“PREVALENCE OF OBESITY AMONG SCHOOL CHILDREN IN THE AGE GROUP OF 10-15 YEARS IN PRIVATE SCHOOLS OF BELGAUM CITY-A CROSS SECTIONAL STUDY”

By

Dr. AMARNATH R.L.C.
(REG. NO. BD0109001)

Dissertation

Submitted to the
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In Partial Fulfillment
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M. D.
in
COMMUNITY MEDICINE

Under the Guidance of

Dr. (Mrs.) VIJAYA A. NAIK MD, DPH
Professor and Head,

DEPARTMENT OF COMMUNITY MEDICINE,
JAWAHARLAL NEHRU MEDICAL COLLEGE,
BELGAUM, KARNATAKA

MAY - 2012

KLE UNIVERSITY, BELGAUM, KARNATAKA

DECLARATION

I hereby declare that this dissertation entitled **"PREVALENCE OF OBESITY AMONG SCHOOL CHILDREN IN THE AGE GROUP OF 10-15 YEARS IN PRIVATE SCHOOLS OF BELGAUM CITY-A CROSS SECTIONAL STUDY"** is a bonafide and genuine research work carried out by me under the guidance of **Dr. (Mrs.) VIJAYA A. NAIK** MD, DPH Professor and Head, Department of Community Medicine, Jawaharlal Nehru Medical College, Nehru Nagar, Belgaum-590010.

Date:

Place:

(Dr. AMARNATH R.L.C.)
REG. NO. BD0109001

KLE UNIVERSITY, BELGAUM,
KARNATAKA

CERTIFICATE

This is to certify that the dissertation entitled **"PREVALENCE OF OBESITY AMONG SCHOOL CHILDREN IN THE AGE GROUP OF 10-15 YEARS IN PRIVATE SCHOOLS OF BELGAUM CITY-A CROSS SECTIONAL STUDY"** is a bonafide research work done by **Dr. AMARNATH R.L.C. (REG. NO. BD0109001)** under my guidance, in partial fulfillment of the requirement for the degree of **M. D. (COMMUNITY MEDICINE).**

Date:

Place:

Dr. (Mrs.) VIJAYA A. NAIK MD, DPH
Professor and Head,
Department of Community Medicine,
J. N. Medical College,
Nehru Nagar, Belgaum – 10

KLE UNIVERSITY, BELGAUM, KARNATAKA

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Dr. (Mrs.) VIJAYA A. NAIK $_{\mathbf{MD,DPH}}$
Professor and Head,
Department of Community Medicine,
J. N. Medical College,
Nehru Nagar, Belgaum – 10

Date:
Place: Belgaum

Dr. V. D. PATIL $_{\mathbf{MD,DCH}}$
Principal,
J. N. Medical College,
Nehru Nagar, Belgaum – 10

Date:
Place: Belgaum

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(Dr. AMARNATH R.L.C.)
REG. NO. BD0109001

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Date:

Place:

Dr. AMARNATH R.L.C.

LIST OF ABBREVIATIONS USED

BMI	– Body Mass Index
CDC	– Centre for Disease Control and Prevention
DBP	– Diastolic Blood Pressure
DF	– Degree of freedom.
DM	– Diabetes mellitus
IOTF	– International Obesity Task Force
JNC VII	– Joint National Committee on prevention, diagnosis, detection, evaluation and treatment of high blood pressure.
MF	– Multiplication Factor
NCDs	– Non Communicable Diseases
N-DOC	– National Diabetes, Obesity and Cholesterol Foundation
NFI	– Nutritional Foundation of India.
NIDDM	– Non Insulin Dependent Diabetes Mellitus
SBP	– Systolic Blood Pressure
SES	– Socio Economic Status
UK	– United Kingdom
USA	– United States of America
WHO	– World Health Organization
WHR	– Waist Hip Ratio
x^2	– Chi-square

ABSTRACT

Background and Objectives

Childhood obesity was considered a problem of developed countries and as on today, the problem is started even in developing countries. Obesity is not an immediate lethal disease itself, but it is a significant risk factor associated with a range of serious non-communicable diseases and conditions. Obesity is seen as the first wave of a defined cluster of non communicable diseases called “New World Syndrome” creating an enormous socioeconomic and public health burden in poorer countries. The objective of the study was to find out the prevalence of obesity in school children in the age group of 10 to 15 years in private schools of Belgaum City and to study the various factors contributing to the development of obesity in these children.

Methods

The present study was conducted in eight private schools located in different zones of Belgaum City, from 1st January 2010 to 31st December 2010. A total of 600 children from selected eight schools, 75 children from each school in the age group of 10 to 15 years studying in 6th to 10th standard (15 children from each class) were selected by systemic random sampling method and were interviewed using pretested questionnaire. Obesity was defined according to WHO and IOTF BMI cut-off standards for Asia and India. Information regarding socio demographic characteristics, physical activities, dietary pattern and anthropometric measurements was collected from the study participants. Association between selected risk factors and obesity in school children was done

by calculating odds ratio and its statistical significance was tested by using chi square test.

Results

Overall prevalence of overweight and obesity was found out as 11% and 7.33% respectively among the study participants. Prevalence of obesity was more in boys (4.66%) when compared to girls (2.67%). children aged 12 years belonging to Muslim religion, socioeconomic status II, using vehicular transport as mode of conveyance to school, who were not doing physical activities, consuming non vegetarian food, beverages and having snacks between meals and children belonging to WHR category II and III were significantly associated with overweight and obesity. Family history of diabetes and obesity had also played a significant part in the child becoming overweight or obese in our study

Conclusion and interpretation

. Prevalence of overweight and obesity was found to be on par with that of the other urban cities of India. Lifestyle changes like daily physical activities avoid consuming beverages, non vegetarian food, snacking in between meals, need to be impressed upon the school going children by regular health education programmes

Keywords

Obesity; Overweight; Prevalence; School Children

CONTENTS

SL. NO.	TOPIC	PAGE NO.
1	INTRODUCTION	1
2	OBJECTIVES	4
3	REVIEW OF LITERATURE	5
4	METHODOLOGY	20
5	RESULTS	31
6	DISCUSSION	56
7	CONCLUSION	68
8	LIMITATIONS	69
9	RECOMMENDATIONS	70
10	SUMMARY	71
11	BIBLIOGRAPHY	74
12	ANNEXURE I – ETHICAL CLEARANCE	82
13	ANNEXURE II – CONSENT FORM	83
14.	ANNEXURE III – PROFORMA	86
15	ANNEXURE IV – MASTER CHART	90

LIST OF TABLES

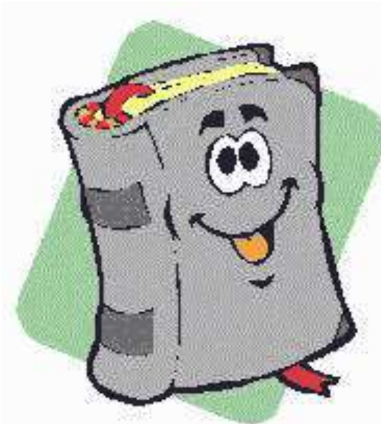
TABLE. NO.	DESCRIPTION	PAGE NO.
1	**Sex and age wise distribution of study participants**	32
2	**Distribution of study participants according to the educational status of their parents**	34
3	**Distribution of study participants according to the occupation of their parents**	35
4	**Distribution of study participants according to the mode of conveyance to school**	36
5	**Distribution of study participants according to the time spent in watching television**	37
6	**Distribution of study participants according to the diet history**	39
7	**Distribution of study participants based on consumption of other food stuffs**	40
8	**Anthropometric measurements of study participants**	41
9	**Association of body mass index with age**	44
10	**Distribution of study participants based on association of overweight and obesity with conveyance to school**	46
11	**Association of Overweight and obesity with participants having snacks between meals**	48
12	**Association of overweight and obesity with consumption of non vegetarian food**	49
13	**Association of consumption of fruits with overweight and obesity**	50
14	**Association of overweight and obesity with consumption of beverages**	51
15	**Association of Family history of DM, Hypertension and obesity with overweight and obesity**	52
16	**Univariate and multivariate logistic regression analysis**	54

LIST OF GRAPHS

GRAPH NO.	DESCRIPTION	PAGE NO.
1	**Sex and age wise distribution of study participants**	32
2	**Distribution of study participants according to the educational status of their parents**	34
3	**Distribution of study participants according to the mode of conveyance to school**	36
4	**Distribution of study participants according to the diet history**	39
5	**Distribution of study participants based on consumption of other food stuffs**	40
6	**Association of body mass index with age**	44
7	**Distribution of study participants based on association of overweight and obesity with conveyance to school**	46
8	**Association of overweight and obesity with consumption of non vegetarian food**	49
9	**Association of overweight and obesity with consumption of beverages**	51

Chapter 1

Introduction



INTRODUCTION

Non communicable diseases (NCDs) have reached epidemic proportions. They are the leading global causes of death, causing more deaths than all other causes combined, and strike hardest at the world's low and middle income populations. They can be significantly reduced and millions of lives can be saved through reduction of their risk factors, early detection and timely treatments.[1]

Out of 57 million global deaths in 2008, 36 million (63%) were due to NCDs principally cardiovascular diseases, diabetes mellitus, cancers and chronic respiratory diseases. As the impact of NCDs increases and as population ages, annual NCD deaths are projected to continue to rise worldwide.[2,3]

Obesity is not an immediate lethal disease itself, but it is a significant risk factor associated with a range of serious non-communicable diseases and conditions.[4] Obesity is seen as the first wave of a defined cluster of non communicable diseases called "New World Syndrome" creating an enormous socioeconomic and public health burden in poorer countries.[5]

Overweight and obesity are a global pandemic. There are one billion overweight people in the world of whom 300 million are obese.[6] In 2010 around 43 million children under the age five were overweight. Among these children close to 35 million overweight children are living in developing countries and eight million in developed countries. The global problem of childhood overweight increasingly extends into the developing world.[7]

In Thailand the prevalence of obesity among children aged 6–12 years rose from 12.2% to 15.6% in just two years from 1991 to 1993.[8] In Japan the prevalence of obesity among schoolchildren aged six to fourteen years increased from five percent to ten percent between 1974 and 1993.[9] In Iran it was found that, the prevalence of overweight among individuals aged six to eighteen years doubled from 4.2% to 8.3% between 1993 and 1999.[10] Using the International Obesity Task Force (IOTF) cutoffs, the prevalence of childhood overweight and obesity were reported to be 15.7% and 15.6%, respectively in Russia[11] and 6.4% and 6.5%, respectively in China.[12]

In India the prevalence of overweight among school children aged between 13 to 18 years was reported to be 17.8% in boys and 15.8% girls in 2002.[13] In affluent cities, prevalence of obesity reached the levels of industrialized countries with values increasing with socioeconomic class.[13] Recent data suggests prevalence of overweight/obesity in urban boys and girls as 5.5% and 5.9% respectively according to WHO, IOTF criteria.[14]

In India under nutrition had always attracted the focus of health workers, as childhood obesity was rarely seen. However over the past few years childhood obesity is increasingly being observed with the changing lifestyle of families with increased purchasing power, increasing hours of inactivity due to television, video games and computers which have replaced outdoor games and other social activities.[15]

The most important consequence of childhood obesity is its persistence into adulthood with all its health risks. 50 to 80% of obese children will continue

as obese adults and fall into risk group of Diabetes (NIDDM), hypertension, coronary heart diseases and many more obesity related diseases. Obesity is more likely to persist when its onset is in late childhood or adolescence.[16] If the underlying causes of the obesity epidemic are not addressed, it has the potential to overwhelm health systems throughout the world.

Prevention of adult obesity will require the prevention and management of childhood obesity. Evidence suggests that it is the most neglected problem in developed as well as in developing countries. WHO had also emphasized on urgent need of understanding the prevalence, trend, factors contributing and developing strategies for effective intervention.[9]

Till date no nationally representative data have emerged from India which makes it difficult to project the prevalence of obesity and overweight among children.

Children going to private schools are known to be from affluent families with most of them having access to computers, television and video games. However no study has been done in this part of the country to find out the prevalence of obesity and its risk factors amongst them.

In view of the above, the present study was undertaken to find out the prevalence of obesity among school children in the age group of 10 to 15 years and also to study the various factors contributing to the development of obesity in these children. This type of study will help in developing interventional programs for the school children which will eventually help in the prevention of diabetes, hypertension and other obesity related diseases.

Chapter 2

Objectives

OBJECTIVES

The objectives of the present study were;

1. To find out the prevalence of obesity in school children in the age group of 10 to 15 years in private schools of Belgaum city.

2. To study the various factors contributing to the development of obesity in these children.

Chapter 3

Review of Literature

REVIEW OF LITERATURE

Overweight and obesity is abnormal or excessive fat accumulation that presents a risk to health. Overweight is excess body weight for a particular height from fat, muscle, bone, water, or a combination of these factors[17] and obesity is having excess body fat.[18]

The medical standard used to define obesity is the Body mass index (BMI). Body mass index (BMI) or Quetelet Index is a statistical measure of the weight of a person scaled according to height. It was invented between 1830 and 1850 by the Belgian polymath Adolphe Quetelet during the course of developing "social physics". It is weight adjusted for height squared (weight in kg/ height in m2), a useful index to assess overweight and is fairly reliable indicator for adiposity.

The limitations of body mass index are

1. It can not differentiate an obese individual from a muscular one.
2. It can not locate the site of fat.
3. People with central obesity may have normal body mass index.

However body mass index is the widely accepted form for measuring obesity.

As per WHO classification (for adult) if BMI is more than 25 then the person is said to be overweight and if BMI more than 30 then the person is said to be obese. If BMI is more than 85 percentile then the child or person is said to be overweight and if more than 95 percentile then obese.

CDC 2000 charts are based on well off population from USA. It is a nationally representative chart. Here 85th percentile of BMI for age and sex is used as a reference point for overweight and 95th percentile for obesity in children.[20]

BMI cutoff ranges for overweight and obesity with age based on the International Obesity Task Force (IOTF) international growth reference constructed from six representative population growth studies (Brazil, Great Britain, Netherlands, Singapore, Hong Kong and United States) were also considered by some countries.[11]

Other methods for measuring obesity

1. **Skin fold thickness:** It is easily an accessible rapid and non invasive method for assessing body fat. Several variants of calipers are available. Harpendens skin calipers are the most commonly used. Measurement can be taken at mid triceps, biceps, sub scapular and supra iliac regions. International standard for comparison are not available. The other disadvantage is poor repeatability.[21]

2. **Waist circumference and waist hip ratio:** It is highly sensitive and specific for central obesity. High more than one cm in men and 0.8 cm in women indicates abdominal fat collection.[21]

   Other methods are[21]

3. **Bio electrical impedance analysis**

4. **Dual Energy X-ray Absorptiometry**

5. **Air displacement plethysmography**

CAUSES OF OBESITY

ENDOGENOUS CAUSES[21]

1. **Genetic causes:**
    a. Parder Willi syndrome
    b. Lawrence Moon Biedl Bardet Syndrome
2. **Hormonal Causes:**
    a. Hypothyroidism
    b. Hypogonadism
    c. Hyper androgenic ovarian syndrome
    d. Cushing syndrome
    e. Growth hormone deficiency
    f. Pseudo hyperparathyroidism

EXOGENOUS CAUSES

Changes in life styles: With improving standard of living and availability of food in plenty, more and more people are becoming obese.[21]

Even in India, in recent years people from upper class society have urbanized to the western level. The components of life style changes are

a. Unhealthy eating pattern, wrong choice of food:

Traditional micro nutrient rich foods are replaced by energy dense highly processed micro nutrient poor foods. All celebrations and festivals are centered on rich food. Excess intake of food, eating in between meals, high calorie food, energy dense fatty and salty food, packed food, ice cream, chocolates, soft drinks and potato chips all contribute towards childhood obesity.[21]

b. Sedentary Pursuits and reduced exercise life styles:

T.V. and movie watching, video games, internet browsing for long hours lead to sedentary type of life even in children.

