“Health is a state of complete physical, mental and social well-being and not merely the absence of diseases or infirmity” - WHO

Kerala enjoys a unique position in the health map of India. The health indicators in Kerala are at par with the Western World. However, the widely acclaimed ‘Kerala model of health’ has started showing a number of disturbing trends recently. Although mortality is low, morbidity is high in Kerala when compared to other Indian states. Hence the Kerala situation was described as “low mortality high morbidity syndrome” (Panikar and Soman, 1984). It is interesting to note that both infectious diseases like dengue fever, diarrhea etc and the so called lifestyle diseases are prevalent in Kerala. Moreover the incidences of many lifestyle diseases are more than the national average (Ekbal, 2006).
1.1 Health Indicators of Kerala

Healthy living condition and access to good quality health care for all citizens are not only basic human rights but also essential prerequisites for social and economical development (Chatterjee, 2009).

The population of Kerala is uniformly scattered throughout the state and is fairly well advanced in its demographic transition. The rapidly declining growth rate, highest mean age at marriage especially of females, a very high level of acceptance and awareness of family planning methods and fertility control, a moderate decline in the mortality rate etc. are the commendable achievements in health standards. Low birth rate and death rate along with higher female life expectancy in relation with males, low infant mortality with negligible gap between rural and urban and lower levels of disability are the special characteristics of Kerala's health scenario. The major factors contributing to such a unique situation are a wide network of health infrastructure and manpower, policies of successive state governments and other social factors like women's education, general health awareness and clean health habits of the people.

Table 1.1 compares the health indicators of the state with the national level.
Table 1.1
Health Indicators of Kerala & India (2011)

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Indicators</th>
<th>Kerala</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Birth rate (1000 population)</td>
<td>14.7</td>
<td>22.5</td>
</tr>
<tr>
<td>2</td>
<td>Death rate (1000 population)</td>
<td>6.8</td>
<td>7.3</td>
</tr>
<tr>
<td>3</td>
<td>Infant mortality rate (1000 population)</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>Child mortality rate (1000 population)</td>
<td>14</td>
<td>69</td>
</tr>
<tr>
<td>5</td>
<td>Maternal mortality rate (per lakh live birth)</td>
<td>81</td>
<td>212</td>
</tr>
<tr>
<td>6</td>
<td>Total fertility rate</td>
<td>1.7</td>
<td>2.6</td>
</tr>
<tr>
<td>7</td>
<td>Life expectancy</td>
<td>74</td>
<td>63.5</td>
</tr>
</tbody>
</table>


The table reveals that Kerala enjoys an envious position in the matter of all the health indicators when compared to the country’s indices (Economic Review, various years). In Kerala, the birth rate has come down from 44 in 1951-1961 to 14.7 in 2011. The national average has come down from 47 in 1951-1961 to 22.5 in 2011. The death rate in Kerala is only 6.8 against the national average of 7.3.

Infant Mortality Rate (IMR) reflects a country’s level of socio-economic development and quality of life. During 2011 the IMR of Kerala is 12 and the national average is 50. In the same period, total fertility rate of Kerala is 1.7 as against the national average of 2.6. Maternal mortality rate is only 81 in Kerala against the national average of 212.

Life expectancy at birth is considered as one of the crucial indicators of human development. In Kerala, it is 74 years as against the
national average of 63.5 in 2011. There are many factors behind the remarkable achievements in these health indicators of Kerala.

The agrarian reforms implemented in the late 1950’s removed feudalism in the agriculture sector. These reforms gave ownership of land to the landless. It improved the social and living conditions of landless poor in rural areas and helped them to improve their health conditions.

The public health system in Kerala has also contributed to the high health standards of the people. Kerala has a three-tier system of health care - the Primary Health Centres and the Community Health Centres, Taluk and District Hospital and the Medical Colleges. Apart from Modern Medicine, Ayurveda, Homoeopathy and many other alternative systems are also very popular in Kerala.

The public distribution system implemented through ration shops distributes necessary food items to poor people at subsidized rates. This has assured certain amount of nutritional food items to the poor, resulting in reduction of illnesses related to malnutrition.

Kerala has a political system that upholds the interests of underprivileged people in the state. This has reduced the exploitation of poor people and increased their earning resulting in poverty reduction.

Another factor that increased health care is the emigration that increased the purchasing power due to the inflow of huge foreign remittances. A survey on the utilization of the remittances by the Government of Kerala in 1987 reveals that households receiving remittances spent 76 per cent more on health per annum than the non-remittance receiving households (Ibrahim, 2009).
High dependence on private sector for health care is a special feature of the state. It is quite high even among the lower economic classes and rural areas. Kerala has witnessed drastic development of specialized hospitals catering to the needs of people.

