HACETTEPE UNIVERSITY
INSTITUTE OF POPULATION STUDIES

THE PREVALENCE OF OBESITY AND ITS DETERMINANTS AMONG 7 YEARS OLD CHILDREN IN TURKEY

Nazan YARDIM

Department of Demography
Master's Thesis

Ankara
March 2021

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Tarih: 02 Nisan 2021

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THE PREVALENCE OF OBESITY AND ITS DETERMINANTS AMONG 7 YEARS OLD CHILDREN IN TURKEY-5

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Submission date: 02-Apr-2021 11:25AM (UTC+0300)
Submission ID: 1548896313
File name: Tez_NYardim_BASIM_1-4-21.pdf (1.52M)
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ACKNOWLEDGEMENT

I would like to thank the World Health Organization Regional Office for Europe and the COSI working team for their intensive collaboration as a part of the COSI Survey; and Turkish COSI teams who are from Hacettepe University Department of Public Health, Department of Nutrition and Physical Activity colleague, Ministry of Education, and to the provincial field coordinators, all our colleagues who worked during the field data collection phase, all school administrators, teachers, families, and children who took part in our survey.

Also, my heartfelt thanks go to my husband Mahmut, my dear children Zeynep Naz and Omer Alp who were me on this long journey.

ÖZET

Çocukluk çağı obezitesi, 21. yüzyılın en ciddi halk sağlığı sorunlarından biridir. Obezite, dünyada olduğu gibi Türkiye'de de yetişkinlik ve çocukluk çağı halk sağlığı sorunlarından biridir. Obezite, Bulaşıcı Olmayan Hastalıkların ve buna bağlı ölümlerin önemli nedenlerinden biridir. Bu çalışma, idarecilere bir içgörü sağlamak amacıyla Türkiye'de sağlığın belirleyicileri perspektifiyle ilkokul 2. sınıftaki 7 yaşındaki çocuklarda obezite prevalansını içeren obezite ve sosyo-ekonomik belirleyicilerle olan bağlantılarına odaklanmaktadır.

Araştırmanın verileri 2016 yılında Sağlık Bakanlığı tarafından gerçekleştirilen Türkiye Çocukluk Çağı Obezite Sürveyansından (COSI TUR) alınmıştır. Araştırma TÜİK tarafından seçilen örneklemle tüm illerde yapılmıştır. Araştırmanın bağımlı değişkeni çocukların obezite durumudur. Ana bağımsız değişken Sosyo Ekonomik Durum (SES) indeksidir. Diğer ortak değişkenler şu şekildedir: cinsiyet, yeme alışkanlıkları, fiziksel aktivite durumu (okula ulaşım, spor aktivitelerine katılma vb.), Aile geliri, ebeveynin BMI'si, ebeveynin eğitimi, ebeveynin çalışma durumu). Çalışma hem tanımlayıcı analizleri hem de SPSS 23.0'da lojistik regresyonlu bir dizi çok değişkenli analizi içermektedir.

Modelimizde SES'in önemi ve çocuk obezitesi için faktörleri pekiştirilmektedir. Tüm modellerde daha yüksek SES, çocuklarda daha yüksek obezite riski ile anlamlı şekilde ilişkiliydi. Cinsiyet, tüm modellerde tutarlı bir obezite öngörüsüdür. Taşıma aracını kullanan, anne ve / veya babası obez, doğum ağırlığı 3500 gr'ın üzerinde olan ve erkek çocuklar obezite riski altındadır. Çocuklarda obezitenin önlenmesinde için fiziksel aktivite yapmaları önemli bir faktördür. Hiç veya günde 1 saatten az fiziksel aktivite yapan çocuklarda obezite riski yaklaşık 2 kat artmaktadır. Haftada sık pizza yiyen çocukların obez olma olasılığı, haftada nadiren yiyen çocuklara göre 1,3 kat daha fazlaydı. İlginç bir şekilde, çocuklarda obezite ile şeker, şekerli içecek ve pasta tüketim sıklığı arasında bir ilişki yoktu.

Obezite ile mücadele çocuklukta başlamalı ve stratejiler tüm sektörü ve paydaşları içermelidir.