Excessive television watching, playing on computers, telephone conversation and tuition classes all contribute to reduced physical activity.[21]

Schools and tuition classes: An important factor for childhood obesity is the tuition classes. From younger age children are forced to use their play time for additional classes. Games or physical training sessions are restricted.[21]

Inadequate play areas: Due to unsafe roads and longer distance to schools children are discouraged from walking or cycling to school, motorized vehicles are used for this purpose. Lack of play ground especially in urban schools lead to lack of exercise.[21]

Familial: Parental obesity is a risk factor for childhood obesity. If parents are obese then risk of childhood obesity is 6 to 8 times more and may be related to family pattern of eating, exercise and behavior.[21]

Prevalence of childhood and adolescent obesity

Obesity has reached epidemic proportions globally, with overweight -at least 300 million of them clinically obese - and is a major contributor to the global burden of chronic disease and disability, affecting virtually all ages and socioeconomic groups.[7]

Over the past 25 years the prevalence of obesity doubled in American children aged 6 to 11 years and tripled in American adolescents aged between 12 to 17 years.[22] A 75% relative increase in obesity in adolescents is noted from 1970 to the present and 25% of American adolescents are identified as obese.[23]

According to WHO (2000) at least 50% of adults and 20% children in UK and USA are currently overweight. Prevalence of overweight among Australian children increased from 11% in 1985 to 20% in 1995, childhood obesity has tripled in Canada in last 20 years.[13] Health survey conducted among children and adolescents aged 2 to 20 years in 1999 in England, showed 23% of children were overweight and 6% were obese.[24]

Even in developing countries obesity is on the rise. Thailand, Nigeria, Iran and Brazil have all reported unprecedented level of obesity which is rising every year. The calculated global prevalence of overweight and obesity in children aged 5 to 17 years as estimated by international obesity task force is approximately 10% for the year 2004.[25] It is unequally distributed with prevalence ranging from 30% in American children to less than 2% in Sub Sahara Africa.

China, India, Pakistan and Indonesia are populous nations with large pediatric populations, undergoing rapid economic development. WHO estimated that 75% of the 43 million overweight and obese children under 5 years of age worldwide will come from low and middle income countries by the end of this decade.[26] In lower and middle income countries, a double burden of both obesity and under nutrition frequently exists.

In India some studies have been carried out in urban cities to estimate the prevalence of overweight and obesity in children and adolescents. In the year 2009 the National Diabetes, Obesity and Cholesterol Foundation (N-DOC)[27] carried out the survey to find out the prevalence of overweight and obesity in children and adolescents in urban cities like Delhi, Mumbai, Agra, Allahabad, Dehradun, Jaipur, Lucknow and others. The study had found that students in the private schools of Delhi were the most obese of all followed by Mumbai and the obesity levels were significantly higher in private schools as compared to public schools.[27]

Meta-analysis on vegetarian diets and childhood obesity prevention by Joan Sabate and Michelle Wienin in 2001, showed vegetarians in the United States have a mean BMI of 22.1 as compared with a mean BMI of 25 among non-vegetarians. Both sexes showed no significant difference in height between vegetarians and non vegetarians, however vegetarians had significantly lower weight and a 2-point lower BMI. Study also noted that non-vegetarians consume less fiber, more alcohol and more animal fat than vegetarians, and also suggested that plant based diet seems to be a sensible approach for the prevention of obesity in children. The study concluded that prevention of excess body weight gain is

the best solution to reduce the rise in childhood obesity and effective strategies for reducing childhood obesity are needed.

Meta-analysis of short sleep duration and obesity in children and adults by Francesco P. Cappuccio et al in 2008, showed a consistent increased risk of obesity among short sleepers in children and adults. Short sleep is noted as less than or equal to five hours. The reason cited for this is that short sleep leads to obesity through the activation of hormonal responses leading to an increase in calorie intake and appetite. The study concluded that causal inference is difficult due to lack of control for important confounders and inconsistent evidence of temporal sequence in prospective studies.[29]

A cross national study by Wang Y, in the year 2001, revealed that prevalence of obesity and overweight was 11.3% and 14.3% respectively in USA and 6.0 to 10.0% in Russia and 3.6 and 3.4% in China. The relationship between obesity and socioeconomic status varied across countries. Higher socioeconomic status subjects were more obese in China and Russia, but in United States lower socioeconomic status group were at higher risk.[12]

Although the overall prevalence of overweight and obesity is highest in America, obesity was more in the lower socio economic group when compared with higher socio economic group and the reason cited was in US, higher-SES groups usually consume more vegetables and fruits, which are less energy-dense, than low-SES groups. Unlike US, in countries like China, richer people have access to meat and other energy-dense foods, which are much more expensive than other foods like vegetables and fruits.[12]

A longitudinal study done by Procter et al from 1987 to 1995 on Television viewing and change in body fat from preschool to early adolescence, showed that obesity was 8.3 times greater in children who watch over 5 hours of television per day compared to those who watch 2 hour and less of television per day. Data was taken from The Framingham (USA) Children's study, 106 children were enrolled during preschool years (mean age 4.0 y) and followed into early adolescence (mean age 11.1 y). Parents completed an annual questionnaire on the child's television and video habits. The study concluded that children who watched the most television during childhood had the greatest increase in body fat over time. Healthy life style education designed to prevent obesity and its consequences should target television watching habits of children.[30]

A cross sectional survey by Saxena et al, in England, in the year 1999, among 5689 children and young adults aged 2 to 20 years showed 23% were overweight of whom 6% were obese. British Afro-Caribbean and Pakistani girls have an increased risk of being obese and Indian and Pakistani boys have an increased risk of being overweight than the general population. In this study the percentage of children and young adults who are obese and overweight are differed by ethnic group and sex but not by social class and also there was no significant difference in the prevalence of obesity and overweight in children from different social class.[24]

In a cross-sectional study done by Zaliah in 1996 among 6555 Malaysian adolescents aged between 11 to 15 years, found overweight adolescents had highest crude intake and energy expenditure. All the study groups had more than 30% and lesser than 55% of energy from fat and carbohydrates. Overweight girls

had significantly higher crude energy intake where as in boys the differences in crude energy intake was not statistically significant.[31]

A cross-sectional study carried out in urban areas of Ho Chi Minh City (HCMC), Vietnam, over the period 2002 to 2005, by Dieu HT, to find out the trends in overweight and obesity among 292 children (2002) and 670 children in (2005) aged 4 to 5 years using multi staged cluster sampling. Study reported that the prevalence of overweight and obesity almost doubled from 2002 to 2005 (21.4% and 36.8% respectively) and the proportion of boys classified as obese in 2005 (22.5%) was 3 times that in 2002 (6.9%). Study concluded that the prevalence of overweight and obesity had rapidly increased in children aged 4 to 5 years in urban areas over a 3 year period.[32]

A cross-sectional survey to find out the prevalence and trends of obesity among school children in Taiwan by N-F Chu (1994) showed the prevalence of obesity steadily increased from 1980 to 1994, 12.4 to 16.4% for boys and 10.1 to 11.1% for girls among 1366 children aged 12 to 15 years. Obesity increased significantly among boys compared to girls. Study also pointed out that obese and even overweight children had higher systolic blood pressures and more adverse lipid profiles, with higher glucose levels (only obese) compared to normal weight children. This study indicates that overweight and obesity and adverse effects of being obese is no longer just a problem of Western countries.[33]

In the cross sectional study by Al-Isa A.N. in 2002 among the adolescents aged 10-14 years, with a multi-stage stratified random sample of 14659 adolescents (7205 males and 7454 females) in Kuwait intermediate school

showed that lack of exercise and over eating, eating in between meals were the causes for obesity among the teenagers and the prevalence of overweight and obesity was 44.3% and 17.2%. Study concluded that the BMI of Kuwait adolescents exceeded that of the Americans and health education programs should be instituted to control this syndrome in order to prevent future risk of obesity related diseases. Notable observation from this study is prevalence of obesity and overweight is significantly more in this country which is far above the global average.[34]

A cross sectional study on Adolescent obesity in Lebanese private schools by Hilda Chakar showed the prevalence of obesity as 7.5% and at risk of obesity as 24.4%. Sample of 12,299 adolescents aged 10 to 18 years, in 33 Lebanon private schools were selected for the study from November 2002 to May 2003. Obesity prevalence is 2.5 times higher in boys than in girls, and boys at risk of obesity are almost 1.5 times more than girls. In girls, overweight and obesity prevalence decreased with age in comparison with boys. The reason cited for this is the western feminine self image and fear of obesity are more marked in Lebanese girls than in boys.[35]

In this study, lower age classes were significantly associated with higher prevalence of obesity in girls and this may be due to generation effect, where newer generations would be adopting new nutrition and physical activity habits and be more prone to obesity. The study concluded that prevention of obesity before adulthood is important because it will be too difficult to lose weight by adulthood. Early recognition of obesity is important, it is possible by routine

assessments of eating and activity patterns in children, in addition to evaluation of weight gain relative to linear growth throughout the childhood.[35]

A cross sectional study on nutritional status of school children in an urban area of Srilanka, by Wickramasinge et al, among 1224 children aged 8 to 12 years, in the year 2002, reported that the prevalence of obesity was more among boys (4.3%) than in girls (3.1%) and also showed that the children of higher socioeconomic status had higher prevalence rate of overweight and obesity when compared to the children of lower socioeconomic group. This study concluded that nutrition transition is evident in the city of Colombo. Obesity and overweight in older children are some emerging nutrition problems that may the consequence of emerging patterns of the life styles and diet in response to social and cultural changes.[36]

A cross-sectional Study done by Raman K et al, in Delhi in the year 2006, among 21485 children, 8840 (3566 boys, 5274 girls) from government schools and 12645 (6197 boys, 6448 girls) from private schools reported that overall prevalence of overweight and obesity among the lower socioeconomic status boys was 2.66% and 0.42% respectively, while that among boys from upper socioeconomic status was significantly higher at 16.75% and 5.59 % respectively. Similarly, the prevalence of over-weight and obesity among the LSES school girls was 2.14% and 0.28% as compared to 19.01% and 5.73% respectively among girls from USES.[37]

A cross-sectional study conducted in 2002 by M.Mehta in four randomly selected public schools of Delhi among 414 girls showed the prevalence of

obesity and overweight to be 5.3% and 15.2% respectively. Out of the 22 obese girls, central obesity was present in 21 girls, and the study also pointed out that half of the study subjects had central obesity. Central obesity is significantly more in girls in this study.[38]

Another study was conducted, by Chhatwal J, to determine the prevalence of obesity in pre-adolescent and adolescent children in a developing country (India) using WHO guidelines for defining obesity and overweight. This cross-sectional study was carried out on 2008 school-children aged 9-15 years in Ludhiana, India. Approximately half the subjects belonged to a school attended by children of well to do families while the rest belonged to two schools from middle and lower socioeconomic background. The results showed that, the overall prevalence of obesity and overweight was 11.1% and 14.2% respectively. The prevalence of obesity as well as overweight was higher in boys as compared to girls (12.4% vs 9.9%, 15.7% vs 12.9%) and it decreased significantly with age, from 18.5% at 9 years to 7.6% at 14 years, rising at 15 years to 12.1%. Significantly more children from higher socioeconomic status were obese and overweight than those from lower socioeconomic status groups. Study concluded that, pediatric obesity is an emerging problem in developing countries, especially among higher socioeconomic status groups. Significant gender disparity is seen, with boys of affluent background having a higher prevalence.[39]

A cross-sectional study done by Dr.Bharati, during 2005 to 2006, in middle and high schools of Wardha city among 2,555 children studying from 5th to 10th standard showed a prevalence of overweight, obesity 3.1% and 1.2% respectively. This study proved the important determinants of

overweight, obesity were urban residents, father and mother involved in service or business, English medium school and outdoor play of less than 30 minutes. And out of these five factors, four factors except outdoor play were family characteristics. This implies the importance of the family characteristics in the causation or pre disposition of an individual to overweight/obesity.[16]

In children, the difference in the prevalence of overweight between the rich and the poor is fairly evident in recently conducted urban studies. Ramachandran, et al. studied children in the age group of 13 to 18 years with the sample size of 4700 (M: F = 2382:2318) from six schools in 2002, two each from high, middle and lower income groups in Chennai and reported the prevalence of overweight including the obese adolescents ranged from 22% in better off schools to 4.5% in lower income schools.[13]

A cross-sectional and institutional study by Avula Lakshmaiah et al, adopting a multi-stage stratified cluster sampling procedure carried out during 2003 on adolescents 12 to 17 years of age of both sexes from Hyderabad reported a prevalence of overweight 6.1% among boys and 8.2% among girls: 1.6% and 1% were obese respectively. Overweight was more in girls and obesity was more in boys in this study. The study pointed out that prevalence was slightly more in those who watch television more than 3 hours, or belonging to a high socioeconomic background where as it was slightly less among those participating regularly in outdoor games and household activities more than or equal to 3 hours per day.[40]

A cross-sectional study followed by a case control study conducted by S. Kumar in two affluent schools of Davanagere found out the prevalence of obesity to be 5.74%. Prevalence of obesity was more in girls than in boys and also obesity increased with increase in age in both boys and girls. The study also found out that family history of obesity, snacking of high energy foods and lack of physical activity were the important influencing factors of obesity.[41]

A school based cross-sectional study was conducted by Dineshkumar among the rural and urban male high school students in the year 2007 at Vellore district Tamilnadu.250 children from each group(urban and rural) studying in eighth to tenth standard were included in the study. Results revealed that the prevalence of overweight in urban schools was 12% and in rural schools 8.8%. Study further reported that history of diabetes mellitus in any of the parents was a signification factor for the children to be overweight [p = 0.042] and playing daily after the school hours protected the students against becoming overweight. This study also found out that the increasing competition among students very early in life is probably depriving many of the children of a healthy childhood as indicated by high proportion of students attending tuitions.[42]

A cross-sectional randomized epidemiological study was conducted among 54 children aged 12 years in a private school at Bhavnagar. This study was done by Shah C regarding assessment of obesity and factors affecting it. Study found out the prevalence of obesity to be 5.5%. Combined overweight and obesity was more in girls (16.66%) than in boys (12.48%). This study recommended that consumption of high fat and snacking in between meals should be avoided, sedentary lifestyle should be discouraged, increased physical

activity like playing outdoor games, cycling, walking should be encouraged in children. The study concluded that family history of obesity and lack of physical activity were the important influencing factors for obesity.[43]

Chapter 4

Methodology

METHODOLOGY

Study Area

The study was undertaken in eight private schools of Belgaum City, Karnataka. As per the Deputy Director of Public Instructions (2009) there are a total of 92 recognized private schools in Belgaum city.