High educational attainment, especially female education and female literacy have contributed a lot for the development of the health sector in the state. Wide implementation and acceptance of immunization programmes also played a greater role in the improvement of health indicators of Kerala.

1.2 Health Crisis in Kerala

The occurrence of lifestyle diseases has become a major crisis in Kerala. Higher incidence of mental health problems, suicide rate, death due to road traffic accidents and other traumas are other dimensions of the health problems in Kerala.

The major problems in the health sector of Kerala (Economic Review, 2011) are:

1. Prevalence of diseases associated with lifestyle and ageing.
2. Prevalence of environment related diseases owing to problems of community hygiene and pollution.
3. Lack of infrastructural and trained personnel

The widely acclaimed 'Kerala Model of Health' is losing its popularity. Although mortality is low, morbidity is high in Kerala compared to other Indian states. Owing to changes in lifestyle brought about by technological revolution and urbanization, people in Kerala
irrespective of their age are physically less active than their forefathers. This reduction in physical activity is seen in younger people and children. The playgrounds are being rapidly replaced by building complexes and children are spending more of their leisure time in playing computer games or watching television than in playgrounds or outdoor games. In addition, food in high calories such as fried food and sweets are no more the luxuries during feasts but regular feature of daily food. The result is that the intake of calories exceeds the expenditure of calories and thus increases the prevalence of obesity in children and adults.

Now there are doubts regarding the sustainability of Kerala’s development strategy especially in the health sector. The envious position in health status of Keralites is burned away by the wild fire of lifestyle related diseases such as obesity, osteoarthritis, metabolic syndrome, diabetes, hypertension, cancers and suicides (Sivasankaran, 2007). The diet and lifestyle related diseases such as obesity, type 2 diabetes, metabolic syndrome, cancer and cardiovascular diseases are the leading killers in Western countries and are increasing in epidemic proportions even in developing countries including India (Laxmaiah and Brahmam, 2009).

1.3 Lifestyle Diseases

Lifestyle diseases are diseases associated with the way a person or a group of persons live. These diseases include atherosclerosis, heart diseases, stroke, obesity, type 2 diabetes and diseases associated with smoking, alcoholism and drug abuse (www.medterms.com). It is estimated that there are about 1.5 million diabetic subjects in Kerala. These people need lifetime management involving lifestyle modifications, drugs and proper diet. Recent surveys in different categories of subjects in Kerala
reveal that one out of three adults in Kerala is hypertensive. Hypertension leads to heart attacks, stroke and kidney failure and it is a life-long disease and needs careful and sensible management throughout life. Non-communicable diseases especially cardiovascular diseases, cancer, type 2 diabetics mellitus account for 53 per cent and 43 per cent of all deaths and disability. Similarly, overweight and obesity leads to heart attack, hypertension, breast cancer, diabetes and joint problems (Economic Review, 2011a).

1.4 Obesity and its Measurement

Ancient Egyptians are said to consider obesity as a disease, having been drawn in a wall of depicted illnesses. Perhaps the most famous and earliest evidence of obesity is the Venus figurines, statuettes of an obese female torso that probably had a major role in rituals. Ancient China has also been aware of obesity and the dangers that come with it. They have always been a believer of prevention as a key to longevity. The Aztecs believed that obesity was supernatural, an affliction of the gods. Hippocrates, the father of medicine, was aware of sudden deaths being more common among obese men than lean ones as stated in his writings. In certain cultures and areas where food is scarce and poverty is prevalent obesity is viewed as a symbol of wealth and social status. To date, an African tribe purposely plumps up a bride to prepare her for child bearing. Before a wedding can be set, a slim bride is pampered to gain weight until she reaches the suitable weight.

Throughout the history of obesity, the public's view and status of obesity changed considerably in the 1900's. It was regarded as unfashionable by the French designer, Paul Poiret who designed skin-
revealing clothes for women. About the same time, the incidence of obesity began to increase and become widespread. Later in the 1940's, Metropolitan Life Insurance published a chart of ideal weights for various heights. They also advocated that weight gain parallel to age is not ok. The government and the medical society became more hands-on with obesity by initiating a campaign against it. This was preceded by a study of risk factors of cardiovascular diseases revealing obesity among the high ranks. Since then various diet and exercise programs have emerged. In 1996, the Body Mass Index (BMI) was published. This statistical calculation and index determined if a person is obese or not. At this time, obesity incidence have soared, led by children and adolescent obesity, tripling in just a few short years, greater than any number in the history of obesity. Over the years and in the history of obesity, it seems to worsen despite growing awareness and combating techniques that it has been called an epidemic (http://EzineArticles.com).