ABSTRACT

Childhood obesity is one of the most serious public health challenges of the 21st century. In Turkey, obesity is one of the adulthood and childhood public health concerns just like in the world. Obesity is one of the important causes of Non-Communicable Diseases and related mortality. This study focuses on obesity including overweight prevalence among 7 years of children in the 2nd class and its linkages with socio-economic determinants with the perspective of determinants of health in Turkey in order to provide insights for governmental actions.

The data of the study are from the Turkey Childhood Obesity Surveillance (COSI TUR) that was conducted by the Ministry of Health in 2016. The survey was conducted in all provinces with a representative sample that was selected by TURKSTAT. The dependent variable of the study is the obesity status of the children. The main independent variable is the SES index. The other covariates are as follows: gender, eating habits, physical activity status (transport to school, attending sports activities etc.), family income, parent's BMI, parent's education, parent's employment status). The study includes both descriptive analyses and a series of multivariate analyses with logistic regression in SPSS 23.0.

In our model reinforces the importance of SES and its factors for childhood obesity. Higher SES was significantly related to a higher risk of obesity among children in all models. Sex is a consistent predictor of obesity across all the models. Among the male children, using a vehicle for transportation, whose mother and/or father is obese, whose birth-weight is over 3500 gr are under the risk of obesity. Making physical activity is an important factor to prevent childhood obesity. For children who make not at all or less than 1 h/day physical activity, the risk of obesity increase approximately 2 times. Children who eat pizza and others frequently per week were 1.3 times more likely to be obese than children who eat seldom per week. Interestingly, there was no relation between child obesity and frequency of consumption sugar, sugar drink, and pastry.

Tackling obesity should start at the childhood and strategies should include all sector and stakeholder.

CONTENTS

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ABRAVATIONS

BMI: Body Mass Index

COSI: Childhood Obesity Surveillance Initiative

MoE: Ministry of Education

MoH: Ministry of Health

NUTS: Nomenclature of Territorial Units for Statistics

SES: Socio-Economic Status

TURKSTAT: Turkish Statistical Institute

WC: Waist Circumference

WHO: World Health Organization

CHAPTER 1

INTRODUCTION

Childhood obesity is one of the most serious public health problems of the 21st century. The problem is global and is progressively affecting numerous low and middle-income countries, particularly in the urban areas. The majority of overweight or obese children reside in developing countries, where the rate of increase is 30% higher than in the developed countries (WHO Report of the Commission on Ending Childhood Obesity, 2017). In Europe, the prevalence of obesity is the highest in Spain and Greece (over 40) and Portugal and Malta (over 30). The prevalence of obesity is under 23 in Turkey (WHO Report of the third of round data collection 2012-2013).

In Turkey, obesity is one of the adulthood and childhood public health concerns just like in the world. Childhood Obesity Surveillance Initiative (COSI) Surveys showed that childhood obesity is increasing steadily in Turkey over the years between 2013 and 2016 from 23 to 25. (COSI-TUR 2013, COSI-TUR 2016)

Obesity increases some diseases which are the metabolic syndrome, cardiovascular disease, type 2 diabetes and its retinal and renal complications, non-alcoholic fatty liver, obstructive sleep apnea, polycystic ovarian syndrome, infertility, asthma, some orthopedic complications, some psychiatric disease, cancers. Childhood obesity keeps on in the grown-up period (Kelsey et al., 2014).

For this growing problem at the global level, WHO, the UN and the EU prepared a series of action plans for prevention. These were declared in UN General Assembly (High-Level Meeting on Prevention and Control NCD's, 2011), and the 66th World Health Assembly (WHA 66, 2013) as decisions of the UN and as the global action plan for the prevention and control of non-communicable diseases for 2013–2020 (WHO Global Action Plan, 2013), in European Food and Action Plan (WHO European Food and Nutrition Action Plan 2015-2020). In Turkey, within policies tackling obesity in Turkey, an updated "Healthy Nutrition and Active Life Program: Prevention Adult and Childhood Obesity and Physical Activity Action Plan 2019-2023" has been implemented by the Ministry of Health since 2010 (Healthy Nutrition and Active Life Program, Action Plan, 2019)

Despite increasing numbers of studies on childhood obesity in Turkey, studies on the associations between determinants such as parental education, working status, income, and children obesity are limited, although information on childhood obesity and its socio-economic determinants are crucial for the government that helps intervention areas to implement the national action plan.