List of selected schools

1. Vanita Vidyalaya
2. Sherman English Medium School
3. Phoenix English Medium School
4. KLS School
5. 7th Day English High School
6. EHPS Saint Meera, Angol
7. Benson English Medium High School
8. G. G. Chitnis English Medium High School

Figure 1. Map of Belgaum City showing the study areas.

Study Design

The present study was a cross sectional study.

Study period

The study was conducted for a period of one year from January 2010 to December 2010.

Sample size

As per the published literature, prevalence of obesity in children between the age group of 10 to 15 years is six percent in urban areas. Based on this the following sample size was calculated from the formula below.

$n = 4p\ q / d^2$

Where,

n = Sample size

p = Prevalence of obesity

q = (100-p)

d = Error in estimation of p (2%)

Considering the above formula the sample size was calculated as 564 and rounded off to 600.

Sampling procedure

Belgaum city was divided into four zones -North, East, South, and West. Two schools having the maximum enrollment in each zone were selected and

children from these schools in the age group of 10 to 15 years studying in sixth to tenth standard were studied.

A total of 600 children from the selected eight schools were included in the study. A total of 75 children from each school in the age group of 10 to 15 years studying in 6 to 10 standard (15 children from each class) were selected by systemic random sampling method.

Inclusion criteria

- School children of sixth to tenth standard aged between 10 to 15 years studying in private schools of Belgaum city.

Exclusion criteria

- Schools having exclusively boys or girls (Non-Coeducational Schools).
- Children having chronic illnesses such as, severe malnutrition, endocrinal problems and physically handicapped.

Data collection

Pilot study was carried out in the study population using a predesigned and structured questionnaire. Appropriate changes were made based on the study.

The study was approved by Institutional Ethics Committee, Jawaharlal Nehru Medical College, Belgaum. Based on the inclusion criteria the school children were selected and informed consent from the principal and ascent from

the children (Annexure I) was obtained. They were interviewed by using predesigned and pretested questionnaire (Annexure II).

The instruments used in this study included questionnaire, weighing machine, measuring tape, sphygmomanometer, stethoscope. All the instruments and techniques were initially standardized.

The questionnaire included the information on socio-demographic variables, educational status, age of menarche in case of female children, family formation, personal history, physical activities, dietary habits and anthropometric measurements.

Children were interviewed by the investigator. Examination was carried out which included general physical examination, measurement of height, weight, waist circumference, hip circumference, blood pressure and other vital signs. The entire procedure lasted for about 25 minutes for each child.

Data analysis

The data was tabulated using Microsoft Excel Worksheet and analyzed using mean, proportions and percentages. Association between selected risk factors and obesity in school children was done by calculating odds ratio and its statistical significance was tested by using chi square test.

Definition of study variables

Adolescent children: According to WHO 10 to 19 years aged were considered as adolescents.[44] Subjects were asked about their age and it was confirmed with

appropriate documents (School records). Age was recorded to the nearest completed year.

Religion: The subject's religion was noted and was grouped as "Hindu", "Muslim", and "Others" (Jains, Christians and sikhs).

Occupation

Farmer: A farmer is a person, engaged in agriculture, who raises living organisms for food or raw materials, generally including livestock husbandry and growing crops such as grain.

Housewife: Women engaged in household duties but doing no other productive work to augment family income.

Professional: trained professional degree holders like doctors, lawyers, engineers including teachers.

Business: this includes any self owned establishments like printing press, medical shop, general shop, boutique shop, bakery, tea shop, saree shop, vegetable vendor etc.

Skilled worker: this includes jobs needing specialized trainings like electric work, mechanical work, carpenter, jewellery maker, computer operator, watch repair, mason etc

Educational status:

The subjects were asked about their parents educational qualifications and were grouped into;

Literate: A person who could read and write with understanding in any language.

Primary school education: A person who had studied up to 4th standard.

Secondary school education: A person who had studied up to 7th standard.

Higher secondary school education: A person who had studied up to 10th standard.

College: A person who had studied up to pre-university / diploma/ Tch/below degree class.

Graduate: A person who had a bachelor's degree in any field.

Post Graduate: A person who had a Master's degree in any field.

Type of family[45]

Nuclear family: Married couple along with their dependent children living in the same house.

Joint family: Many married couples and their children who live in the same household. Males are blood relatives and females of the family are related by either marriage or blood relation.

Three generation family: Married couple with married children and their kids (three generations) related to each other by direct descent living together.

Broken family: Is one where the parents have separated or where death has occurred for one or both the parents.

Food habits: The children consuming meat and sea foods were considered as taking 'mixed diet' and remaining as consuming 'vegetarian diet'

Menarche: Menarche was defined as beginning of the cycle of menstruation.[46]

Socioeconomic status: Information of total monthly income of the family in Rupees was obtained as well as the family size. Per capita monthly income in rupees was calculated, and then the family was classified using modified B. G. Prasad's classification.[45]

Modified B. G. Prasad's Classification

Socioeconomic class	Prasad's classification (1961) per capita income in Rs./ month[45]	Modified Prasad's classification in the study period (2010) Per capita income in Rs/month[47]
I	100 & above	4100 & above
II	50 – 99	2050 to 4099
III	30 –49	1230 to 2049
IV	15 – 29	615 to 1229
V	below 15	below 615

Average Consumer Price Index for the year 2010 = 841[47]

Modification was done with the aid of Multiplication Factor (M.F), which was obtained as below:

$$\text{M. F.} = \frac{\text{Average Consumer Price Index for study period}}{100} \times 4.93$$

$$\text{M. F.} = \frac{841}{100} \times 4.93$$

$$= 41.46 \approx 41$$

Tobacco use: Subjects who had never smoked any form of tobacco (beedi, cigar) and never used tobacco in any form viz gutka, pans were considered as “non smokers” and “tobacco non users” respectively. While those who had smoked either in the past or smoking at present and have used tobacco either in the past or using at present were considered as “smokers” and “tobacco users” respectively. The total duration of use was noted in years.

***Height**:* The subject stood straight without footwear, with heels, buttocks and back touching the wall and arms hanging by side. The height was measured from head to heal. The coinciding reading was measured to the nearest 0.1 cm using a stadiometer.[48]

Weight: Body weight was measured without any foot wear and with minimal clothing to the nearest 0.1 kilogram using a standard portable weighing machine, which was standardized periodically during the study. The scale was adjusted to zero before each session and weight was recorded in kilogram.[48]

Waist circumference: The waist circumference of girls and boys were taken separately in separate rooms. The measurements were taken in presence of a third party [Male class teacher – boys and female class teacher – girls].

Waist circumference was measured to the nearest centimeter using nonstretchable tailors measuring tape at the midpoint between the bottom of the rib cage and above the top of the iliac crest during minimal respiration.[49]

Hip circumference: The waist circumference of girls and boys were taken separately in separate rooms. The measurements were taken in presence of a third

party [Male class teacher – boys and female class teacher – girls]. The hip circumference was taken at the level of the anterior superior iliac spine.

Measurement of Body Mass Index (BMI): The BMI was calculated using the formula given below.

$$BMI = weight\ (Kg) / Height\ (Meter^2).$$

BMI IOTF Classification

Based on WHO and International obesity task force (IOTF) BMI cut-off standards for Asia and India, obesity was defined[50] as below.

Category	BMI range (Kg/m^2)
Underweight	<18.5
Normal	18.5-22.99
Overweight	23-25
Obesity	>25

Waist hip ratio

Central obesity classification – Nutritional Foundation of India (NFI), New Delhi, 2004 have classified central obesity for male and female based on waist hip ratio (WHR). WHR II Category is taken as pre obese and WHR CategoryIII is considered as obese in both males and females. The ratio of waist circumference to the hip circumference.

Category	Male	Female
WHR I	< 0.93	< 0.81
WHR II	0.93 – 1.00	0.81 – 0.89
WHR III	> 1.00	> 0.89

Blood pressure measurement: During the course of interview, two measurements of blood pressure on each study participant were recorded using mercury sphygmomanometer, first by palpatory method followed by auscultatory method as per standard guidelines. Both blood pressure measurements were obtained after the subject had rested for at least five minutes in a seated position. The first blood pressure measurement was recorded after obtaining sociodemographic information from study subject, while second was recorded during physical examination. All blood pressure measurements were made on left arm of each subject, using a cuff of appropriate size at the level of the heart. The average of two systolic blood pressure (SBP) and diastolic blood pressure (DBP) were considered to describe the blood pressure of the participant. In cases where the two readings differed by over 10 mm Hg, a third reading was obtained and three measurements were averaged.

Categorization of subjects by blood pressure levels: The subjects were divided into "Normotensives" or "Hypertensives" on the basis of their blood pressure levels as per JNC 7 Report.

Normotensives: Systolic blood pressure less than 140 mm Hg and Diastolic blood pressure less than 90 mm Hg.

Hypertensives: Systolic blood pressure 140 mm Hg or above Diastolic blood pressure 90 mm Hg.[51]

Chapter 5

Results

RESULTS

The present cross sectional study was conducted for a period of one year from January 2010 to December 2010 among 600 children of private schools of Belgaum City. Study participants were in the age group of 10 to 15 years studying in sixth to tenth standard.

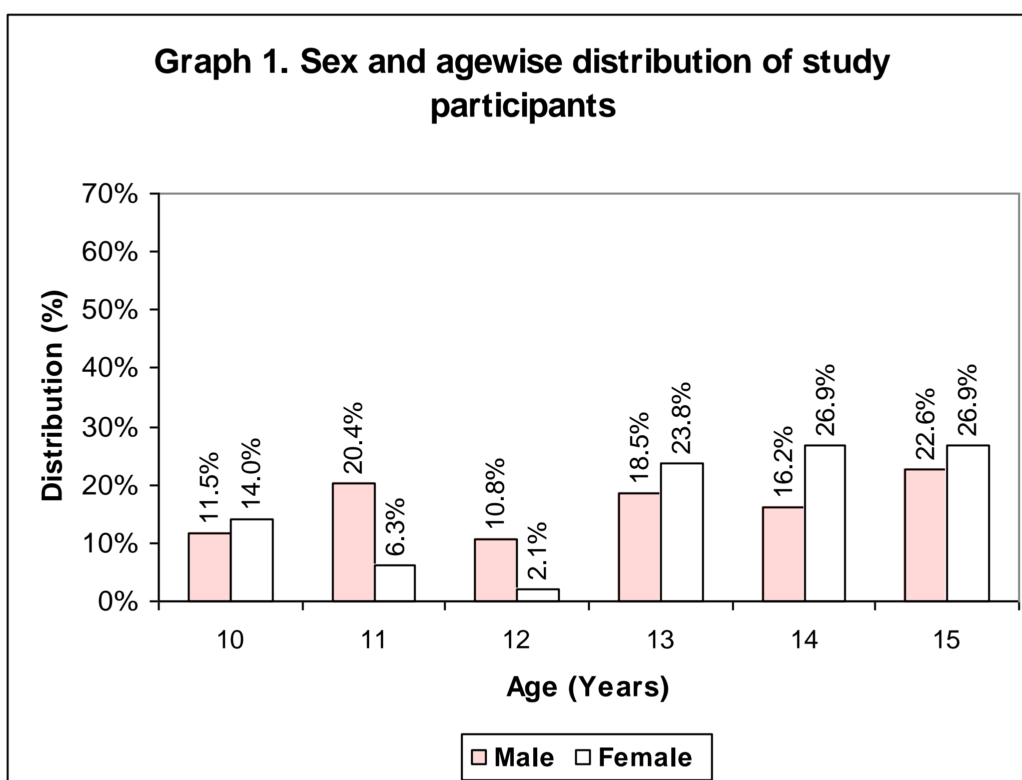
Data collected was analysed and presented under the following headings;

1. Socio demographic characteristics
2. Physical activities
3. Dietary pattern
4. Anthropometric measurements
5. Association of obesity with various factors

I. Socio Demographic Characteristics

Table 1. Sex and age wise distribution of study participants

Age (In years)	Male No	Male %	Female No	Female %	Total No	Total %
10	36	11.5	40	14.0	76	12.7
I11	64	20.4	18	6.3	82	13.7
12	34	10.8	6	2.1	40	6.7
13	58	18.5	68	23.8	126	21.0
14	51	16.2	77	26.9	128	21.2
15	71	22.6	77	26.9	148	24.7
Total	**314**	**100**	**286**	**100**	**600**	**100**



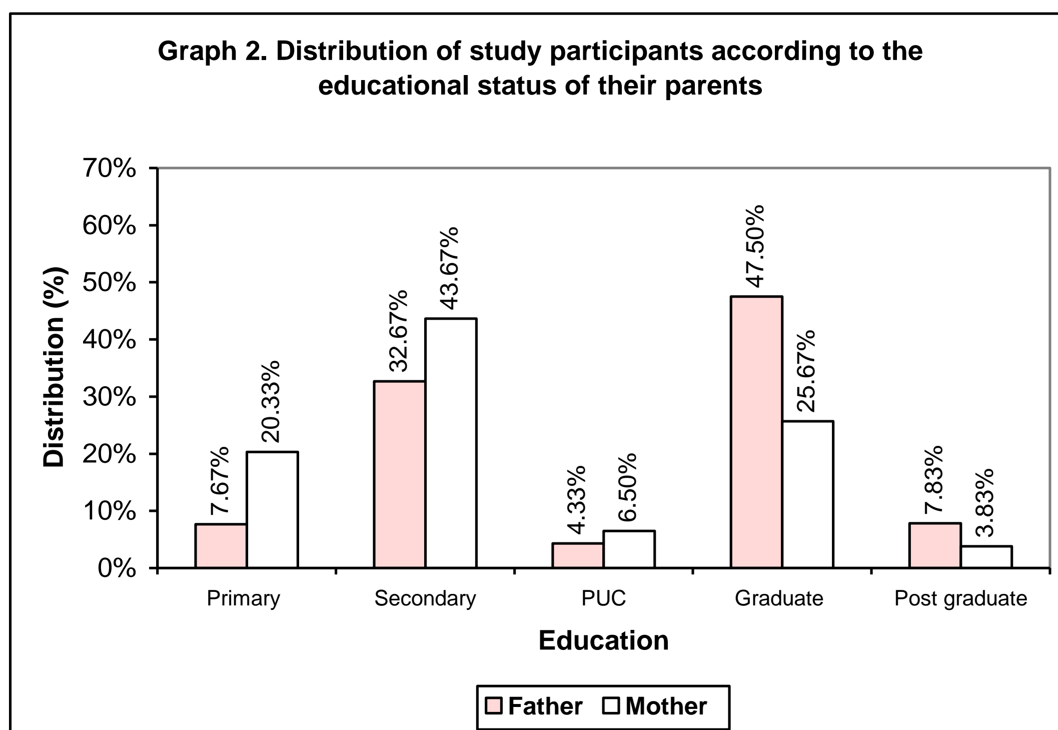
In this study 314 (52.33%) were boys and 286 (47.67%) were girls with male to female ratio being 1.09:1. Among boys and girls maximum were 15 years old (22.6% and 26.9%).

In the present study, majority (75%) of the children were Hindus followed by Muslims (17.67%), Jains (3.16%), Sikhs (1.84%) and Christians (1.33%).

Majority of the study participants (84.17%) belonged to class I socioeconomic status according to modified B. G. Prasad Classification and the remaining (15.83%) belonged to class II.