Obesity is now recognized as a major medical and health problem all over the world. Overweight and obesity are important public health issues in the world today. Obesity is defined as 'a condition of excess fat and is associated with a large number of debilitating and life threatening disorders' (www.who.Int/bmi). Dorland's Illustrated Medical Dictionary defines obesity as 'an increase in body weight beyond the limitation of skeletal and physical requirement, as the result of an excessive accumulation of fat in the body'. Morbid obesity is the condition of weighing two or more times the ideal weight; it is so called because it is associated with many serious and life threatening disorders (diabetes mellitus, atherosclerosis hypertension, pickwickain syndrome etc. (Douglas
According to Stedman's Medical Dictionary obesity is ‘an abnormal increase of fat in the subcutaneous connective tissues’. Morbid obesity is obesity sufficient to prevent normal activity or physiological function or to cause the onset of a pathological condition’ (Hensyl, 1990). Obesity is defined ‘as a body fat content of more than 25% in men and more than 33% in women’ (Enas et al. 2005). It is the condition in which excess body fat has accumulated to a degree that health and function are negatively affected (Ulojaszek and Lofink, 2006).

Measures used to assess body fatness and obesity include a) visual appearance b) anthropometry c) body density by underwater weighing, isotopic dilution, dual X-Ray absorptiometry, or bioelectrical impedance and body imaging by ultrasound, computed tomography, or magnetic resonance imaging (Poskitt, 1995). The onset of obesity is sometimes defined as that point at which proliferation of adipose tissue cells begins. Unfortunately we have no easy, quick field method for assessing this point (Huenemann, 1968).

The most frequently used measure of obesity is anthropometric. The most common of anthropometric measures is Body Mass Index (BMI) which is derived by dividing body weight in kilograms by the square of height in meters (Ulijaszek and Lofink 2006a). The corresponding formula for calculating BMI is given below.

\[
BMI = \frac{Weight(Kg)}{Height(meters) \times Height(meters)}
\]

BMI gives an index that is broadly independent of age, and equally applicable to both sexes. A few individuals who are exceptionally muscular
may be misclassified as overweight or obese, but otherwise BMI provides a useful tool for large scale epidemiological assessment (Elizabeth, 2007).

The International Obesity Task Force (IOTF) has given cut off values for children and adults. The cut offs have to be age specific during periods of growth. The IOTF has taken the data on BMI among children from 6 large nationally representative cross sections surveys on growth from Brazil, Britain, Hong Kong, Netherland and the United States. The cut offs are given in the following table.

**Table 1.2**

<table>
<thead>
<tr>
<th>Age</th>
<th>BMI cut off for overweight</th>
<th>BMI cut off for obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>2</td>
<td>18.41</td>
<td>18.02</td>
</tr>
<tr>
<td>5</td>
<td>17.42</td>
<td>17.15</td>
</tr>
<tr>
<td>10</td>
<td>19.84</td>
<td>19.86</td>
</tr>
<tr>
<td>18</td>
<td>25.00</td>
<td>25.00</td>
</tr>
</tbody>
</table>


Individual with BMI of 25-29.9 Kg/m$^2$ are classified as overweight and those with the value of 30Kg/m$^2$ or more are classified as obese (Suchithra, 2011).
1.5 Research Problem

Overweight and obesity and their health consequences have been recognized as major public health problems world-wide. Kerala which is at par with developed countries in social development aspects is also becoming a land of lifestyle diseases, overweight and obesity which is implied in Figure 1.1.

Figure 1.1

The Broadening Waist-Line of Keralites


One of the important causes of lifestyle diseases is obesity and overweight. It leads to metabolic syndrome that includes high blood pressure, diabetes and cholesterol. Cancers, heart diseases, diabetes and
lung conditions cost the state dear in terms of the health bills and productive life spans of the people. Non-communicable diseases (NCDs) are rapidly spreading across Kerala, fuelled by obesity as a result of bad diet and sedentary lifestyles, together with alcohol and smoking. Chronic diet related diseases are becoming more common among children and adolescents apart from adults.

An overview of available studies revealed that though many studies are undertaken on problems and causes of obesity, no serious attempt is made to analyse adolescent obesity in Kerala. Therefore, the present study is an attempt to estimate overweight and obesity among the most vulnerable group the adolescents, and to examine the socio-economic and consumption aspects contributing to this health crisis.