On the other hand, demography is the science of populations that examines: (1) the size and composition of populations (age, ethnicity, sex, marital, educational occupational status, etc. (2) dynamic life-course processes that change this composition: birth, death, migration, (3) relationships between population composition and changes, also in which they exist their social and physical environment.

Understanding these processes and their relationship with each other it helps and illuminates important social, political, economic, and environmental items and their impacts, such as growing population, urbanization, family structure changes, migration, and health and human life duration (Lindquist, Demography, 2015). The children growing in a good health, free from obesity, may reach until the reproductive age and contribute more to the fertility of the society and then may live longer in a healthy life. Furthermore, the dependent variable of the study, the SES, is also crucial in determining the components of the demography. As we know, as the SES increases the fertility, mortality, and migration levels decrease considerably in all societies. In this manner, the topic of this study (obesity among school-age children) and its main determinant (the SES) are closely linked to the all components of the demography.

Within this study focuses on obesity including overweight prevalence among 7 years of children in the 2nd class and its linkages with socio-economic determinants with the perspective of determinants of health in Turkey in order to provide insights for governmental actions. Within this context, the study has four different but highly related main objectives:

(1) To determine the prevalence of obesity and overweight among children age at 7.

(2) To understand the impact of socio-economic status (SES) on the obesity and overweight among children at age 7, under the control of other covariates regarding with the children's and families' socio demographic and socio-economic

characteristics, nutrition as well as school characteristics in line with perspective of the determinants of health.

(3) To find out the impact of other covariates on obesity and overweight of children at age 7.

(4) To provide inputs for the policy makers for evidence-based policy in order to revise national action plan, and to give an opportunity to evaluate the intervention areas.

CHAPTER 2

CONCEPTUAL FRAMEWORK and LITERATURE REVIEW

There are some theories on obesity etiology in the literature. One of them explained by Thibodeau is “lay theories” which focus on trait-level beliefs, the cause of obesity, and personal stories- that get important implications for the public health concern. At the trait level, some people think about psychological and physical attributes as relatively fixed, but some people believe pliable. According to the observational studies, it is important for people to think of weight as pliable to effective obesity treatments. In public health, obesity is accepted a disease to reduce the stigmatization. This approach also can cause the belief that obesity depends on physiological factors which are out of control. Alternately a person can successfully loses weight through diet and exercise. This can be a more effective strategy for obesity prevention. Also, personal stories lead to empathy because of this effectiveness (Thibodeau et al; 2017).

Late studies have shown that genetic, physiological also behavioral factors responsible to develop obesity. Depending on these reasons obesity treatments and preventions are also different from medical, surgical, and nutrition consultancy. A healthy diet with physical activity is currently a better intervention to prevent and treat obesity (Wilborn et al., 2005).

Marks states that “homeostasis” is important for a healthy body and preventing obesity. In homeostatic imbalance cause to a “circle” which include weight gain, it triggers dissatisfaction, negative affect and overconsumption respectively and finally again weight gain this was named the “Circle of Discontent” theory. There are some suggestions to break the circle, which do not blame the victim, stigmatization, discrimination; removing the perception of being thin; reducing consumption of unhealthy foods, and promoting plant-based diets (Marks, 2015).

Obesity studies also focused on socio-economic status and obesity. Some studies showed that obesity and SES associations vary from country to country. But remarkably obesity was higher living at the lower SES people in industrialized countries e.g. the USA, UK.

Wang showed that obesity is more common in people with high socioeconomic status in Russia and China while it is more common in people with low socio-economic status in the USA. It means obesity is seen differently in countries according to the socioeconomic status (Wang, 2001).

Ogden et al. indicated that childhood and adolescent obesity are higher among people with low-income. They also showed that obesity is lower in households with members are having higher education (Ogden et al., 2010).

A similar study has been done in England. Stamatakis et al. developed a composite score according to the income and social status which name is "Socio-Economic Position (SEP) score". They found that in England obesity in school children remained stable in 10 years (1997-2007) while this stability was not observed in low-income children (Stamatakis et al., 2010).