Table 2. Distribution of study participants according to the educational status of their parents

Educational status of parents	Father		Mother	
	No	%	No	%
Primary	46	7.67	122	20.33
Secondary	196	32.67	262	43.67
P.U.C.	26	4.33	39	6.5
Graduate	285	47.5	154	25.67
Post graduate	47	7.83	23	3.83
Total	**600**	**100**	**600**	**100**



In this study, among fathers most (47.5%) were graduates followed by up to secondary (32.67%), post graduation (7.83%) primary (7.67%) and PUC (4.33%). Among the mothers most (43.67%) had studied up to secondary followed by 25.37% up to graduation, 19.33% up to primary, 20.33% up to PUC and 3.83% were post graduates.

Table 3. Distribution of study participants according to the occupation of their parents

Occupation of parents	Father		Mother	
	Number	Percentage	Number	Percentage
Skilled worker	29	4.83	-	-
Service	115	19.17	17	2.83
Professional	153	25.5	55	9.17
Business	292	48.67	21	3.5
Agriculture	11	1.83	-	-
Housewife	-	-	507	84.5
Total	600	100	600	100

In our study, among fathers 48.67% had business, 25.5% were professionals, 19.17% were in service, 4.83% were skilled workers and 1.83% were agriculturists. Among the mothers, majority (84.5%) were house wives followed by 9.17% professionals, 2.83% service and 3.5% own business.

In the present study 65.67% children belonged to nuclear family, 32% belonged to joint family and 2.33% belonged to 3rd generation family.

Almost 91.67% of the children were of either first or second birth order.

Out of 286 female participants 192 (67.13%) had attained menarche. The mean menarcheal age was 13.17 ± 0.89 years.

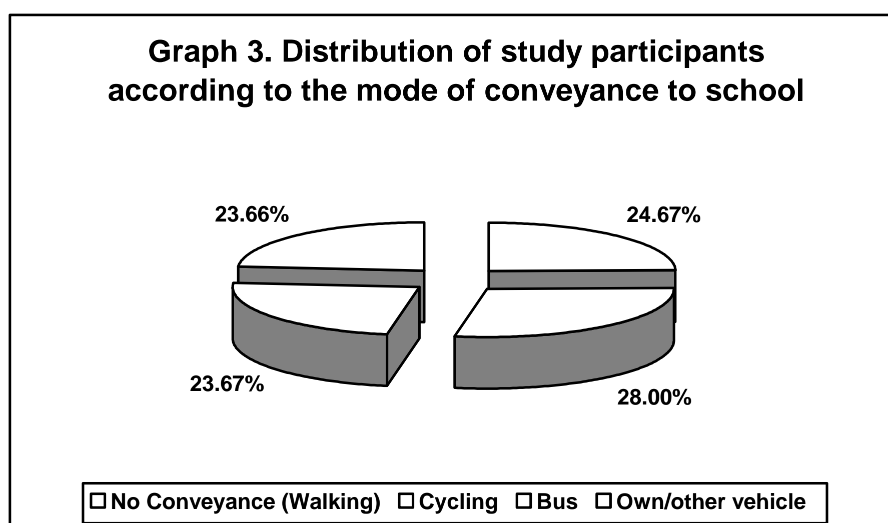
II. Physical Activities

Distribution of study participants according to daily physical activities

Daily physical activity of jogging / running was noted in 29.83% children, skipping 11.7%, swimming in 5.5% and other activities like games in 33.0% children whereas 19.97% children were not involved in any kind of physical activity.

Table 4. Distribution of study participants according to the mode of conveyance to school

Mode of conveyance	Number	Percentage
No conveyance (Walking)	148	24.67
Cycling	168	28.00
Bus	142	23.67
Own/other vehicle	142	23.66
Total	**600**	**100**



In the present study 28% children preferred cycling as mode of conveyance to reach school followed by, 23.67% by bus, 21.17% by their own vehicle.

In this study 56.33% children resided within the distance of less than or equal to two Kms from school, 12.67% within 2.1 to 3.0 Kms, 14% within 3.1 to 4.0 Kms and17% more than four Kms.

All the children (100%) utilized indoor sports complex whereas 87.5% children had access to the playground. Majority (76.33%) had two physical training classes per week whereas 14.5% and 9.17% children had one and three classes per week respectively.

Table 5. Distribution of study participants according to the time spent in watching television

Time spent in watching TV (Hours/day)	Number	Percentage
No	21	3.5
≤ 1	293	48.84
1.1 – 2	173	28.83
2.1 – 3	87	14.5
> 3	26	4.33
Total	**600**	**100**

In the present study 96.5% children watched television as mode of entertainment. Among these, 48.84% watched for less than or equal to one hour, 28.83% for 1.1 to 2.0 hours, 14.5% for 2.1 to 3.0 hours and 4.33% for more than

three hours. However 3.5% children did not preferred television as the mode of entertainment.

In this study 52.67% children utilized computer either as mode of entertainment or for other activities such as browsing the internet, chatting and emails. Among these, 45.83% utilized for less than or equal to one hour and 6.84% for more than two hours. However, 47.33% children either did not have access to the computers as their families did not possess them.

In the present study 57.17% children utilized cell phones as mode of entertainment for playing games, chatting etc. Among these, 50.34% utilized for less than or equal to one hour and 6.83% for more than one hour.

Habits of the study participants

Out of 600 children only nine (1.5%) had habits. Out of these nine children, five (0.83%) were smokers and four (0.67%) were consuming tobacco.

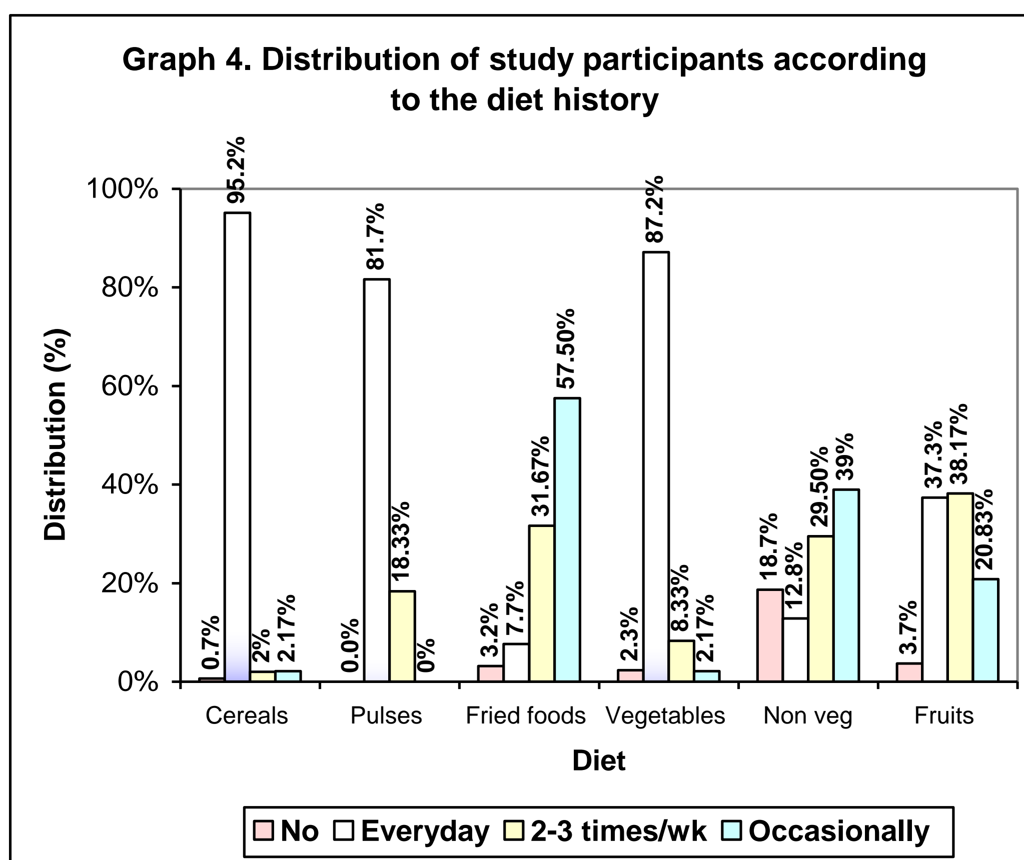
Distribution of study participants according to the duration of sleep

In this study more than half (51.83%) had 7.1 to 9.0 hours of sleep every day followed by 34.17% who slept for 6.1 to 7.0 hours per day. Remaining children either slept for less than six hours (2.33%) or more than nine hours (11.67%).

III. Dietary Pattern

Table 6. Distribution of study participants according to the diet history

Frequency	Cereals		Pulses		Fried foods		Vegetables		Non veg		Fruits	
	No	%	No	%	No	%	No	%	No	%	No	%
No	4	0.67	0	0.00	19	3.16	14	2.33	112	18.67	22	3.67
Everyday	571	95.16	490	81.67	46	7.67	523	87.17	77	12.83	224	37.33
2 to 3 times per week	12	2.00	110	18.33	190	31.67	50	8.33	177	29.50	229	38.17
Occasionally	13	2.17	0	0	345	57.50	13	2.17	234	39.00	125	20.83
Total	**600**	**100**	**600**	**100**	**600**	**100**	**600**	**100**	**600**	**100**	**600**	**100**

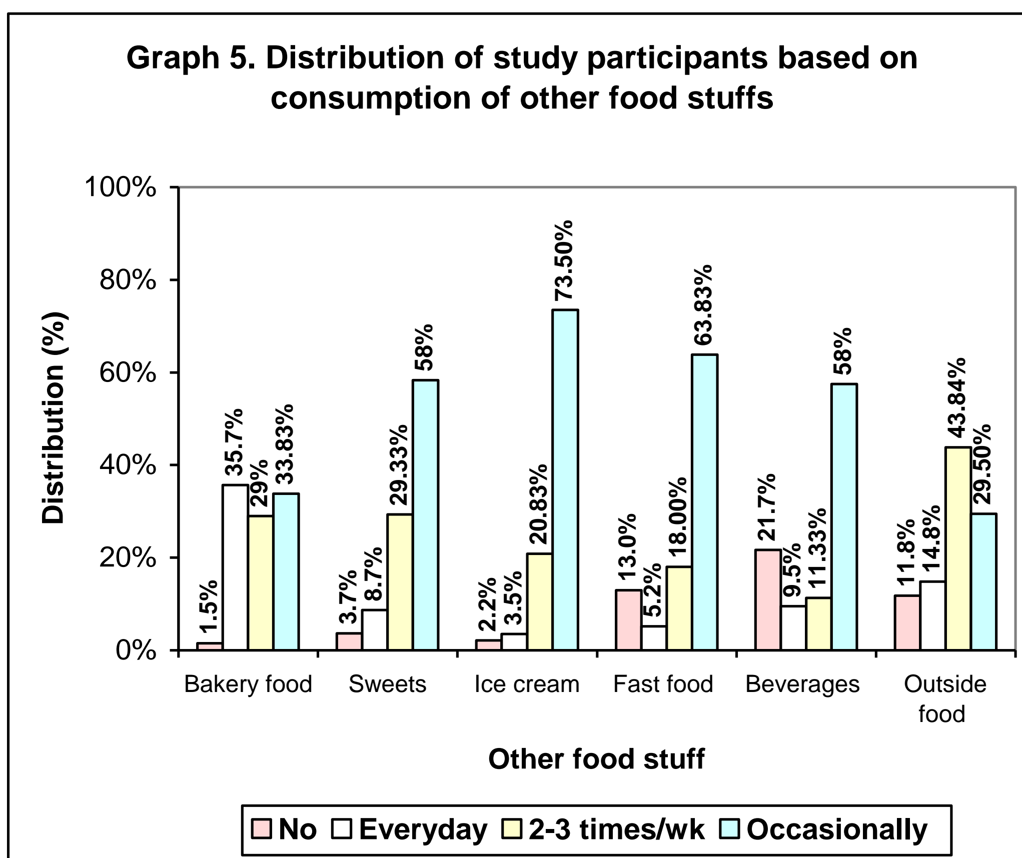


In the present study, majority of the children consumed cereals (95.16%), pulses (81.67%) and vegetables (87.17%) everyday. The consumption of fried

food and non vegetarian food was occasionally in 57.50% and 39% children respectively. The consumption of fruits was noted in 37.33% children everyday and in 38.17% children it was two three times per week.

Table 7. Distribution of study participants based on consumption of other food stuffs

Frequency	Bakery food		Sweets		Ice cream		Fast food		Beverages		Outside food	
	No	%	No	%	No	%	No	%	No	%	No	%
No	9	1.50	22	3.67	13	2.17	78	13.00	130	21.67	71	11.83
Everyday	214	35.67	52	8.67	21	3.50	31	5.17	57	9.50	89	14.83
2 to 3 times per week	174	29.00	176	29.33	125	20.83	108	18.00	68	11.33	263	43.84
Occasionally	203	33.83	350	58.33	441	73.50	383	63.83	345	57.50	177	29.50
Total	**600**	**100**	**600**	**100**	**600**	**100**	**600**	**100**	**600**	**100**	**600**	**100**



In the present study, consumption of bakery food, sweets, ice cream, fast food and beverages and outside food was noted everyday in 35.67%, 8.67%, 3.5%, 5.17%, 9.5% and 14.83% children respectively.

Snacks between meals

Almost three fourth of children (75.17%) preferred snacks between meals and the remaining (24.83%) did not prefer.

IV. Anthropometric measurements

Table 8. Anthropometric measurements of study participants.

Age (Years)	Height (Cms)		Weight (Kgs)		BMI (Kg/m^2)		WHR	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
10	142.71	7.41	43.42	7.49	21.21	2.30	0.84	0.04
11	149.21	9.36	47.67	7.40	21.37	2.44	0.82	0.05
12	150.68	10.19	49.28	6.39	21.82	3.01	0.79	0.07
13	149.02	12.95	48.57	8.44	21.92	3.13	0.79	0.05
14	153.89	10.64	50.85	7.92	21.51	2.85	0.79	0.05
15	158.54	7.25	52.65	6.13	20.94	1.97	0.79	0.05

The mean height of the study participants with age 10 years was 142.71 ± 7.41 cms and mean weight was 43.42 ± 7.49 Kgs. The mean BMI of the study

participants was 21.21 ± 2.30 Kg/m^2. The mean WHR among the study participants was 0.84 ± 0.04.

The mean height of the study participants with age 11 years was 149.21 ± 9.36 cms and mean weight was 47.67 ± 7.40 Kgs. The mean BMI of the study participate was 21.37 ± 2.40 Kg/m^2 and the mean WHR among the study participants was 0.82 ± 0.05.

The mean height of the study participants with age 12 years was 150.68 ± 10.19 cms and mean weight was 49.28 ± 6.39 Kgs. The mean BMI of the study participants was 21.82 ± 3.01 Kg/m^2 and the mean WHR among the study participants was 0.79 ± 0.05.

The mean height of the study participants with age 13 years was 149.02 ± 12.95 cms and mean weight was 483.57 ± 8.44 Kgs. The mean BMI of the study participants was 21.92 ± 3.13 Kg/m^2 and the mean WHR among the study participants was 0.79 ± 0.05.

The mean height of the study participants with age 14 years was 153.89 ± 10.64 cms and mean weight was 50.85 ± 7.92 Kgs. The mean BMI of the study participants was 21.51 ± 2.85 Kg/m^2 and the mean WHR among the study participants was 0.79 ± 0.05.