1.6 Relevance of the Study

The effect of changing trends in socio-economic background and consumption pattern on adolescent obesity is an unexplored area. A lot needs to be done not only in the form of effective policies and legislation but also by targeting specific and need-based strategies. Adolescents have to be viewed and focused upon with utmost importance because firstly, it is their human right to achieve the highest attainable level of health. Secondly, a nation gets economic benefits because better prepared and healthy adolescents will result in more productivity. Thirdly, there would be health benefits as the burden of morbidity and mortality in later life would be minimal.

Many studies conducted in the USA and other advanced countries regarding adolescent obesity reveal the far reaching consequences on their
health. Kerala, which is at par with the developed countries in human development indices, must conduct serious studies on obesity and associated factors among adolescents leading to lifestyle diseases.

The present study will be an eye opener to parents, teachers, adolescents and policy makers towards prevention of lifestyle diseases in Kerala to enable the state in its march towards sustainable health indices.

1.7 Objectives of the Study

The objectives of the study are:

1. To understand the different types of lifestyles diseases prevalent in Kerala

2. To study the various factors contributing to lifestyle diseases and obesity.

3. To examine the lifestyle of adolescents in the study area.

4. To trace the correlation between socio-economic backgrounds, consumption pattern, leisure time activities and adolescent obesity in Kottayam district.

5. To suggest various measures to prevent overweight and obesity among adolescents.

1.8 Methodology

Methodology consists of area covered and period of study, method of measuring obesity, sources of data, sample design and data management and analysis.
1.8.1 Area covered and period of study

The study is conducted among the higher secondary students of Kottayam District in Kerala. Kottayam is one of the 14 districts of Kerala. It was formed on 1st July 1949. Kottayam is known as land of letters, legends, latex and lakes. Kottayam town became India’s 1st fully literate town on 25th June 1989. The average literary rate in the district is 96.40 per cent and 15.35 per cent of population live in urban area. The district has five taluks namely Kottayam, Changanassery, Kanjirappally, Meenachil and Vaikom.

The study covers government, aided and unaided plus two schools in Kottayam district. There are 205 higher secondary school in the district distributed unevenly among government (61), aided (70) and unaided (74) sectors. Out of the total 61 higher secondary schools in the government sector, 37 are government plus two schools, 21 vocational higher secondary schools (VHSE), 1 technical higher secondary school (THS), 1 Kendriya Vidyalaya and 1 Navodaya Vidyalaya. Out of the 70 aided higher secondary schools, there are 60 aided plus two schools and 10 VHSE schools. There are totally 74 unaided higher secondary schools in the district- 28 unaided plus two (State) schools, 42 Central Board of Secondary Education (CBSE) schools and 4 Indian School Certificate (ISC) schools. The study was conducted during the academic year 2010-2011.

1.8.2 Method of Measurement of Obesity

Trained investigators weighed all the sample adolescents without shoes and heavy clothes, heavy belts and with empty pockets. The
A portable anthropometric rod was used for measuring height. The International Obesity Task Force (IOTF) references were used for measuring overweight and obesity.

1.8.3 Sources of Data

The study has used both primary and secondary data. Primary data for the study has been collected from +2 students in Kottayam district by using pre-tested questionnaire. Books, research journals, reports, newspapers and websites are the sources of secondary data.

1.8.4 Sample Design

A multi-stage proportionate random sampling technique has been adopted for this study. The sample size is 400.

In the first stage of sampling, respondents are selected from five taluks of the district in proportion to their population in each taluk. Out of 54,494 plus two students of Kottayam district, Kottayam taluk has 16,893 students, Changanassery, taluk has 10,463 students, Kanjirappally taluk has 5,722 students, Meenachil taluk has 12,424 students and Vaikom taluk has 8,992 students constituting 31%, 19.2%, 10.5%, 22.8% and 16.5% of the total respectively. 400 students in the sample are selected in the same proportion- 124 students are taken from Kottayam taluk (31%), 77 from Changanassery, taluk (19.2%), 42 from Kanjirappally taluk (10.5%), 91 from Meenachil taluk (22.8%) and 66 from Vaikom taluk (16.5%). This is shown in Table 1.3.
Table 1.3

