Genetic factors and family history effects the obesity in School Going Children

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Abstract:

Genes and family history affects the obesity of children and could it translate into various diseases in their adulthood. Various studies and clinical investigations indicates that family history has great impact on the obesity of the children and suggest certain precautionary measures, sports and physical activities for children to avoid future health complications. The objective of this article is to probe into the main health issues in the family and their effects on the obesity of school going children and also suggest the measures to avoid future health issues in children. Childhood obesity and overweight is an emerging problem in pre-school-going and school-going children in Pakistan. As a developing nation, it is important to address this issue to get healthy future human capital for the country. A nation having status of a developing country cannot afford its next generation to be sick and dull. Role of teachers and schools is pivotal in controlling and minimizing obesity in children. Present research was conducted in two cities of Pakistan with total sample size of 600 respondents, 300 from each districts studying in Elite Private School, Private Schools and Government Schools in Urban and rural areas. Calibrated techniques were used to collect the age, height, weight and waist of the respondents. Respondents were in the age group from 15-19 years. Data was collected through a well-designed and pretested interviewing schedule. Uni-Variate, Bi-Variate and Multi-Variate statistical techniques were applied on collected data to draw inferences against hypothesis.

Key words: Family history, Morbidity, Body Max Index, Obese, Diseases

1.0 Introduction:

Obesity is an abnormal accumulation of fat in adipose tissue to the extent that impairs the health. Obesity leads to an augmented threat of emerging a co-morbid disease. Obesity is

an aspect of body image that is measured against an acceptable body size in a particular society. It can therefore be examined from an anthropometric or physical, a sociological and a psychological perspective. This implies that obesity is a multi-dimensional and relative concept and may be approached accordingly. Obesity is the result of energy intake surpassing energy expenditure over a substantial period of time. This definition is the appropriate and uncomplicated in contrast of other complex definitions of obesity but there are contradictions in diagnosis and definitions of obesity during childhood and adolescence. Body fat mass depends on certain factors such as age, ethnic background, developmental stage and gender. Besides these factors, Body Mass Index is now commonly acknowledged as a clinical definition of obesity during childhood and adolescence. Overweight is an increase in body weight in comparison of age and height. Body Mass Index (BMI) is derived from a person's weight in pounds divided by the square of a person's height in inches and multiplied by a factor of 703. Campbell and Haslam (2005), indicated that obesity simply can be defined by calculating Body Mass Index (BMI) of any person and if it is greater or equal to 30 (BMI≥30) the individual will be declared obese and if it is over 25 it will be overweight.

1.1 Measures of obesity

These are two measures of BMI:

$$BMI = \frac{\text{Weight (Kg)}}{\text{(Height (m)2}} \quad \text{or} \quad \frac{\text{Weight in Pounds *703}}{\text{(Height in inches)*(Height in inches)}}$$

Example: A fourteen years old boy having weight 210 lbs. and 65 inches tall would have
BMI = {210/(65)*(65)}*703 = 34.94

World Health Organization (2007) has reported the BMI scores in graphic and tabulation form for 5 to 19 years old boys which are quite relevant with this study. These are annexed as Appendix-II at the end of dissertation for reference purpose.

BMI values at different levels of weight, for Caucasians: (BMI definition BMI range (kg/m2)

- Underweight — Under 18.5
- Normal — 18.5 to less than 25

- Overweight 25 to less than 30
- Obese 30 to less than 40
- Obese Grade I 30 to less than 35
- Obese Grade II 35 to less than 40
- Morbidly obese/obese Grade III/severe 40 and over
- Overweight including obese 25 and over
- Obese including morbidly obese 30 and over

Source: Commissioning Board Clinical Reference Group for Morbid Obesity (2013).

Objectives:

- To know the obesity and other diseases history in the families of the respondents
- To identify the causes of obesity in the families of the respondents and their implications on respondents
- To identify social, psychological and health implications of obesity in children
- To suggest measures to address and control the issue of obesity among the children

1.2: Genetic factors, family history and obesity

There is a chance of obesity in children when either of the parents is obese and it increases up to 80% when both parents are obese (Schwimmer, Burwinkle, & Varni, 2003). Ecological and genetic factors substantially affect expression of obesity but the relative contribution of each of genetic factor to the phenotype variance of obesity is not yet fully explored. The importance of primary prevention of obesity begins early in life. The role of health behaviors is also vital which includes physical activity and dietary intake. There is a need for modification of health-related practices and policies focused on consumers, providers, schools, and communities (Havlik et al., 1979).