The mean height of the study participants with age 15 years was 158.54 ± 7.25 cms and mean weight was 52.65 ± 6.13 Kgs. The mean BMI of the study participants was 20.94 ± 1.97 Kg/m^2 and the mean WHR among the study participants was 0.79 ± 0.05.

Overall, the mean height of the study participants was 151.75 ± 11.07 cms and mean weight was 49.34 ± 7.91 Kgs. The mean BMI of the study participants was 21.42 ± 2.63 Kg/m^2.

The mean waist circumference of the study participants was 62.86 ± 7.72 cms and mean hip circumference was 78.72 ± 8.65 cms. The mean WHR among the study participants was 0.80 ± 0.05.

Mean blood pressure levels among study participants

In this study the mean SBP was 109.62 ± 12.40 mm Hg and DBP was 71.37 ± 8.53 mm Hg.

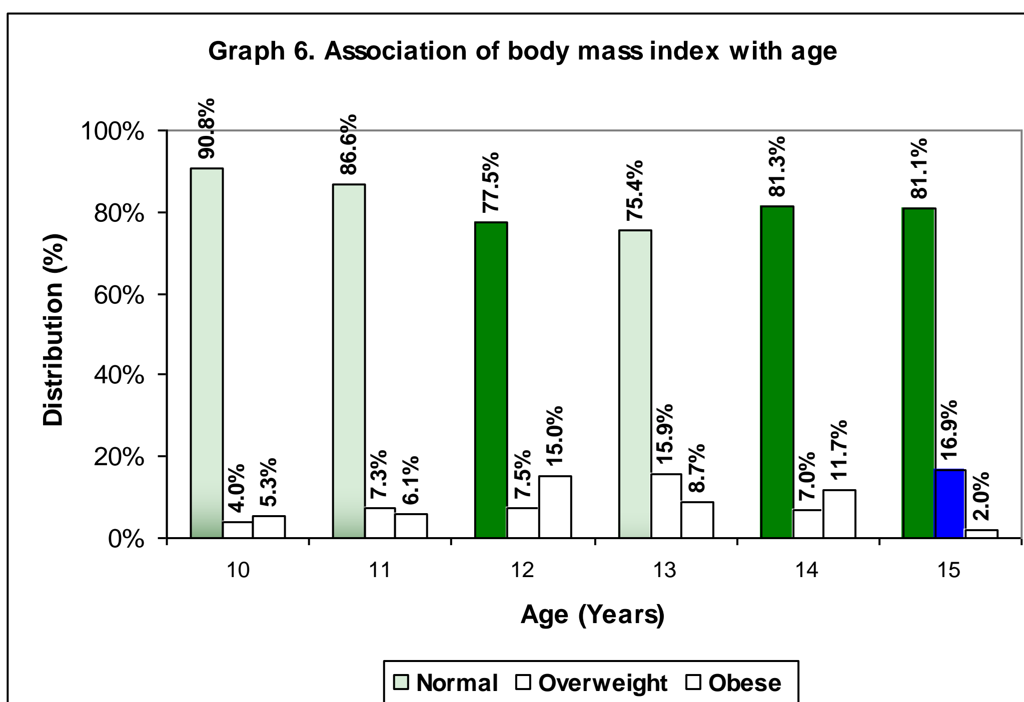
In this study, Overall prevalence of overweight and obesity was noted as 11% and 7.33% respectively among the study participants. 81.67% children had normal BMI (18.50 to 22.99 Kg/m^2). Prevalence of obesity was more in boys (4.66%) when compared to girls (2.67%).

VI. Association of obesity with various factors

Table 9. Association of body mass index with age

Age (Year)	BMI (Kg/m^2) Normal (18.50 to 22.99)		Overweight (23 to 25)		Obese (> 25)	
	No.	%	No.	%	No.	%
10	69	90.79	3	3.95	4	5.26
11	71	86.58	6	7.32	5	6.10
12	31	77.5	3	7.5	6	15.0
13	95	75.4	20	15.87	11	8.73
14	104	81.25	9	7.03	15	11.72
15	120	81.08	25	16.89	3	2.03
Total	**490**	**81.67**	**66**	**11.00**	**44**	**7.33**

$\lambda^2 = 29.3$ DF = 10 p = 0.001



In this study, prevalence of overweight and obesity was more in the age groups of 13(15.87% and 8.73%) and 12 years(7.5% and 15.0%) respectively and less in the age group of 10 years with overweight (3.95%) and obesity (5.26%). Children aged 13years were significantly at risk for overweight and obesity when compare to other age groups and this was statistically significant (x^2=29.3; DF=10; p=0.001).

Association of body mass index with socioeconomic status

In the present study, Prevalence of overweight and obesity was 9.11% and 7.92% respectively in children who belonged to class I SES according to modified B.G.prasad's classification.

Prevalence of overweight and obesity in class II SES was 21.59% and 4.55% respectively. Overweight was more in class II socioeconomic status whereas obesity was more in children of class I socioeconomic status. This association of BMI with socioeconomic class was statistically significant (x^2 = 12.534; DF=2; p=0.002).

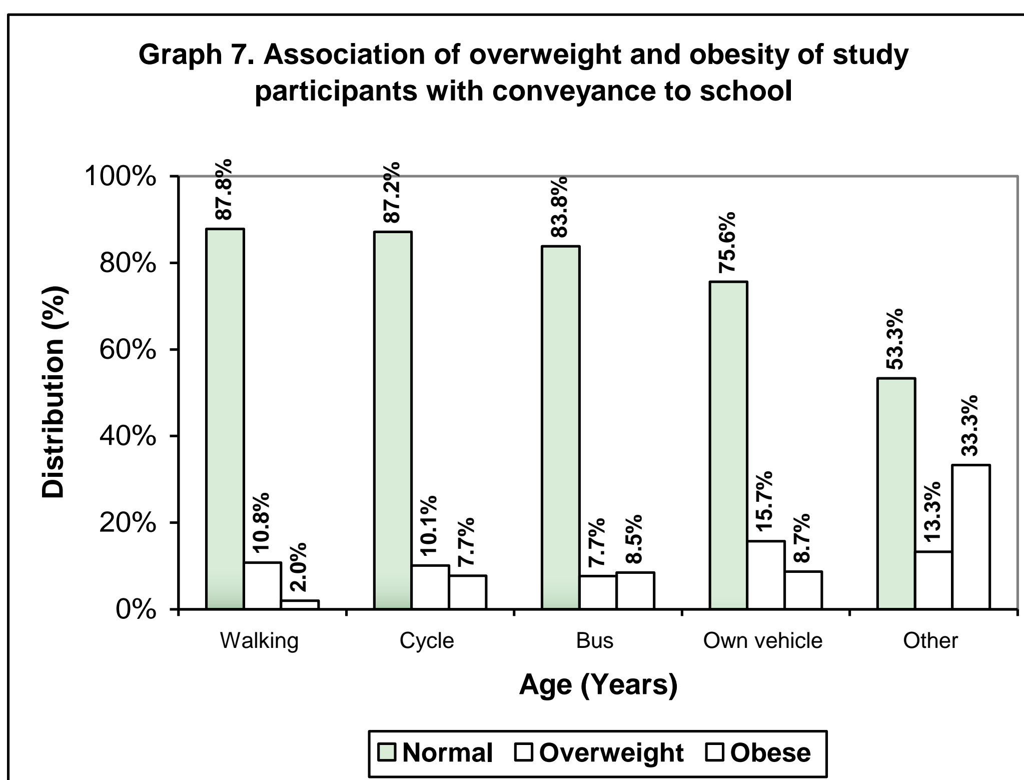
Association of study participants with WHR categorized by gender

In this study majority of the boys (90%) had normal WHR (WHR category I) whereas 41.6% girls had WHR category II and 1.75% had category III. This association of WHR among girls was statistically significant (x^2=171.6; DF =2; $p<0.0001$).

Table 10. Distribution of study participants based on association of overweight and obesity with conveyance to school

BMI	No Conveyance (Walking)		Cycle		Bus		Own vehicle		Others		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Normal	129	87.20	138	87.16	119	83.80	96	75.60	8	53.33	490	81.67
Overweight	16	10.80	17	10.11	11	7.70	20	15.70	2	13.33	66	11.00
Obese	3	2.00	13	7.73	12	8.50	11	8.70	5	33.34	44	7.33
Total	**148**	**100**	**158**	**100**	**142**	**100**	**127**	**100**	**15**	**100**	**600**	**100**

$x^2 = 26.941$ DF = 8 p = 0.001



In this study, prevalence of overweight and obesity was 10.8% and 2% respectively when children came by walk (no conveyance) to school and 10.11% and 7.73% respectively when cycle was used as mode of conveyance to school

and when they used bus as mode of conveyance, prevalence of overweight and obesity was 7.7% and 8.5% respectively, whereas in children who were using their own vehicles as mode of conveyance, prevalence of overweight and obesity was 15.7% and 8.7%, others (auto rickshaws), prevalence of overweight and obesity was 13.33% and 33.34% respectively. Children who were using their own vehicles and others (Auto Rickshaws) as mode of conveyance to school were significantly at risk for overweight and obesity. This association of overweight and obesity with mode of conveyance was statistically significant (x^2=26.941; DF=8; p=0.001).

Association of overweight and obesity with playing outdoor games

Prevalence of overweight and obesity was 14.5% and 8.2% in children who were not playing outdoor games (cricket, football) and prevalence of overweight and obesity was 4.55% each in children who were playing outdoor games daily, 13.3% and 6.7% if they were playing alternately. This association of playing outdoor games with overweight and obesity was statistically significant (x^2=18.244; DF =6; p=0.031).

Table 11. Association of Overweight and obesity with participants having snacks between meals

BMI (Kg/m²)	No		Yes		Total	
	No	**%**	**No**	**%**	**No**	**%**
Normal (18.5-22.99)	134	91.16	356	78.60	490	81.67
Overweight (23.00-25.00)	11	7.48	55	12.10	66	11.00
Obese (>25)	2	1.36	42	9.30	44	7.33
Total	**147**	**100**	**453**	**100**	**600**	**100**

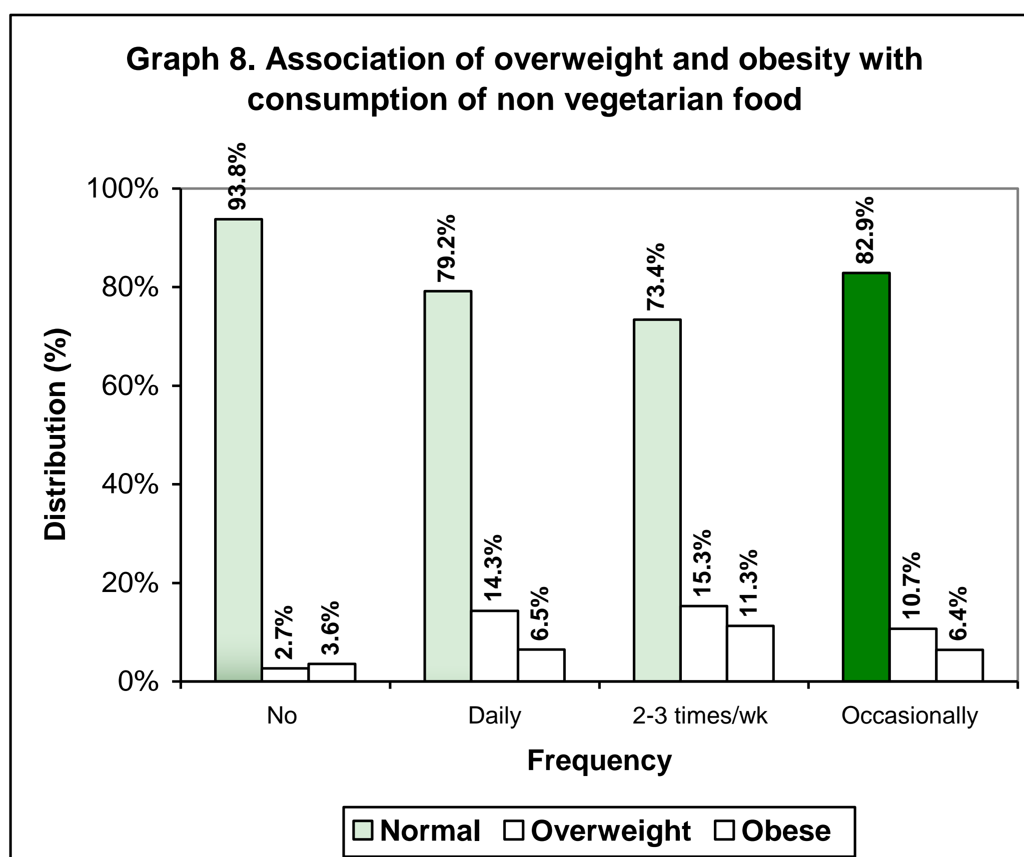
x^2 = 13.808 DF = 2 p=0.001

In the present study, prevalence of overweight and obesity was 7.48 and 1.36% respectively when children were not having snacks between meals, whereas prevalence of overweight and obesity was 12.10 and 9.30% when children had snacks between meals. This difference was statistically significant (x^2=13.808; DF =2; p=0.001).

Table 12. Association of overweight and obesity with consumption of non vegetarian food

BMI (Kg/m^2)	No		Daily		2 – 3 times a week		Occasionally		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Normal (18.5-22.99)	105	93.75	61	79.20	130	73.40	194	82.90	490	81.67
Overweight (23.00-25.00)	3	2.68	11	14.30	27	15.30	25	10.70	66	11.00
Obese (>25)	4	3.57	5	6.50	20	11.30	15	6.40	44	7.33
Total	**112**	**100**	**77**	**100**	**177**	**100**	**234**	**100**	**600**	**100**

$x^2 = 20.611$ DF = 6 p = 0.002



In this study, the prevalence of overweight and obesity was 2.68% and 3.57% when the children were not consuming non vegetarian food, whereas

prevalence of overweight and obesity was 14.3% and 6.5% respectively when they consumed daily and 15.3% and 11.3% when consumed 2 to 3 times a week.

This association of consumption of non vegetarian food with overweight and obesity was statistically significant (x^2=20.611; DF =6; p=0.002).

