criteria, on the basis of BMI, 52.33% USES girls

Comparison of BMI of USES and LSES girls										
Age Group (Years)	USES				LSES				D	t-value
	N	Mean	SD	SEM	N	Mean	SD	SEM		
10	57	19.82	3.13	0.38	53	14.23	2.35	0.32	5.59	6.26*
11	68	20.53	3.39	0.34	55	14.98	2.50	0.60	5.55	6.43*
12	51	21.37	4.11	0.48	47	15.12	2.36	0.45	6.25	7.41*
13	68	22.17	4.65	0.49	42	16.27	2.62	0.46	5.9	6.76*
14	62	21.47	4.07	0.45	54	17.04	2.89	0.48	4.43	5.40*
15	74	23.28	4.87	0.57	83	17.71	2.68	0.33	5.57	8.89*
16	64	23.25	4.99	0.62	54	19.31	3.02	0.52	3.94	4.24*

D-actual difference *p<0.001

AGE IN YEARS	GROUP	TOTAL NO.	OVERWEIGHT	OBESITY	UNDERWEIGHT
			%	%	%
10	USES	57	40.29	23.88	0
	LSES	53	0	00	26.32
11	USES	68	35.72	24.48	0
	LSES	55	8	0	23.52
12	USES	51	26.76	23.94	1.4
	LSES	47	2.7	0	33.33
13	USES	68	52.27	22.73	1.13
	LSES	42	9.3	0	18.75
14	USES	62	26.83	13.41	1.21
	LSES	54	3.7	0	21.62
15	USES	74	29.73	22.97	1.35
	LSES	83	6.02	1.2	9.63
16	USES	63	22.23	23.80	0
	LSES	54	17.64	2.94	11.76
COMBINED	USES	443	52.33	23.14	72
	LSES	388	11.84	0.92	20.69

were found overweight, out of which 23.14% were obese. Maximum overweight or obesity was recorded at 10 years in this group and minimum overweight or obesity was found in 14 year old group. The overall overweight or obesity in LSES girls was found as 11.84% and S 0.92%,maximum overweight or obesity was found in 16 year old girls in this groupand no girl was found overweight at 10years of age in the LSES group.

Table3: Comparison of Prevalence of overweight, obesity and underweight of USES

YEAR	GROUP	TOTAL NO.	OVERWEIGHT	OBESITY	UNDERWEIGHT
			%	%	%
2014	USES	443	52.33	23.14	0.72
	LSES	388	11.84	0.92	20.69
2007	USES	514	35.68	11	3.45
	LSES	535	7.92	2.12	17.49

and LSES girls in year 2007 and year 2014

When the BMI of both the groups was compared for underweight, it was found that there is drastic difference in prevalence of underweight in both the groups. The average percentage of underweight in USES was 0.72%, out of which 0.52% were severely underweight. On the contrary, 20.69% LSES girls were underweight out of which 16.91% girls were severely underweight.

The data collected in year 2014 was compared with the data collected from a similar study in 2007 from same age group from same area. The prevalence of overweight, obesity and underweight was compared to find out temporal changes in the above mentioned prevalence during seven year period.On comparison of data collected during year 2007 and year 2014, it was found that prevalence of overweight has increased in both LSES and USESgroups. Table 3 shows the average prevalence of overweight, obesity and underweight in both groups. The data also indicates that the prevalence of underweight has decreased in both the groups during a span of seven years.

DISCUSSION:

Researchers have realized the need of using lower cut off values of BMI standards for South Asians recently. Therefore, using latest IAP guidelines,it was observed that there is increase in percentage of overweight population with respect to Socioeconomic status (SES).The results of this study show that there is a large difference between the body composition of girls hailing from different socioeconomic backgrounds. The reason for this large gap could be because of better availability of food and other basic amenities to the USES girls as compared to the LSES girls (Aggarwal et al. 1992; Kapil et al. 2002;Kaur et al. 2005;Sangha et al. 2006; Sharma et al. 2007;Kaur et al. 2009). The observed difference between both the groups in this study is in consistence with many Indian studies and surge in prevalence of overweight among children has been reported in many other studies conducted in this region (Kapil et al., 2002;Sidhu et al. 2006; Wang and Lobstein, 2006;Sood et al. 2007; Raj et al.2007;Ramachandran and Snehlata, 2010;Kaur et al.2012; Kaur and Mehta 2009).

Comparison of data of years' 2007 and 2014 highlighted an increasing percentage of overweight and obese girls with in the span of

seven years, which is indeeda worrying trend(Figure1,2,3,4).On the other hand there is decrease in percentage of underweight girls over seven years indicating a nutritional-transition where decrease in underweight in population is accompanied with increase in overweight population.