Specific genes like mutations are important in the development of obesity in children and there is a need to explore such genes. Causative genes were explored for 5 obese mouse models. Two lepton and lepton receptors were linked with variation in body fat. Association

with body fat measures were reported for over 20 other candidate genes in humans, but linkage among these genes were not strong and in some cases were even inconsistent. Chromosomal sites of genes responsible for several rare familial human obesity syndromes were explored, but none to date have been linked with obesity in the general population. On the other hand, with genome-wide searches, quantitative trait associations of body fat indexes were explored for a lot of genetic markers in both humans and mouse models (Prentice & Jebb, 1995). Causative mutation in human genes and the heritable nature of obesity was the real cause of rising trend in the prevalence of obesity in childhood. The mutation disrupts the function of hypothalamic integrative centers that leads increasing the food intake habit in children due to genetic factors. The estimated heritability factor of BMI was in the range of 64 and 84 percent in the children and around 25 to 40 percent of BMI was heritable. Mutation in our genes has made all of us more susceptible to obesity but the pace of rising obesity in population is so high that the genetic factors has been left behind and it is very alarming for our future generation who will undergo various obesity related diseases (Farooqi & O'Rahilly, 2006).

Pakistan specific study was conducted (Khan, Toledano, & Taylor-Robinson, 2008) based on the sample of 330 obese participants of age group of 35-45 years of both males and females. As per results, 198 respondents reported that their families had history of obesity. Obesity history in parents was found in 257 respondents who constituted 78% and obesity in kith and kin was reported in 92 respondents who were 28%. Oil-rich foods were taken by 108 respondents who were in 33%, 66 respondents habitual of taking sweets, 33 were found to be habitual of taking high fiber food in excessive quantity and 82 respondents were found to be regularly taking soft drinks. Out of total respondents 99 reported that they were taking more than three meals a day. Some 112 respondents took some eatables in between meals. Fast food use was reported in 6 respondents. Exercise routine to reduce weight was found in 99 respondents but 33 respondents were not regular in doing exercise, television watching was found in 108 respondents and duration of television watching was found to be more than 4 hours on daily basis. Out of total sample 66 respondents were shopkeepers, 59 respondents were businessman, 42 respondents were students, 33 respondents were doing clerical jobs, 16 were tailors and 13 were from teaching community. Socio-economic status was higher in 66 respondents who were 20% and had income of over Rs. 30,000 per month. Life with great

stresses was responded by 16 respondents. There was tendency of taking anti-psychiatric medications on prescription in 5 respondents. Respondents with epidemic of diabetes were 33. Two respondents had Cushing syndrome and one female respondent was on treatment for hypothyroidism (Khan et al., 2008).

In Pakistan out of 16 boys, 6 were reported being obese whose fathers and mothers were also obese. Four boys were found in the normal range whose both parents were obese. Five boys were wasted and 3 boys had fathers and mothers obese. Two boys were found obese who had wasted fathers and obese mothers. It was also found that out of 20 girls, 3 were reported obese whose both parents were obese. Four girls were in the normal range whose fathers and mothers were obese and 12 had wasted, 11 girls had fathers and mothers, one girl had normal father and wasted mother. There were 15 families where both parents were found obese. Out of 13 such boys, 6 were obese which constitute 46.15 percent, 4 were normal which constitute 30.77 percent 3 were wasted who constitute 23.08 percent; in contrast out of 17 such girls, 3 were obese which constitute 17.65 percent, 4 were normal who constitute 23.53 and 10 were wasted who constitute 58.82 percent respectively. In case of both parents being obese, boys had a more risk of obesity than girls. Girls in these families, where both parents were obese, were having a tendency of being underweight and took it a common problem in all developing countries where nutrition transition were taking place and Pakistan is also one country undergoing nutrition transition ((Caballero, 2005; Jinabhai, Taylor, & Sullivan, 2003; Reilly et al., 2005).

1.3: Family history

While studying about phenomenon of diseases in childhood, adolescence and adulthood, facts sheet about genetic factors and family history helps researchers in ascertaining and anticipating the future health issues which might be faced by children. Major diseases such as cardio-vascular diseases, hypertension, anxiety, diabetes and cancer do have association with family history. Children' maternal and paternal health history also affects their future health. They are on risk of certain ailments which they carry from their families. In the below table results relating to family history are being discussed along with the measures families and respondents are taking or wish to take to prevent them from certain diseases. The discussion is particularly with regard to obesity in the respondents' families and respondents and their preventive measures.