Table 13. Association of consumption of fruits with overweight and obesity

BMI (Kg/m^2)	No		Daily		2 – 3 times a week		Occasionally		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Normal (18.5-22.99)	7	31.8	187	83.5	183.	79.9	113	90.4	490	81.67
Overweight (23.00-25.00)	4	18.2	28	12.5	24	10.5	10	8.20	66	11.00
Obese (>25)	11	50.0	9	4.0	22	9.6	2	1.6	44	7.33
Total	**130**	**100**	**57**	**100**	**68**	**100**	**345**	**100**	**600**	**100**

x^2=75.795 **DF=6** **p<0.001**

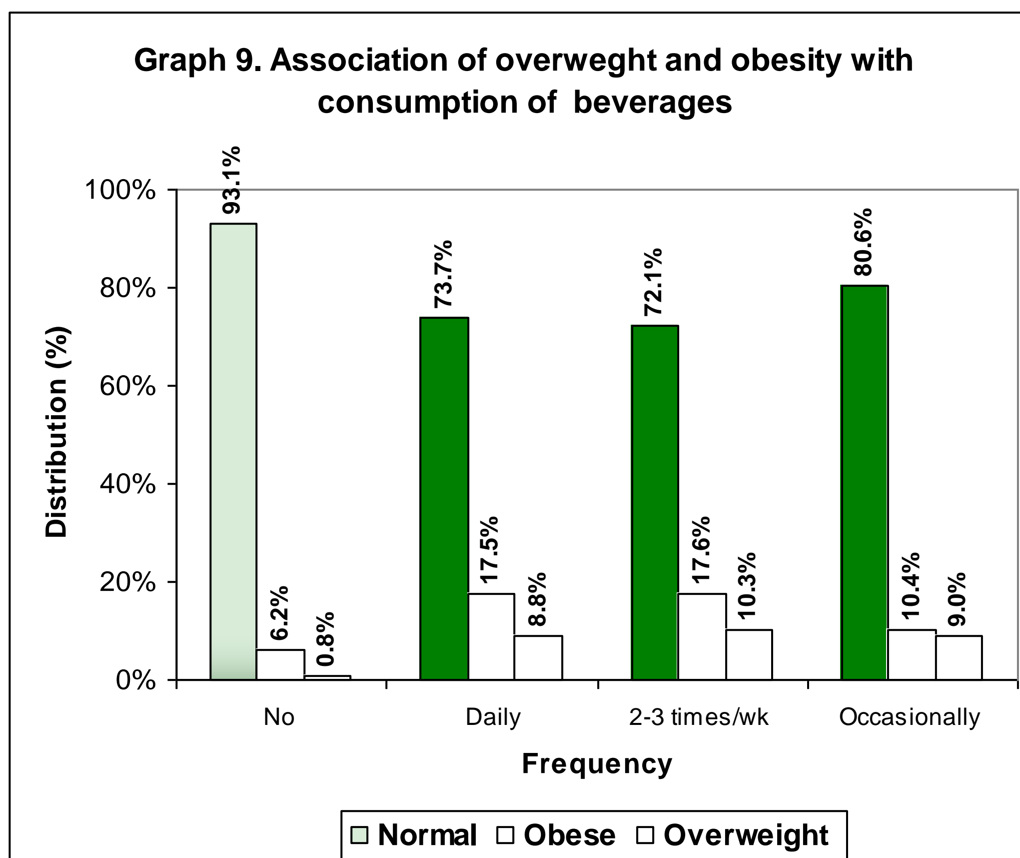
In the present study when the fruits were not consumed, the prevalence of overweight and obesity was 18.2% and 50% respectively, whereas when the fruits were taken daily prevalence of overweight and obesity was 12.5% and 4%, and when consumed 2 to 3 times a week it was 10.5% and 9.6% respectively.

This association of consumption of fruits with overweight and obesity was statistically significant (x^2=75.795; DF =6; p<0.001).

Table 14. Association of overweight and obesity with consumption of beverages

BMI (Kg/m^2)	No		Daily		2 – 3 times a week		Occasionally		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Normal (18.5-22.99)	121	93.08	42	73.70	49	72.10	278	80.60	490	81.67
Overweight (23.00-25.00)	8	6.15	10	17.50	12	17.60	36	10.40	66	11.00
Obese (>25)	1	0.77	5	8.80	7	10.30	31	9.00	44	7.33
Total	**130**	**100**	**57**	**100**	**68**	**100**	**345**	**100**	**600**	**100**

$x^2 = 21.058$ DF = 6 p = 0.002



In this study, when the beverages were not consumed the prevalence of overweight and obesity was 6.2% and 0.8% respectively, whereas when beverages were taken daily, prevalence of overweight and obesity was 17.5% and 8.8% respectively and when taken 2 to 3 times a week, prevalence of overweight and obesity was 17.6% and10.3% respectively.

This association of consumption of beverages with overweight and obesity was statistically significant (x^2=21.058; DF =6; p=0.002).

Table 15. Association of Family history of DM, Hypertension and obesity with overweight and obesity

Family history		BMI (Kg/m^2) Normal (18.50 to 22.99)		Overweight (23 to 25)		Obese (> 25)		Total	
		No.	%	No.	%	No.	%	No.	%
DM	No	454	83.2	50	9.1	42	7.7	546	100
	Yes	36	66.7	16	29.6	2	3.7	54	100
	Total	**490**	**81.67**	**66**	**11.00**	**44**	**7.33**	**600**	**100**
	Inference	**x^2=21.424**		**DF=2**		**p<0.001**			
HTN	No	452	81.6	62	11.2	40	7.2	554	100
	Yes	38	82.6	4	8.7	4	8.7	46	100
	Total	**490**	**81.67**	**66**	**11.00**	**44**	**7.33**	**600**	**100**
	Inference	**x^2=0.372**		**DF=2**		**p=0.830**			
Obesity	No	488	84.3	58	10.0	33	5.7	579	100
	Yes	2	9.5	8	38.1	11	52.9	21	100
	Total	**490**	**81.67**	**66**	**11.00**	**44**	**7.33**	**600**	**100**
	Inference	**x^2=88.612**		**DF=2**		**p<0.001**			

In the present study, amongst the family of children with history of diabetes mellitus, prevalence of overweight and obesity was seen in 29.69% and 3.7% respectively. With no family history of diabetes mellitus, prevalence of overweight and obesity was 9.1% and 7.7%. This difference was statistically significant with overweight and obesity (x^2=21.424; DF=2 p<0.001).

There was no statistically significant association for overweight and obesity in children with and without family history of hypertension (x^2=0.372; DF=2; p=0.830).

With the family history of obesity, prevalence of overweight and obesity was 38.1% and 52.9% respectively whereas prevalence of overweight and obesity was only 10% and 2% in the children without the family history of obesity. This difference was statistically significant with overweight and obesity (x^2=88.612; DF=2; p<0.001).

Table 16. Univariate and multivariate logistic regression analysis

Parameters		Univariate analysis Unadjusted			Multivariate analysis Adjusted		
		OR	'p' value	95% CI	OR	'p' value	95% CI
Age	10 (Ref)						
	11	1.52	0.408	0.56-4.16	1.70	0.401	0.49-5.88
	12	2.86	0.055	0.97-8.40	6.13	**0.012***	1.49-25.0
	13	3.21	**0.009***	1.34-7.75	3.00	0.056	0.97-9.25
	14	2.27	0.072	0.93-5.55	2.91	0.074	0.90-9.43
	15	2.29	0.063	0.95-5.55	1.80	0.315	0.57-5.68
Religion	Others	1.97	0.083	0.31-4.23	1.85	0.201	0.72-4.78
	Muslim	2.18	**0.002***	1.32-3.57	2.10	**0.027***	1.11-4.17
	Hindu (Ref)						
SES	II vs I	1.65	0.059	0.98-2.76	2.15	**0.023***	1.11-4.17
Conveyance	Walk (Ref)						
	Cycle	1.47	0.220	0.79-2.75	2.51	**0.024***	1.13-5.61
	Bus	1.31	0.417	0.68-2.53	2.68	**0.022***	1.15-6.21
	Own vehicle	2.19	**0.014***	1.47-4.11	3.06	**0.005***	1.39-6.75
	Others	5.95	**0.002***	1.93-18.18	9.43	**0.002***	2.32-38.46
Physical activities	Running/ Jogging Yes/No (Ref)	1.91	**0.003***	1.24-2.95	0.99	0.997	0.54-1.85
	Skipping Yes/No (Ref)	1.51	0.061	0.98-2.31	1.87	**0.024***	1.09-3.23
	Swimming Yes/No (Ref)	1.48	0.091	0.94-2.33	1.52	0.169	0.83-2.78
	Outdoor games Yes/ No (Ref)	1.82	**0.006***	1.19-2.79	2.57	**0.001***	1.44-4.60
Non veg	Yes/No(Ref)						
	Every day	3.93	**0.004***	1.53-10.10	3.48	**0.039***	1.06-11.36
	2-3 times/wk	5.43	**<0.001***	2.35-12.50	3.22	**0.032***	1.10-9.43
	Occasionally	3.09	**0.008***	1.34-7.14	2.67	0.057	0.83-7.35
Beverages	Yes/No(Ref)						
	Every day	4.81	**0.001***	1.95-11.76	8.33	**<0.001***	2.71-25.64
	2-3 times/wk	5.21	**<0.001***	2.21-12.34	8.93	**<0.001***	3.21-25.00
	Occasionally	3.23	**0.002***	1.56-6.71	5.32	**<0.001***	2.18-12.82
Snacks between meals	Yes/No(Ref)	2.81	**0.001***	1.52-5.18	5.49	**<0.001***	2.67-11.36
WHR	II & I (Ref)	1.58	0.060	0.98-2.54	3.58	**<0.001***	1.86-6.91

From the logistic regression analysis, children aged 13 years, religion Muslim, using their own vehicle and other modes (Auto rickshaws) as conveyance to school, who were not doing physical activities like running and

jogging and playing other games, consuming non vegetarian food, beverages everyday, 2-3 times a week, occasionally and having snacks between meals were significantly associated with overweight and obesity in univariate analysis. Whereas in multivariate analysis children aged 12 years, religion Muslim, socioeconomic status II, using cycle, bus, own vehicle and others (Auto rickshaws) as mode of conveyance to school, who were not doing physical activities like skipping and playing other games, consuming non vegetarian food daily, 2-3 times and having beverages everyday, 2-3 times per week, occasionally and WHR category II were significantly associated with overweight and obesity in multivariate analysis.

Attitude of the study participants regarding obesity

During the study, information regarding attitude (only two components) of the children towards obesity was also collected. Among the overweight and obese children, 24.28% and 32.86% felt that they were obese. However in 88.9% overweight and 85.7% obese children did not feel the necessity to reduce the weight.

Chapter 6

Discussion

DISCUSSION

This is a cross-sectional study of 600 children in the age group of 10 to 15 years studying in sixth to tenth standard from the eight private schools of Belgaum city.

Socio-demographic characteristics of study participants (Table 1-3)

In the present study, among 600 study participants in the age group of 10 to 15 years, 314 were boys (52.33%) and 286 were girls (47.66%), with male to female ratio of 1.09:1. Whereas in a study[16] conducted at Wardha city girls (53.2%) were more than boys (46.8%). As against this, boys (65.1%) were significantly more than girls (34.9%) in a study[41] carried out at Davangere.

In our study, majority of the children were Hindus (75%), followed by Muslims (17.6%) and others (6.33%). Majority of the participants (84.17%) belonged to class I socioeconomic status and the remaining belonged to class II socioeconomic status. A similar study[52] conducted in Delhi showed that majority of the children were Hindus and belonged to class I socioeconomic status and this distribution is very much comparable to our study.

In the present study, most of the fathers (47.5%) were graduates, followed by secondary education (32.67%) and most of them were in either business (48.67%) or professionals (25.57%). Most of mothers studied up to secondary school (43.67%) followed by graduation (23.37%) and majority (84.5%) of them were housewives.

In our study 65.67% children belonged to nuclear family, 32% belonged to joint family and 2.33% belonged to 3rd generation family. Almost 91.67% of the children were of either first or second birth order.

Table 4 and 5: Distribution of study participants according to daily physical activities, mode of conveyance to school and the time spent in watching television

Daily physical activity of jogging / running was noted in 29.83% children, skipping 11.7%, swimming 5.5% and other activities like outdoor games in 33.0% children and 19.97% were not involved in any kind of physical activity was noted in our study.

In the present study, 28% children preferred cycling as mode of conveyance to reach school followed by 23.66% by bus and 21.17% by their own vehicle.

In this study 96.5% children watched television as mode of entertainment. Among these, 48.84% watched for less than or equal to one hour, 28.83% for 1.1 to 2.0 hours, 14.5% for 2.1 to 3.0 hours and 4.33% for more than three hours. However 3.5% children did not prefer television as the mode of entertainment.

In the present study more than half of the children utilized computer either as mode of entertainment or for other activities such as browsing the internet, chatting and emails. Among these, 45.83% utilized for less than or equal to one hour and 6.84% for more than two hours. However, 47.33% children did not have access to the computers as their families did not possess them.

In the present study 57.17% children utilized cell phones as mode of entertainment for playing games, chatting etc. Among these, 50.34% utilized for less than or equal to one hour and 6.83% for more than one hour.

Table 6 and 7 Distribution of study participants according to the diet history and consumption of other food stuffs

In this study, majority of the children consumed cereals (95.16%), pulses (81.67%) and vegetables (87.17%) everyday. Consumption of fruits was noted in 37.33% children every day and in 38.17% children it was two to three times per week.

In the present study, consumption of bakery food, sweets, ice cream, fast foods, beverages and having outside food was noted everyday in 35.67%, 8.67%, 3.5%, 5.17%, 9.5% and 14.83% children respectively. Almost three fourth of children (75.17%) preferred snacks between meals.

Anthropometric measurements of study participants (Table 8)

The mean height of the study participants was 151.75 ± 11.07 cms and mean weight was 49.34 ± 7.91 Kgs. The mean BMI of the study participants was 21.42 ± 2.63 Kg/m^2.

The mean waist circumference of the study participants was 62.86 ± 7.72 cms and mean hip circumference was 78.72 ± 8.65 cms. The mean WHR among the study participants was 0.80 ± 0.05.

Association of overweight and obesity with various factors

In our study, Overall prevalence of overweight and obesity was 11% and 7.33% respectively. Prevalence of obesity was more in boys (4.66%) when compared to girls (2.67%). This could be because of boys enjoy cultural advantages more in our country. They get larger helpings of food, more freedom to go out of the house and thus snack and also do not contribute much to the house hold activities.

Our results are similar to the studies,[39,53] conducted at other places like in Meerut where the prevalence of obesity was higher in boys (10.82%) than in girls (5.3%).[39] A study[53] conducted amongst school children at Ludhiana, where the prevalence of obesity was significantly higher in boys (15.1%) as compared to girls (10.2%).

Association of overweight and obesity with age (Table 9)

In this study, prevalence of overweight and obesity was more in the age groups of 13(15.87% and 8.73%) and 12 years (7.5% and 15.0%) respectively.

Our findings are very much comparable to the findings of a study[54] conducted in Chennai among 10 to 15 years age group adolescent girls, which showed a prevalence of 9.6% overweight and 6% obesity. A study[55] conducted in Bangalore city among affluent adolescent girls had also showed the highest prevalence of obesity at 12 years.

A study[53] conducted in Meerut among adolescents of affluent public schools had also reported the prevalence of obesity as higher in boys (10.82%) than in girls (5.3%).

Prevalence of obesity in Lebanese adolescent private school children was more in boys (10.1%) when compared with girls (4.2%) which could be because of the western feminine self image.[35]

Association of study participants with WHR categorized by gender

In the present study, majority of the boys (90%) had normal WHR (WHR category I) whereas 41.6% girls had WHR category II and 1.75% had category III. This association of WHR among girls was statistically significant ($p<0.0001$).

Our results are consistent with a similar study[38] done in Delhi on affluent adolescent girls, which reported a prevalence of obesity 5.3% and overweight 15.2%. Out of the 22 obese girls, central obesity was present in 21 girls. 10 girls had a Waist Circumference more than 100 centimetres.

Our findings are similar with the study done in school going children of Pondicherry, among urban adolescents 12.3% of boys were overweight and obese according to WHR, where as in girls 77.1% were overweight, and 19.4% were obese.[14]

Association of overweight and obesity with socioeconomic status

In the present study, prevalence of overweight and obesity was 9.11% and 7.92% respectively in children belonging to class I SES according to modified B.