Distribution of Sample among Five Taluks in Kottayam District

<table>
<thead>
<tr>
<th>Taluk</th>
<th>No.of +2 Students</th>
<th>Percentage</th>
<th>No. of Students in the Sample</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kottayam</td>
<td>16893</td>
<td>31</td>
<td>124</td>
<td>31</td>
</tr>
<tr>
<td>Changanassery</td>
<td>10463</td>
<td>19.2</td>
<td>77</td>
<td>19.2</td>
</tr>
<tr>
<td>Kanjirappally</td>
<td>5722</td>
<td>10.5</td>
<td>42</td>
<td>10.5</td>
</tr>
<tr>
<td>Meenachil</td>
<td>12424</td>
<td>22.8</td>
<td>91</td>
<td>22.8</td>
</tr>
<tr>
<td>Vaikom</td>
<td>8992</td>
<td>16.5</td>
<td>66</td>
<td>16.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54494</strong></td>
<td><strong>100</strong></td>
<td><strong>400</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Field Study

In the second stage as shown in Table 1.4, three types of schools are identified in each taluk - government, aided and unaided. Government schools constitute 42%, aided schools constitute 36% and unaided schools constitute 22% in Kottayam taluk. Similarly 32, 50 and 18 percentages of schools are government, aided and unaided in Changanassery taluk. In the same way Kanjirappally taluk has 19%, 52% and 29% and Meenachil taluk has 25%, 62% and 13% and Vaikom taluk has 48%, 46% and 6% schools from government, aided and unaided sectors respectively. The proportionate distribution of sample among these schools is given in the following table.
Chapter I - Introduction

Table 1.4
Distribution of Sample among Schools in Different Taluks

<table>
<thead>
<tr>
<th>Taluk</th>
<th>Schools</th>
<th>No. of Students</th>
<th>Percentage</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kottayam</td>
<td>Government</td>
<td>7095</td>
<td>42</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Aided</td>
<td>6081</td>
<td>36</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Unaided</td>
<td>3717</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>16893</strong></td>
<td><strong>100</strong></td>
<td><strong>124</strong></td>
</tr>
<tr>
<td>Changanassery</td>
<td>Government</td>
<td>3348</td>
<td>32</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Aided</td>
<td>5232</td>
<td>50</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Unaided</td>
<td>1883</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>10463</strong></td>
<td><strong>100</strong></td>
<td><strong>77</strong></td>
</tr>
<tr>
<td>Kanjirappally</td>
<td>Government</td>
<td>1087</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Aided</td>
<td>2976</td>
<td>52</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Unaided</td>
<td>1659</td>
<td>29</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>5722</strong></td>
<td><strong>100</strong></td>
<td><strong>42</strong></td>
</tr>
<tr>
<td>Meenachil</td>
<td>Government</td>
<td>3106</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Aided</td>
<td>7703</td>
<td>62</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Unaided</td>
<td>1615</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>12424</strong></td>
<td><strong>100</strong></td>
<td><strong>91</strong></td>
</tr>
<tr>
<td>Vaikom</td>
<td>Government</td>
<td>4316</td>
<td>48</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Aided</td>
<td>4136</td>
<td>46</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Unaided</td>
<td>540</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>8992</strong></td>
<td><strong>100</strong></td>
<td><strong>66</strong></td>
</tr>
</tbody>
</table>

Source: Field Study

In third stage, one school each from these types of schools from each taluk is selected randomly. Therefore, there are a total of 15 schools from five taluks and 400 samples are taken randomly from these schools.
1.8.5 Data Management and Analysis

Simple statistical tools like ratios, averages, percentages, mean, standard deviation, pie diagram, bar diagram etc. have been used for the analysis of data. T-test, F-test, Chi-square test and Z-test are also employed. Statistical Package for Social Sciences (SPSS) is employed for analysis.

1.9 Scheme of Study

The entire study is divided into seven chapters. The introductory chapter includes relevance of the topic, objectives, methodology, sampling frame, area covered, limitations and schematic arrangement of the study. Second chapter reviews available literature on the subject which brings out the research gap and importance of the present study. Third chapter presents socio-economic profile and consumption pattern of Kerala. Fourth chapter explains different theories of obesity. An overview of lifestyle diseases and obesity in Kerala is provided in the fifth chapter. Sixth chapter deals with the analysis of data. Seventh chapter discusses findings and recommendations of the study.

1.10 Limitations

The present study is exploratory in nature and has scope for life-long research. But time and money constraints have restricted the scope of the study. Some important limitations of the study are given below.

1. The coverage of study is limited to +2 level students (late adolescents) and only Kottayam district is brought under study. 

2. Only regular students are considered.
3. Though there are many methods of measuring obesity, BMI (Body Mass Index) is used for measuring obesity and overweight.

4. The study analyses the impact of socio economic status, consumption pattern, leisure time activities and health awareness of adolescent on obesity and overweight. It has not taken into consideration more independent variables.
References