Table 1.4: Percentage distribution of the respondents according to their family history related characteristics

Disease history of family members	Family history						
	Obesity	Diabetes	Heart disease	High BP	Cancer	Arthritis	Early death

N=600							**and causes**
No member	48.5	61.7	77.2	67.2	92.5	85.8	89.7
Mother	22.7	10.5	6.2	15.2	1.7	4.5	3.5
Father	13.2	11.5	6.0	6.5	1.2	2.3	1.5
Maternal grand mother	7.5	6.8	4.0	3.0	2.2	3.2	2.0
Maternal grand father	3.5	3.8	2.7	3.5	.5	.8	.8
Paternal grand mother	2.0	3.2	2.3	2.3	.5	1.5	1.0
Paternal grand father	2.7	2.5	1.7	2.3	1.5	1.8	1.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Any health problem faced by their family member due to obesity N=322	**Frequency**	**Percentage**
Yes	196	60.9
No	126	39.1
Total	**322**	**100.0**

Continue….

Health problems N=196	**Frequency**	**Percentage**
Blood pressure	64	19.9
Cholesterol	6	1.9
Diabetes	17	5.4
Heart disease	32	9.9
Joint pain	16	5.0
Diabetes/sugar and blood pressure	61	18.9
Any one in their family being obese N=600		
Yes	331	55.2
No	269	44.8
Total	**600**	**100.0**
Obese family members N=331		
Father	102	38.8
Mother	134	40.5
Brother	60	18.2
Sister	35	10.5
Any family member of their family struggles for reducing obesity		
Brother	50	8.4
Sister	17	2.8
Father	20	3.3
Mother	235	39.2
No	278	46.3
Total	**600**	**100.0**

Continue….

Measures for reducing Obesity by family members	Father		Mother		Brother		Sister		Total	
	F.	%	F.	%	F.	%	F.	%	F.	%
Dieting	2	10.0	145	61.7	2	4.0	7	41.2	156	48.4
Exercise	3	15.0	16	6.8	11	22.0	0	0.0	30	9.3
Jogging	5	25.0	5	2.1	17	34.0	0	0.0	27	8.4
Walking	8	40.0	58	24.7	16	32.0	7	41.2	89	27.6
Medicine	2	10.0	11	4.7	4	8.0	3	17.6	20	6.2
Total	20	100.0	235	100.0	50	100.0	17	100.0	322	100.0

Willingness of respondents to reduce obesity	**Frequency**	**Percentage**
Yes	152	46.1
No	178	53.9
Total	**330**	**100.0**

Measures to reduce obesity by respondents (no time line) N=152	**Yes**		**No**	
	F.	**%**	**F.**	**%**
Leaving cold drink	93	61.2	59	38.8
Leaving Junk/Fast food	66	43.4	86	56.6
Leaving sweets	99	65.1	53	34.9
Walking and exercise	88	57.9	64	42.1
Medicine using	12	7.9	140	92.1

Discussion

Table 1.4 reveals that 50.5% of the respondents had disease history in the families and the dominating diseases were 22.7% obesity, 10.5% diabetes and 15.2% high blood pressures in mothers of the respondents. With regard to health problems 60.9% respondents' family members were having health issues. With regard to specific health problems in family

members, 19.9%, 1.9%, 5.4%, 9.9%, 5.0% and 18.9% had blood pressures, cholesterols, diabetes, heart disease, joint pain, and diabetes, sugar, blood pressures at a time. Results indicate that 55.2% respondents' family members had obesity and fathers, mothers, brothers and sister were obese by 38.8%, 40.5%, 18.2% and 10.5% respectively. Astonishingly, a majority of 46.3% of the family members being obese were not doing any effort to reduce their obesity. This is also observed that people are not generally motivated and mentally tough to face the diseases and take steps to get rid of the ill effects of these diseases.

It emerged from the study that family members like fathers, mothers, brothers and sisters are not inclined towards healthy life styles in our society. They do not have the will to fight against their obesity or other disease. The result indicates that a huge majority of over 47% had not time for jogging, walk and exercise at all. People mainly try to address and control their obesity through dieting and becomes victims of eating disorders and they are in vast majority of 48.4%. Those who were willing to control obesity through walk and exercise were merely 27.6%.