CONCLUSION:

Temporal changes indicate increase in overall BMI and overweight over seven years in both the groups studied in this area where as the girls from USES also showed an increase in obesity

Figure1 : Upper Socioeconomic Group in 2007

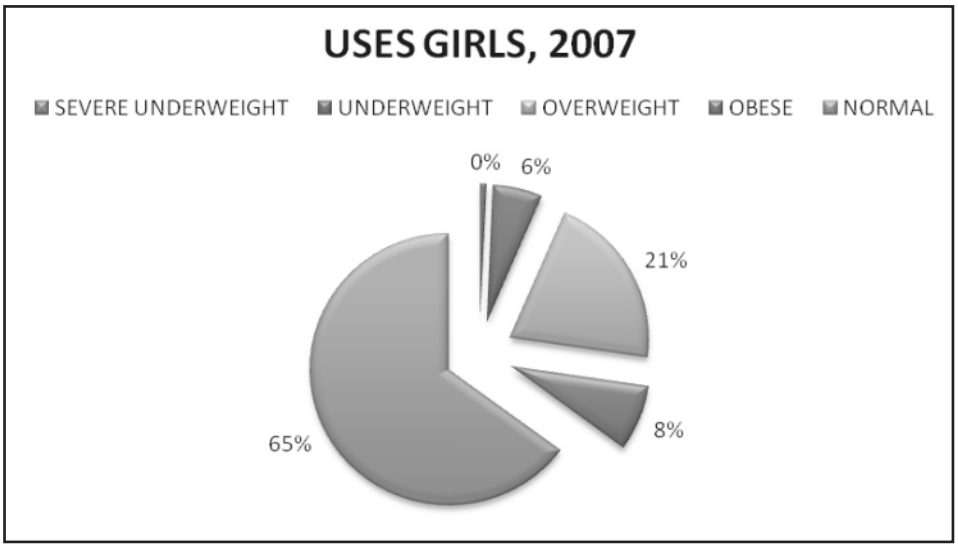
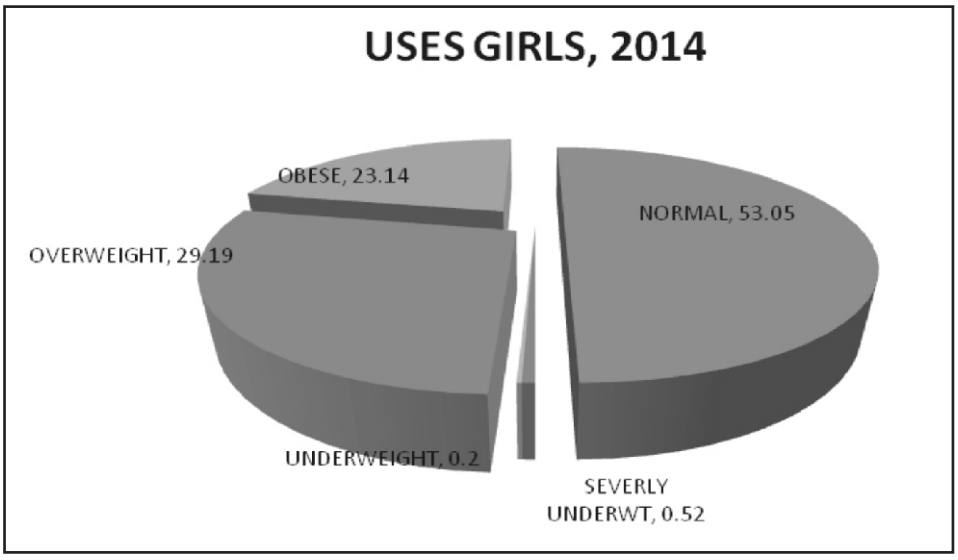


Figure2 : Upper Socioeconomic Group in 2014



prevalence. The present study appears to be as a classic example of nutritional transition among children and adolescents in this region. There is an urgent need to address this issue at individual and community level as it is likely to adversely affect the health of future adults.

SUMMARY:

Heredity and environment has a combined effect on health and nutritional status. Many researchers have highlighted the effect of socioeconomic status in the growth of children. Many studies have found increased prevalence of over nutrition among children across world. Temporal studies are useful in finding the trend and magnitude of nutritional status. Therefore, this study was planned with the following objectives:

1. To compare the prevalence of overweight, obesity and underweight among urban adolescent girls from different socioeconomic backgrounds.
2. To compare data collected in 2007 and in 2014 and to investigate the temporal changes in the prevalence during this period.

The data was collected in 2014 from 10-16 year old urban school going girls from Ludhiana, Punjab. For this cross sectional study a random sample of 831 girls was chosen comprising of upper socioeconomic status (USES) girls from schools with higher fee structure and low socioeconomic status (LSES) girls from government schools. The height and weight of both the groups were recorded and BMI was calculated. On the basis of BMI, prevalence of overweight, obesity and underweight was assessed with the help of latest IAP (2015) guidelines. This data was compared with the findings of a similar study conducted in 2007 on 1049 USES and LSES girls. Temporal changes in prevalence of overweight, obesity and underweight in seven year period were investigated by comparing the prevalence of overweight and underweight in 2007 and in 2014 in both groups.