G. Prasad's classification[45] and overweight and obesity in class II SES was 21.59% and 4.55% respectively. Overweight was more in class II socioeconomic status whereas obesity was more in class I socioeconomic status. The reason for this could be children belonging to higher socioeconomic group, had more access to the computers, TVs, which had resulted in sedentary life style and less physical activity. Similar findings were observed in the study[56] done among school going children of Lucknow city where the prevalence of obesity is more in the higher socioeconomic groups. This is in contrast to the results of the study[12] done in developed country like United States where the prevalence of obesity was more in lower socio income groups when compared with higher and the reason cited was in US, higher-SES groups usually consume more vegetables and fruits, which are less energy-dense and less meat, than low-SES groups.

Children of poor socioeconomic status tend to consume less quantities of fruits and vegetables and to have a higher intake of total and saturated fat contributing to overweight and obesity.

Association of overweight and obesity with conveyance to school (Table 10)

In the present study, children who were using their own vehicle and other vehicles (motor bikes &auto rickshaws) as mode of conveyance to school had highest prevalence of overweight and obesity as 14.5% and 21.02% respectively, and children who had no conveyance (walking) had least prevalence of overweight and obesity that is 10.8% and 2% respectively. Children who were using their own vehicles and others (Auto Rickshaws) as mode of conveyance to

school were significantly at risk for overweight and obesity. Regular walking to school on all the days had helped the students to maintain their normal weight.

These findings are comparable with the study[40] done in Hyderabad among urban adolescents, where the prevalence was low in children who walked to school compared to those who used vehicular transport such as motor cycles or cars.

Our findings are also similar with the study conducted in school going children of Pondicherry, where the prevalence of overweight and obesity was low (2.3%) among the children who were walking to school when compare with those who used vehicular transport (6.7%).[14]

Association of overweight and obesity with playing outdoor games

In the present study, prevalence of overweight and obesity was 14.5% and 8.2% in children who were not playing outdoor games (cricket, football etc.,) whereas prevalence of overweight and obesity was significantly reduced to 4.55% in children who were playing outdoor games daily (p=0.031).

Playing outdoor games is not only a type of recreation for school going children but also a physical exercise which helps in spending energy and thus avoiding overweight and obesity.

Parents from urban areas especially from higher socioeconomic group prefer having their children watch television at home rather than play outside unattended because parents are able to complete their chores while keeping an

eye on their children, which is indirectly leading to sedentary lifestyle in children and thereby helping them to be overweight and obese.

Our findings are very much comparable to a study[40] done in Hyderabad among adolescents where the prevalence of obesity was significantly lower among those participating regularly in outdoor games for more than 6 hours per week.

Similar results were also observed in the study[16] conducted at Wardha city.

Association of overweight and obesity and eating snacks between meals amongst the study participants (Table 11)

Our study revealed significant association between overweight and obesity and the consumption of snacks between meals (p=0.001). Prevalence of overweight and obesity was 7.48 and 1.36% respectively when children were not having snacks between meals, whereas prevalence of overweight and obesity was 12.10 and 9.30% when children had snacks between meals.

Davangere study[41] also reported that among affluent school children, snacking of high energy foods between meals was an influencing factor for overweight and obesity. A similar study done in Bhavnagar also showed that snacking in between the meals is a risk factor for overweight and obesity and hence to be avoided.

Association of obesity with consumption of non vegetarian food (Table 12)

In our study, prevalence of overweight and obesity was significantly high 14.3% and 6.5% in children who consumed non vegetarian food daily when compared with those who were not consuming non vegetarian food (p=0.002).

However similar study[57] conducted in Western part of India reported no difference in the prevalence of overweight and obesity when children were consuming vegetarian or non vegetarian diet.

Association of consumption of fruits with overweight and obesity (Table 13)

In our study, consumption of fruits either daily or 2 to 3 times a week had shown a protective effect against overweight and obesity. Prevalence of overweight and obesity was (18.2%) and (50%) in those who were not consuming fruits. This association was statistically significant (p = 0.002). Fruits are protective foods having low calories and thus help in maintaining the weight.

A study[28] done on vegetarian diets and childhood obesity prevention suggested, plant based diet like fruits and vegetables, was a sensible approach for the prevention of obesity in children as the plant-based diets are low in energy density, protein, and fat and high in nutrient density, complex carbohydrate, fibre, and water.

Association of consumption of beverages with overweight and obesity (Table 14)

In our study, when the beverages were not consumed the prevalence of overweight and obesity was 6.2% and 0.8% respectively, whereas when beverages were taken daily, prevalence of overweight and obesity was 17.5% and 8.8% respectively. Thus the consumption of beverages either daily or 2 to 3 times a week was a significant risk factor for the development of overweight and obesity (p=0.002).

Similar results have been reported by other authors that consumption of sweetened beverages is positively associated with overweight and obesity.

A study[58] conducted in developed country like US has shown a significant association between consumption of beverages with overweight and obesity. The study further reported that odds ratio of becoming obese among children increased 1.6 times for each additional can or glass of beverages they consume every day. The authors explain that consumption of sugar sweetened drinks could lead to obesity because of imprecise and incomplete compensation for energy consumed in liquid form.

Association of Family history of diabetes mellitus, hypertension and obesity with overweight and obesity (Table 15)

Diabetes Mellitus is a disease that runs in families. Obesity being one of the important risk factors for the same. In our study amongst the children with family history of diabetes mellitus, prevalence of overweight/obesity was

33.39% and With no family history of diabetes mellitus, prevalence of overweight and obesity was 16.8% and this difference was statistically significant ($p<0.001$). Our results are comparable to the study[42] conducted in Vellore district Tamilnadu, in which it was found that the history of diabetes mellitus in any of the parents was a significant risk factor for the students to be overweight and obese.

Similar study[57] conducted in Western India, among school children reported that family history of diabetes was positively associated with overweight and obesity.

In our study there was no statistically significant association for overweight and obesity in children with and without family history of hypertension ($p<0.830$).

In our study, family history of obesity was significantly associated with prevalence of overweight and obesity in 38.1% and 52.9% respectively whereas prevalence of overweight and obesity was only 10% and 2% in the children without the family history of obesity($p<0.001$).

Similar results were observed in the study[59] conducted in China which found out that 44% of obese children had obese fathers and 12% had obese mothers. A similar observation was also found in a study conducted, among school children in Western India[57] which reported that family history of obesity was positively associated with overweight and obesity in children. These findings suggest a genetic predisposition to obesity. Obesity clearly demonstrates a familial tendency.

Univariate and Multivariate Logistic Regression Analysis(Table 16)

In our study univariate logistic regression analysis had showed children aged 13 years, Muslim religion, using their own vehicle and other modes (Auto rickshaws) as conveyance to school, who were not doing physical activities like running and jogging and playing outdoor games, consuming non vegetarian food, beverages and having snacks between meals were significantly associated with overweight and obesity.

Whereas the final multivariate analysis revealed that children aged 12 years, Muslim religion, socioeconomic status II, using vehicles as mode of conveyance to school, who were not doing physical activities like skipping and playing outdoor games, consuming non vegetarian food daily, 2-3 times a week and having beverages everyday and WHR category II were significantly associated with overweight and obesity.

Our results are comparable to the Hyderabad study[40] among urban adolescents, where the multivariate regression analysis revealed that the risk of overweight and obesity was 4 times among the adolescents of high socioeconomic status, 3 times higher among those participating < 3 hours per week in outdoor games, 2.7 times higher among those who are not participating in household activities and 2 times higher among those who reported watching television.

A study[16] conducted amongst school going children of Wardha City, Central India, to find out the correlates of overweight and obesity, the final model of the multivariate logistic regression showed that the important correlates of overweight/obesity were urban residents, English medium school and child playing outdoor games for less than 30 minutes.

Chapter 7

Conclusion

CONCLUSION

Childhood obesity is the neglected problem. Effective prevention of adult obesity will require the prevention and management of childhood obesity. This cross-sectional study found out the prevalence of overweight and obesity among school going children of private schools aged 10 to 15 years to be 11% and 7.33% respectively which is on par with many urban cities of India.

There was significant association of overweight and obesity with the socio demographic characteristics like age, gender and Socio Economic Status. Children aged 13 years who belonged to Socio Economic Class I and II were more at risk. Children who were not doing physical activities like running / jogging, not taking part in outdoor games, using vehicles as mode of conveyance to school were found to be significantly associated with overweight and obesity. Consumption of snacks between meals, non vegetarian food, beverages regularly, and not having fruits were the significant risk factors for the development of overweight and obesity. Family history of diabetes and obesity had also played a part in the child becoming overweight or obese

Chapter 8

Limitations

LIMITATIONS

Data with respect to dietary pattern and physical activities has been only qualitative as it does not include quantity of different food items consumed and duration of time for which the physical activities were performed.

Chapter 9

Recommendations

RECOMMENDATIONS

Based on our results following recommendations are made.

1. There should be regular class hours on healthy food habits, nutritive values of different food items, lifestyle and behavioral modification.
2. Teachers should be motivated to explain the health related problems through non-conventional ways like short play, video clips, games etc.
3. Teachers should encourage all the children to participate in outdoor games and monitor their weight gain.
4. School authorities should ban the sale of undesirable foods and beverages in school canteen and its premises.
5. Periodic health education program incorporating the causes of obesity and its health hazards should be organized for the school children, teachers and parents.

Chapter 10

Summary

SUMMARY

The present cross-sectional study was undertaken in eight private schools of Belgaum city to find out the prevalence of obesity and to know the various factors contributing to the development of obesity.

The duration of the study was for one year, from 1st January 2010 to 31st December 2010. 600 children in the age group of 10-15 years studying in sixth to tenth standard were included in the study.

Majority of the participants, 52.33% were boys and 47.66% were girls, and aged 15 years. Majority of the children three fourths (75%) were Hindus, belonged to class I socio economic status (84.17%), nuclear family (65.67%) and almost 91.67% of the children were of either first or second birth order.

Daily physical activity of jogging / running was noted in 29.83% children, skipping 11.7%, swimming 5.5%, other activities like outdoor games in 33.0% children and 19.97% were not involved in any form of physical activity.

28% of the children were using bicycles and slightly less than 50% (47.32%) were using fuel vehicles (buses, cars, autos) as mode of conveyance to school. One fourth (24.67%) had no conveyance (walking).

Majority of the children (96.5%) watched television as mode of entertainment and more than half (52.67%) used computer, either for entertainment or for browsing and 57.17% utilized cell phones, as mode of entertainment for playing games or chatting.

Most of the children (90%) were consuming cereals, pulses, vegetables every day. One third of the children (37.33%) consumed fruits every day. 35.67% children consumed bakery food every day. Almost three fourth of the children 75.17% preferred snacks between meals.

The mean height of the study participants was 151.96 ± 11.47 and mean weight was 43 ± 10.75 Kgs. The mean BMI of the study participants was 18.64 ± 4.32 Kg/m2. The mean Waist Circumference of the study participants was 62.86 ± 7.72 cms and mean hip circumference was 78.72 ± 8.65 cms. The mean WHR among the study participants was 0.80 ± 0.05.Girls had significantly more WHR than boys.

Overall prevalence of overweight and obesity was found to be 11% and 7.33% respectively. Prevalence of obesity was more in boys (4.67%) when compared to girls (2.67%) and was more in children of class I Socioeconomic Status.

Overweight and obesity was found to be significantly more (14.5% and 21.02% respectively) in children who were using conveyance to school when compared to others who were not using conveyance (10.8% and 2% respectively). Children who were not playing outdoor games were found to be significantly at risk for overweight and obesity (14.8% and 8.2% respectively, p=0.031).

Snacking between meals had a significant association with overweight and obesity among children (p=0.001).

Consumption of non vegetarian food had shown significant association with overweight and obesity among children. Prevalence of overweight and obesity was significantly high at 14.3% and 6.5% when they consumed non vegetarian food when compared to children who had not consumed non vegetarian food (2.68% and 3.5% respectively).

Intake of fruits had a significant protective effect against overweight and obesity ($p<0.001$).

Consumption of beverages had a significant association with overweight and obesity. When beverages were consumed daily, prevalence of overweight and obesity was 17.5% and 8.8% and remarkably high when compared to children who were not consuming beverages (6.2% and 0.8% respectively).

There is a significant association of family history of obesity and Diabetes Mellitus with overweight and obesity. With a family history of obesity, prevalence of overweight and obesity was significantly high 38.1% and 52.9% respectively, when compared to only 10% and 2% in the children without the family history of obesity. In the case of Diabetes Mellitus, with family history, prevalence of overweight and obesity was seen in 29.69% and 3% respectively and with no family history prevalence of overweight and obesity was remarkably low (9.9% and 7.1% respectively).

Among the overweight and obese children, 24.28% and 32.86% felt they were obese. However, majority of the overweight (88.9%) and obese (85.7%) children did not feel the necessity to reduce weight.

Chapter 11

Bibliography

BIBLIOGRAPHY

1. Non Communicable diseases – Country profiles 2011. Geneva: World Health Organization; 2011.

2. Alwan A, Maclean DR, Riley LM, d'Espaignet ET, Mathers CD, Stevens GA, et al. Monitoring and surveillance of chronic noncommunicable diseases: progress and capacity in high-burden countries. The Lancet, 2010; 376: 1861-8.

3. The global burden of disease: 2004 update. Geneva, World Health Organization; 2008.

4. Agrawal PK. Emerging Obesity in Northern Indian States: A Serious threat for Health. Mumbai: International Institute for Population Sciences; 2002.

5. World Health Organization. Obesity: preventing and managing the global epidemic. (WHO Technical Report Series no. 894). Geneva, Switzerland: World Health Organization; 2000.

6. Obesity: Preventing and Managing the Global Epidemic, Report of a WHO Consultation on Obesity, 3-5 June 1997, Executive Summary, p. 2.

7. Global strategy on diet, Physical Activity and Health – Childhood overweight and obesity. Geneva: World Health Organization; Available from: URL: http://www.who.int/dietphysicalactivity/childhood/en/ Accessed on: 18.08.2011

8. Mo-suwan L, Junjana C, Puetpaiboon A. Increasing obesity in school children in a transitional society and the effect of the weight control program. Southeast Asian J Trop Med Public Health 1993; 24: 590-4.

9. Kelishadi R. Childhood Overweight, Obesity, and the Metabolic Syndrome in Developing Countries. Epidemiol Rev 2007; 29 (1): 62-76.

10. Kelishadi R, Hashemipour M, Sarraf-Zadegan N, Amiri M. Trend of atherosclerosis risk factors in children of Isfahan. Asian Cardiovasc Thorac Ann 2001; 9: 36-40.

11. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. Br Med J 2000; 320: 1240-3.

12. Wang Y. Cross-national comparison of childhood obesity: the epidemic and the relationship between obesity and socioeconomic status. Int J Epidemiol 2001; 30: 1129-36.

13. Ramachandran A, Snehalatha C, Vinitha R, Thayyil M, Kumar CK, Sheeba L, et al Prevalence of overweight in urban Indian adolescent school children. Diabetes Res Clin Pract 2002; 57: 185-90.

14. Mohanty B. The prevalence of overweight and obesity in school going children of Pondicherry. Puducherry: Aarupadai Veedu Medical College and Hospital; 2008.