The table also reveals that 46.1% respondents reported their consent and willingness to reduce obesity so that they could avoid the complications of this epidemic in their future life. This also supports the health belief model which indicates that peoples' self efficacy is very important in tailoring the health behaviors. It was also explored that 53.9% respondents were not interested to reduce their obesity and were satisfied with their current conditions. This result demands that children need information and knowledge about obesity through education and intervention. School management may also play its pivotal and peculiar role in this context to address the obesity issue in children. Results also indicate that 61.2% respondents reported that they will leave cold drinks and 38.8% indicated that they will not leave cold drinks, 43.4% respondents reported that they will leave junk/fast food and 56.6% respondents were not willing to leave fast foods from diet. The respondents who were 65.1% reported that they will leave eating sweets; whereas 34.9% respondents replied that they will not leave eating sweets, 57.9% respondents showed their willingness to do walking and exercise to reduce the obesity and 42.1% answered in negative as they were not ready to start walk and exercise. About a critical question of using medicines to reduce obesity, 7.9% showed their consent to start taking obesity reducing medicines and 92.1% respondents said that will not use medicines for obesity reduction. Few children said that as per their parents,

obesity reduction medicines had side effects besides other complications and they wanted to reduce the obesity through leaving certain foods and by doing walk and exercise.

Table 1.5: Percentage distribution of the respondents according to their health status and researcher's perception about their health

Health status	Respondents' opinion about their health		Researcher's perception about respondents health	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Very good	302	50.3	278	46.3
Just normal	208	34.7	237	39.5
Not normal	90	15.0	85	14.2
Total	**600**	**100.0**	**600**	**100.0**

Table 1.5 indicates the perception of the respondents about their health and researcher' opinion about the general health conditions of the respondents. With regard to respondents' own opinion 50.3% thought that they are in very good health, 34.7% revealed that they are just normal in their health, whereas as remaining 15.0% accepted that they were not enjoying the normal health conditions. With regard to researcher's own perception or assessment 46.3% respondents had very good health, 39.5% just normal health conditions and 14.2% were not in the normal health conditions. It is quite evident that health conditions which affect the appearance of the people are easily read by other peoples. Obesity is a health condition that no can conceal. During the field data collection, researcher formed his opinion about the general health condition of the school-going children using the observational method. Though some children did not consider them obese but researcher did consider them in obese category by analyzing their weight, height, age, and general appearance.

Table 1.6: The values of Chi-Square, Gamma and Pearson's Correlation Coefficient of different independent variables with dependent variable (Obesity) for both rural and urban areas

Variables	Chi-square value	Gamma	Pearson's Correlation Coefficient value
Income	18.01**	.139*	.093*
Mother's education	68.70**	-.336**	-.264**
Family type	9.62**	.217**	.192**
Age	17.83**	.023	-.034
Family size	14.74**	.222**	.162**
Mode of traveling	39.79**	.420**	.198**
Waist	65.99**	.359**	.675**
School distance	23.46**	-.261**	-.173**
Playing facility in school	19.94**	-.305**	-.262**
Exercise habits	177.82**	-.670**	-.828**
Eating pattern	15.66**	.203**	.106**
TV & Internet	57.51**	.390**	.316**
Junk food	179.62**	.847**	.435**
Mutton and beef	27.15**	.371**	.128**
Weekly Time spent in sports	23.10**	-.228**	-.099*
Weekly Time spent in walking	74.46**	-.337**	-.174**
Family History	65.21**	.508**	.300**
Residence type	17.73**	.220**	.162**

Dependent variable: BMI

* = Significant at 5% level of significance

** = Significant at 1% level of significance

NS=Non-significant

Table 1.7: Results of Regression Analysis: un-standardized, standardized regression coefficient values of independent variables regressed on BMI of the children for both rural and urban areas.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
Monthly income	-6.620E-6	.000	-.055	-1.540	.124
Father's education level	.034	.087	.015	.396	.692
Mother's education level	-1.892	.369	-.183	-5.133	.000
Age of respondent	.708	.523	.055	1.353	.176
Family type	2.775	.716	.131	3.875	.000
Weight of respondents	1.637	.298	.173	5.485	.000
School distance	-1.122	.390	-.089	-2.873	.004
Playing facility at school	-3.921	.854	-.190	-4.591	.000
TV & Internet	1.977	.334	.219	5.913	.000
Weekly Time spent in sports	-.924	.286	-.107	-3.233	.001
Weekly Time spent in walking	-.929	.307	-.100	-3.028	.003
Mode of traveling	2.714	.642	.134	4.227	.000
Junk food	6.722	.727	.302	9.248	.000
Mutton and beef taken	1.143	.856	.048	1.335	.182
Family history	2.219	.653	.109	3.397	.001