According to latest IAP criteria, on the basis of where as 11.84% and 0.92% LSES girls were

Figure3 : Lower Socioeconomic Group in 2007

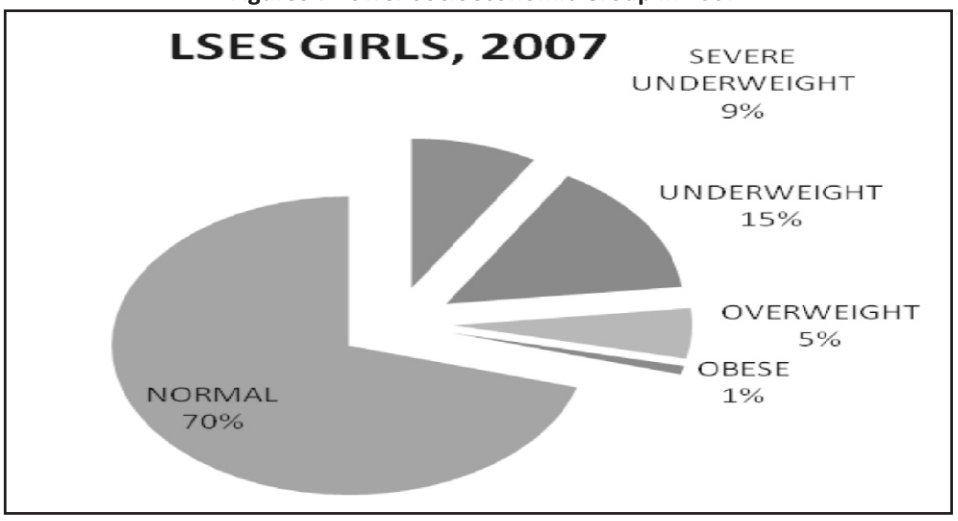
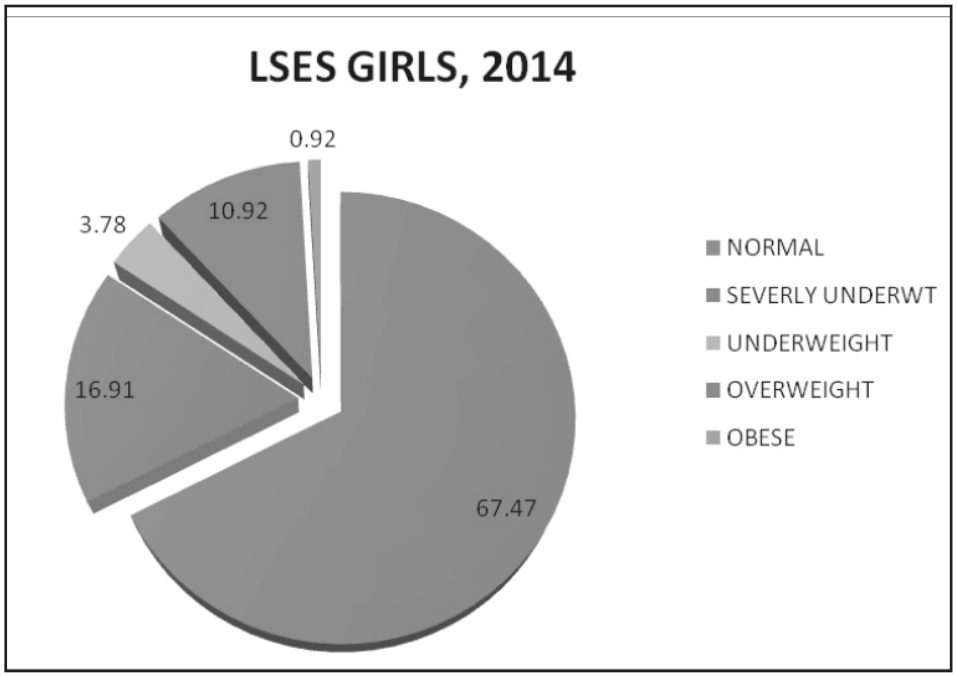


Figure4 : Lower Socioeconomic Group in 2014



BMI, 52.33% USES girls were found overweight, out of which 23.14% were obese where as 11.84% and 0.92% LSES girls were found overweight and obese respectively.

Temporal changes indicate increase in overall BMI and overweight over seven years in both the groups studied in this area where as the girls from USES also showed an increase in obesity prevalence. The present studyappears to be as a classic example of nutritional transition among children and adolescents in this region. There is an urgent need to address this issue at individual and community level as it is likely to adversely affect the health of future adults.

Acknowledgement:

Principal and Staff of KVM School, Ludhiana and Principal and Staff of Govt. Sr. Sec. School for Girls. Ludhiana for their consent and support for data collection.

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