15. Singh M, Sharma M. Risk factor for obesity in children. Indian Paediatr 2005; 42: 183-5.

16. Bharati DR, Deshmukh PR, Garg BS. Correlates of overweight and obesity among school going children of Wardha city, Central India. Indian J Med Res 2008; 127: 539-43.

17. National Institutes of Health, National Heart, Lung, and Blood Institute. Disease and Conditions Index: What Are Overweight and Obesity Bethesda, MD: National Institutes of Health; 2010.

18. Krebs NF, Himes JH, Jacobson D, Nicklas TA, Guilday P, Styne D. Assessment of child and adolescent overweight and obesity. Pediatrics 2007; 120: S193–228.

19. Obesity and overweight Factsheet N^0 311. Geneva: World Health Organization; 2011.

20. CDC growth charts. National centre for health statistics. Atlanta: 2000.

21. Bhave S, Bavbekar A, Otiv M. IPA National task force for childhood prevention of adult disease. Childhood obesity. Indian Pediatrics 2004; 41: 559-75.

22. Dietz WH. Overweight in childhood and adolescence. N Engl J Med 2004; 350: 855-7

23. Stice E, Cameron RP, Killen JD, Hayward C, Taylor CB. Naturalistic weight reduction efforts prospectively predict growth in relative weight and onset of obesity. J Consult Clin Psychol 1999; 67: 967-74.

24. Saxena S, Ambler G, Cole TJ, Majeed A. Ethnic group differences in overweight and obese children and young people in England: cross sectional survey. Arch Dis Child 2004; 89: 30-6.

25. Lobstein T, Baur L, Uauy R. Obesity in children and young people. A crisis in public health. Report to the WHO. London: IASO IOTF; 2004.

26. World Health Organization. Population-based prevention strategies for childhood obesity. Report of the WHO Forum and Technical Meeting Geneva: 15-17 December 2009.

27. Childhood obesity - Prevalence of Overweight/Obesity among 14 – 18 year old urban Indian adolescents in 8 cities of India. New Delhi: National Diabetes, Obesity and Cholesterol Foundation N-DOC; 2009.

28. Sabate J, Wien M. Vegetarian diets and childhood obesity prevention. Am J Clin Nutr 2010; 1S-5S.

29. Cappuccio FP, Taggart FM, Kandala NB, Currie A, Peile ED, Stranges S. et al. Meta-analysis of short sleep duration and obesity in children and adults. Sleep duration and obesity. SLEEP 2008; 31(5): 619-26.

30. Proctor MH, Moore LL, Gao D, Cupples LA, Bradlee ML, Hood M, et al. Television viewing and change in the body fat from preschool to early

adolescence : The Framingham Children's Study. International Journal of Obesity 2003; 27: 827-33.

31. Zalilah MS, Khor GL, Mirnalini K, Norimah AK, Ang M. Dietary intake, physical activity and energy expenditure of Malaysian adolescents. Singapor Med J 2006; 47(6): 491.

32. Dieu HT, Dibley MJ, Sibbritt DW, Hanh TT. Trends in overweight and obesity in pre-school children in urban areas of Ho Chi Minh City, Vietnam, from 2002 to 2005. Public Health Nutr. 2009; 12(5): 702-9.

33. Chu NF. Prevalence and trends of obesity among school children in Taiwan – the Taipei children heart study. International Journal of Obesity 2001; 25: 170-6.

34. AN Al-Isa. Body mass index, overweight and obesity among Kuwaiti intermediate school adolescents aged 10-14 years. Eur J Clin Nutr 2004; 58: 1273-7.

35. Chakar H, Pascale RS. Adolescent obesity in Lebanese private schools. Eur J Public Health. 2006; 16(6): 648-51.

36. Wickramasinghe VP, Lamabadusuriya SP, Atapattu N, Sathyadas G, Kuruparanantha S, Karunarathne P. Nutritional status of school children in an urban area of Sri Lanka. Ceylon Med J 2004; 49 (4): 114-8.

37. Marwaha RK, Tandon N, Singh Y, Aggarwal R, Grewal K, Mani K. A study of growth parameters and prevalence of overweight and obesity in school children from Delhi. Indian Pediatr 2006; 43(11): 943-52.

38. Mehta M, Bhasin SK, Agrawal K. Dwivedi S. Obesity amongst affluent adolescent girls. Indian Journal of Pediatrics. 2007; 74: 619-22

39. Chhatwal J, Verma M. Riar SK. Obesity among pre-adolescent and adolescents of a developing country (India). Asia Pac J Clin Nutr 2004; 13(3): 231-5.

40. Laxmaiah A, Nagalla B, Vijayaraghavan K, Nair M. Factors affecting prevalence of overweight among 12- to 17-year-old Urban Adolescents in Hyderabad, India. Obesity 2007; 15: 1384-90.

41. Kumar S, Mahabalaraju DK, Anuroopa MS. Prevalence of obesity and its influencing factor among affluent school children of Davangere city. Indian J Community Med 2007; 32 (1): 15-7.

42. Kumar D. A comparison of the risk factors for the coronary artery diseases among the rural and rub an male high school students in Vellore district, Tamilnadu: A school based cross sectional study. Healthline 2011; 2 (2): 24-7.

43. Shah C, Diwan J, Rao P, Bhabhor M, Gokhle P, Mehta H. Assessment of obesity in School Children. Calicut Med J 2008; 6(3): e2.

44. Programming for Adolescent Health and Development. Technical Report Series No. 886. Geneva: World Health Organization; 1999.

45. Park K. Park's Textbook of Preventive and Social Medicine. 20th Ed., Jabalpur, India: Banarasidas Bhanot; 2009.

46. Guyton AC. Hall J. Textbook of Medical Physiology. 11th ed., Philadelphia: Saunders; 2006.

47. Insurance Worker. 2011; LIII (6): 28.

48. Physical Status: The use and interpretation of Anthropometry. Technical Report Series No. 854. Geneva: World Health Organisation; 1995.

49. Alberti KG, Zimmet P, Shaw J. Metabolic syndrome--a new world-wide definition. A Consensus Statement from the International Diabetes Federation Diabet Med 2006; 23(5): 469-80.

50. WHO/IASO/IOTF. The Asian Pacific Prospective: Redefining Obesity and its treatment. Health Communications Australia Pty Ltd. 2000.

51. Chobanian AV, Bakris G, Black HR, Cushman WC, Green A, Izzo JL, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension. 2003; 42(6): 1206-52.

52. Sharma A, Sharma K, Mathur KP. Growth pattern and prevalence of obesity in affluent schoolchildren of Delhi. Public Health Nutrition. 2007; 10(5): 485-91.

53. Jain S, Pant B, Chopra H, Tiwari R. Obesity among adolescents of affluent public schools in Meerut. Indian Journal of Public Health, 2010; 54:

54. Subramanyam V, Jayashree R, Rafi M. Prevalence of Overweight and Obesity in Affluent Adolescent Girls in Chennai in 1981 and 1998. Indian Pediatrics 2003; 40: 332-6.

55. Sood A, Sundararaj P, Sharma S, Kurpad AV, Muthayya S. BMI and Body Fat Percent: Affluent adolescent girls in Bangalore city. BMI and body fat in adolescent girls. Indian Pediatrics 2007; 44: 587-91.

56. Vohra R, Bhardwaj P, Srivastava J, Srivastava S, Vohra A. Overweight and obesity among school-going children of Lucknow city. J Family Community Med 2011; 18: 59-62.

57. Goyal RK, Shah VN, Bandhi DS, Phatak SR, Shah NN, Gohel M, et al. Prevalence of overweight and obesity in Indian adolescent school going children: Its relationship with socioeconomic status and associated lifestyle factors. JAPI 2010; 58: 151-8.

58. Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. The Lancet 2001; 357: 505-8.

59. Chen W, Wu KW. Family environment of children with simple obesity. Zhonghua Min Guo Xiao Er Ke Yi Xue Hui Za Zhi. 1994; 35(6): 536-41.

Annexures

Annexure I

ANNEXURE I – ETHICAL CLEARANCE

K.L.E.SOCIETY'S
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELGAUM-590010 (KARNATAKA-INDIA)
(Affiliated to KLE University, Belgaum)

Website: http/www.jnmc.edu
E-Mail : domejnmc@sancharnet.in
: jnmc@sancharnet.in

Phone: (+91-(0)831 Office : 2471350
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref. No. :MDC/DOME/ **Date: 14/10/2009**

To,

Dr. Amaranth R.L.C,
Postgraduate student in
Department of Community Medicine,
J.N.Medical College,
Belgaum.

Dear Dr. Amaranth R.L.C,

The JNMC – Institutional Ethics Committee on Human Subjects Research met on 12th October, 2009 to consider your application for approval of the research project **"PREVALENCE OF OBESITY AMONG SCHOOL CHILDREN IN THE AGE GROUP OF 10-15 YEARS IN PRIVATE SCHOOLS OF BELGAUM CITY-A CROSS SECTIONAL STUDY.".**

After review of the documents submitted by you and satisfactory explanations provided to the members, the committee has provided approval date through October 11th, 2010 at which time the study will be reviewed by the committee.

If you have any questions concerning the above, please feel free to contact the committee office.

Sincerely,

(Dr.V.D.Patil)
Chairman,
JNMC Institutional Ethics Committee on
Human Subjects Research

Annexure II

ANNEXURE II – CONSENT FORM

"PREVALENCE OF OBESITY AMONG SCHOOL CHILDREN IN THE AGE GROUP OF 10-15 YEARS IN PRIVATE SCHOOLS OF BELGAUM CITY-A CROSS SECTIONAL STUDY."

INVESTIGATOR: Dr Amaranth R.L.C. Guide: Dr (Mrs).Vijaya.A.Naik.

Introduction

You are being invited to participate in this study to find out prevalence of obesity among school children in the age group of 10-15 years in private schools of Belgaum city. Participation in this study is completely voluntary.

Explanation of procedures

In this study you have to answer a few prepared questions about your general health information and socio-demographic details and then your height, weight, waist circumference, waist hip ratio and blood pressure will be recorded. The entire procedure will take about 30minutes.You will be continued asking questions but the moment you don't want to continue then you can withdraw any time.

Possible Benefits

The investigator does not promise or guarantee that you will receive direct benefit being in the study. This type of studies will help in developing intervention programs for school children which will eventually help in reducing the prevalence of diabetes, hypertension and many more obesity related diseases.

Possible risks

The tools employed for conducting the tests are safe and as such are not likely to cause any harm to the persons.

Confidentiality

Your identity will not be revealed. All information collected will be coded so that no one will know your identity.

Withdrawal

Participation in this study is voluntary. If you don't not to wish to participate in this study, you will not lose benefits to which you are entitled.

Costs of Participation

The cost of the study will be borne by the researcher. There will be no additional cost to you for participating in this study.

Payment of Participation

There will be no incentives to you for participating in this study.

Questions

If you have any questions about this study, you should contact DR (Mrs.). VIJAYA A NAIK at 9448191532 and DR. Amarnath R.L.C at 9844399234. If you have any questions about your rights as a study participant, you may contact Dr V.D. PATIL, Principal &Chairman, JNMC Institutional Ethics Committee on human subjects research at 0831 2741701.

Authorization to publish results

The Researchers may use the information gathered from this study for presentation in scientific journals. However your identity will not be disclosed in such presentation or publication.

Legal Rights

By signing this consent form, you are not waiving any of your legal rights

Consent statement

"I volunteer and consent to participate to participate in this study. I have read the consent or it has been read to me. The study has been fully explained to me and I had given the opportunity to ask questions and they have answered to my satisfaction and that I have received a copy of this signed consent form".

___________________________________ ___________________

Signature Date

(Volunteer Subject)

___________________________________ ___________________

Signature of Person Obtaining Consent Date

___________________________________ ___________________

Signature of Witness Date

Annexure III

ANNEXURE III – PROFORMA

K.L.E. UNIVERSITY'S J.N.MEDICAL COLLEGE, BELGAUM.

DEPARTMENT OF COMMUNITY MEDICINE.

PROFORMA

"PREVALENCE OF OBESITY AMONG SCHOOL CHILDREN IN THE AGE GROUP OF 10-15 YEARS IN PRIVATE SCHOOLS OF BELGAUM CITY-A CROSS SECTIONAL STUDY".

Investigator: Dr AMARNATH R.L.C

[Note: All the personal information provided during this study will be kept confidential. Only aggregated data will be published.]

I. IDENTIFICATION DATA:

1. Name: ____________________ 2. Sex M/F
3. Age: ________________ 4. Date of Birth___________________
5. Class studying at present : _________________
6. Name of the school: _________________________
7. Age at attainment of menarche :________________

   (In case of girls)
8. Religion : ___________________

9. Residential address : ____

   ____

II. FAMILY HISTORY:

1. Parent's

   a) Occupation : Father ______________________________

      Mother ______________________________

   b) Family income: _______________rs.

c) Literacy

Status : Illiterate/Primary/Secondary/Graduate/Post Graduate.

Father ______________________________

Mother ______________________________

2. Type of family : Nuclear/joint/three generation/broken family.

3. No. of siblings :

4. Birth order of this child :

5. Family history of diabetes and hypertension:

6. Any obese persons in your family:

Father: Height _______cms weight ________ kgs BMI ________

Mother: Height_______cms weight ________ kgs BMI ________

III. PERSONAL HISTORY

1. Physical activities

	Daily	Alternatively	Once a week	rarely
a) Running/ jogging				
b) Skipping				
c) Swimming				
d) Outdoor games				

2. Mode of conveyance to school: Walking/cycling/Bus/Private vehicles/others.
3. Distance between school and residence:
4. Does the school have a play ground:
5. Does the school have indoor and outdoor sports complex:
6. How many physical training classes in a week:
7. No. of hours spent in watching TV everyday :
8. No. of hours spent with computer everyday (playing games/chatting etc) :

9. No. of hours spent with mobile everyday :
10. Habits: Smoking/Tobacco chewing/any others/Nil.
11. No. of hours spent in sleep :

IV. DIET AND APPETITE HISTORY

1. How would you describe your appetite : Good/Poor
2. Do you eat snacks between meals : Yes/No

   (If yes, specify)

V. FOOD-STUFFS CONSUMED BY CHILD

	Consumed Everyday	Consumed 2-3 times a week	Consumed Occasionally
01.Cereals			
Rice,idli,uppit etc			
02.Pulses			
Dal,soya,groundnut etc			
03 Fried foods			
Puri,vada,kachori etc			
04.Vegetables			
05. Non vegetarian			
Egg.chicken,fish,meat etc			
06.Fruits			
Banana,apple,orange etc			
07.Bakery foods			
Cakes.chocolates,biscuits etc			
08.Sweets			
09.Ice cream			
10.Fast foods			
Pizzas, burgers etc			

11.Beverages

Tea,coffee,milk,soft drinks etc

12. Others

VI. How often do you eat outside (Hotels/Restaurants): 1to3 times a week/>3times a week/once in a month.

VII. ANTHROPOMETRY

Height …….cms.

Weight ……..kgs.

VIII. Body mass index (BMI Kg/m^2):

IX. Waist circumference …….cms.

X Hip circumference ………cms.

XI. Waist hip ratio …….

XII. Blood Pressure ……. mmHg.

XIII Attitude regarding obesity

1. Do you think you are obese: yes/no.
2. Would you like to reduce your weight: yes/no.