Dependent Variable: BMI

In table 6.1 un-standardized and standardized regression coefficients of each independent variable are represented accordingly for both rural and urban areas. Besides these calculations, standard errors and significant levels of the predictor variables have also been presented and shown in the table.

1.8: Regression coefficients of health characteristics

Health characteristic could be current diseases of the respondents and their disease history in the families. In the study family health history was taken as an intervening variable which later on proved to be a right selected variable which was affecting the obesity of the children. Its Beta value came as .109 for both urban and rural areas indicating its impact on dependent variable – BMI of the children. It shows a positive relationship with BMI at one percent level of significance.

Multivariate Analysis
(Rural Areas)

Model Summary **N=200**

R	R Square	Adjusted R Square	Std. Error of the Estimate
.732	.536	.488	6.94139

The rural areas' model summary of regression analysis indicates that R^2 value is .538, Adjusted R^2 at .488 and standard error of estimate as 6.94139. The value of R^2 depicts all intervening variables used in the study were quite suitable and explain epidemic of obesity in children.

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	9190.781	17	540.634	11.220	.000[a]
Residual	7950.183	165	48.183		
Total	17140.963	182			

The ANOVA table indicates the overall picture of the model in the context of regression analysis. The F value 11.220 is significant at one percent level of significance and it can be said that all independent variables selected for the study of rural areas in predicting BMI of the children are appropriate variables.

1.9: IMPORTANT DIMENSIONS

Diseases do not develop over-night; there is a gradual transition in the emergence of various health related ailments including obesity. Obesity is a very serious phenomenon in the world. It has spread so rapidly in last two decades that not a single country in the world has been able to avoid it. There has been much industrialization in the past two to three decades and people's lives have become mechanical due to urbanization and industrialization. In developed countries life is very fast, both males and females are engaged in commercial lives and earning money for the families. They do not have much time for families, no homemade foods are prepared for children and there is much reliance on packed foods, junk/fast foods. These foods are instrumental in spreading obesity in the societies as fast foods have also reached in developing and developed countries. Moreover, people have adopted sedentary life styles all over the world. Habits of walking and exercise among the people have been reduced.

1.10: MAIN FINDINGS

Family history is the most important factor in study the health related social phenomenon. The univariate analysis indicated that a substantial number of the family members such as fathers, mothers, sisters, grand fathers and grandmothers of the respondents were suffering from diseases like obesity, high blood pressures, diabetes, joint pain, heart problem, cancer and in some families early death cases were also reported. It indicates that family history of the respondents had a highly positive relationship between with the obesity of the children. Higher the obesity in family, higher was the obesity in children both in rural and urban areas. Multivariate analysis indicated that family history was an important correlate of the obesity of the children. This finding has similarity what Khan et al. (2008) found, overweight children in less than three years of age will have less chances of becoming obese if their parents are normal. They also concluded that obesity of parents increases the chances of obesity in two times in obese and normal weight children who are under 10 years.

The study also explored that children who used to bring pocket money with them used to eat more junk food as compared to those children who did not bring pocket money for schools. Moreover, the children who used to bring lunch with them were also eating junk foods more often. This supports the emerging trend of junk foods usage in our society. This is a major socio-cultural shift in past fifteen years which is being welcomed by all age groups and geographic distributions across Pakistan. Children eat pizzas, burgers, noodles, nuggets and potato chips frequently along with cold drinks. This habit is being adopted through advertisements by marketing companies. Parents and other family members also take junk foods regularly; they also visit the foods streets and other fast foods stores more often along with children which promotes the junk foods trend in school-going children as well.

1.11: RECOMMENDATIONS

- Government should start National Childhood Obesity Prevention Program and cascade it to all Provinces, Divisions, Districts, Tehsils and Union Councils.
- A comprehensive strategy has to be devised so that sedentary behavior could be decreased in young people and young generation could be stimulated to participate more in physical activities and stop doing minimum physical activity and bring positive and healthy change in their life styles which will eventually help a lot to fight against the obesity epidemic.
- Schools and other educational institutions should come forward and start intervention programs and should invite experts and consultants to teach children about healthy eating habits and physical activities.
- No school should be registered by the governing authorities until it has proper school infrastructure; playing grounds, exercise and playing facilities and regular sports for children. Sports period should be made compulsory at all levels in the schools and annual sports festivals should be made mandatory for school managements.
- School cafeteria staff should be trained enough about healthy food combinations to be offered to children at breaks. There should be minimum junk foods items. It is recommended that health experts should preach and work hard to eliminate soft drinks from the school premises, speak and train to school administrators and teachers the ways how nutrition in school foods programs could be done better. They should

be goal oriented and come forward and keep them involved in nutrition related activities and decision making by school advisory board. Maintaining strong physical education (PE) programs that engage students in moderate to vigorous physical activity for at least 50% of PE class time. Providing a variety of activities and specific skills so that students can be physically active not just during class but throughout the day and year; and providing qualified school professionals who are trained in teaching methods to engage students in PE, including for students who face greater barriers to activity.

- Parents' role in obesity prevention would also be a crucial one. Parents should inculcate the healthy eating habits in their children. They should discourage junk foods habits in children. They should carry their children on regular walks in the morning and evening. They should restrict TV watching and playing video games in computers and internet at home by the children. They should develop the habits of book reading and playing sports in their children. Parents should be well trained in health education programs.
- Media' role could be very pivotal for prevention of children's obesity. Studies have shown that children adapt the things and habits which they see on media. Media should send social messages through advertisements which show the problems of obesity and the chronic diseases it carries in future lives of children. Media could restrain children from taking unhealthy foods. Media should organize periodical talk shows in which doctors and health experts should come and tell the public about healthy life styles and eating habits.
- Government should make amendments in rules and regulations in media policy of marketing companies and should ensure that promotion of such food items which are injurious for children should not be promoted on print media and electronic media.
- Annual medical check of children in all schools should be made mandatory. Government should take strict actions against the management of schools where medical checkups of children will not be done once in a year.
- Awareness campaigns with regard to a balance diet, increasing the literacy level, better socioeconomic conditions and enhanced physical activity on people' part will help in bringing down the obesity epidemic among children in Pakistan.

1.12: References

1. [Caballero, B. (2005). A nutrition paradox—underweight and obesity in developing countries. *n engl j med, 352*(15), 1514-1516.]
2. [Campbell, I. W., & Haslam, D. W. (2005). *Obesity: your questions answered*: Churchill Livingstone.]
3. [Farooqi, I. S., & O'Rahilly, S. (2006). Genetics of obesity in humans. *Endocrine reviews, 27*(7), 710-718.]
4. [Havlik, R. J., Garrison, R. J., Feinleib, M., Kannel, W. B., Castelli, W. P., & Mcnamara, P. M. (1979). Blood pressure aggregation in families. *American Journal of Epidemiology, 110*(3), 304-312.]
5. [Jinabhai, C., Taylor, M., & Sullivan, K. (2003). Implications of the prevalence of stunting, overweight and obesity amongst South African primary school children: a possible nutritional transition? *European journal of clinical nutrition, 57*(2), 358.]
6. [Khan, S., Toledano, M., & Taylor-Robinson, S. (2008). Epidemiology, risk factors, and pathogenesis of cholangiocarcinoma. *Hpb, 10*(2), 77-82.]
7.]Prentice, A. M., & Jebb, S. A. (1995). Obesity in Britain: gluttony or sloth? *Bmj, 311*(7002), 437-439.]
8. [Reilly, J. J., Armstrong, J., Dorosty, A. R., Emmett, P. M., Ness, A., Rogers, I., . . . Sherriff, A. (2005). Early life risk factors for obesity in childhood: cohort study. *Bmj, 330*(7504), 1357].
9. [Schwimmer, J. B., Burwinkle, T. M., & Varni, J. W. (2003). Health-related quality of life of severely obese children and adolescents. *Jama, 289*(14), 1813-1819.]
10. [World Health Organization. 2007. Diet, nutrition and the prevention of chronic diseases. Report of a Joint World Health Organization/Food and Agriculture Organization of the United States. Report Series, No. 916. Geneva: WHO. Available at: http://whqlibdoc.who.int/trs/WHO_TRS_916.pdf.]