The other theory is the risk of obesity in the early childhood period is reduced among breastfed children. Low income is also a risk for childhood obesity so breastfeeding especially in this social class should be promoted. Gibbs suggested in their study that mothers with low income should be supported for breastfeeding to prevent early childhood obesity (Gibbs, 2013).

Literature in Turkey shows that there are some national surveys for childhood obesity. These surveys are as follows: Turkish Demographic Health Survey (under 5), Turkish School Age (6-10) Children Monitoring Project (TOCBI) 2008-09, Turkish Nutrition and Health Survey (TBSA) 2010, Childhood Obesity Surveillance Initiative (COSI) 2013 and Childhood Obesity Surveillance Initiative (COSI) 2016 for 7-8 years old.

According to data from Turkey Demographic Health Survey (DHS), the prevalence of overweight was reduced from 11 to 8 in the last five years among under five years old children (TDHS, 2018).

According to Turkey Monitoring Growth in School-Age Children (TOÇBİ-2009) Project for the 6-10 age group in Turkey, 14.3 of children were overweight, and the rate of obesity also was found to be 6.5. The obesity has been found 5.8 at 7 years old. The obesity incidence rate was 7.5 among the male population and 5.4 among the female population; while the rate of being overweight among children age 6-10 was 15.1 among the male population; 13.5 for the female population (TOÇBİ 2009).

In Turkish Nutrition and Health Survey (TNHS) 2010, obesity was 9.1 and overweight was 12.0 among 6-8 years old children (TNHS, 2010).

In 2013 COSI TUR survey, at primary school 2nd grade totally 4.958 students were been measured for BMI. Prevalence of overweight and obesity were found 14.2, 8.3 respectively (COSI-TUR, 2014). But in 2016 COSI TUR survey; obesity was 9.9, overweight was 14.6 (COSI-TUR, 2017).

For adolescents in the 2009-2010 period; 7 of 11 years-old girls, 16 of 11 years-old boys, 10 of 13 years-old girls, 18 of 13-years-old boys and 6 of 15 years-old girls and 17 of 15 years-old boys were overweight or obese (WHO Euro HBSCS, 2010)

In Health-Related Physical Fitness Report (2017 September and October Period), 3.750.999 secondary school students (10-14 years) have been measured and overweight was found 20.2 among the male population, 19.0 among the female population, obesity was found 13.0 among the male population and 7.8 among the female population. Totally obesity was found as 10.5, overweight was found as 19.6 among secondary the school children. Also 1.531.269 high school students (15-18 years) the BMI Z-Score distribution by gender; 16.5 of male students, 13.5 of female students were overweight, 6.8 of male students and 4.3 of female students were obese. Around 15 among high school children were found overweight and 5.6 of them were obese (Fitness Gram Test Report, 2017).

Obesity-related determinants have been examined in many studies. One of them conducted by Chandrasekhar et al. which t showed that there are relationships between dyslipidemia, oxidative stress, insulin resistance, endothelial dysfunction, and obesity. These biomarkers also represent cardiovascular risk factors and components of metabolic syndrome (Chandrasekhar et al., 2017).

Pearce et al. searched that childhood obesity and its relationship with fast-food consumption. Study results supported the previous researches and indicated that fast-foods were more prevalent in deprived areas and fast-food related behaviors help increase weight in the childhood period (Pearce et al. 2017).

Umer (2017) discussed that childhood obesity could be a risk factor for some adulthood cardiovascular diseases.

Committee on Adolescent Obstetrics Gynecology prepared a report on obesity in adolescents. According to this report, with the increase in obesity related

diseases have also increased in the United States (Committee on Adolescent Obstetrics Gynecology, 2017).

In a study on Austrian school children the effect of gender, role of parental education, school types and migration on weight gain was evaluated. Furthner et al. showed that if parents have low education, high BMI and to be migrant, children overweight- obesity increased among 10-years-old children. But for adolescent to be male and higher parental BMIs have been found just as risk factors (Furthner et al., 2017).

Davison draws attention to the father's role for tackling childhood obesity which is not adequately addressed in the studies. He suggested that fathers should be included in childhood obesity prevention and should be given special attention (Davison et al., 2018).

The current reviews examined the relationship between sleep duration and childhood obesity. Results showed that sleep duration was associated with gaining weight in children.

In Felsö et al.'s reviewed relations with short sleep duration and changing the obesity-related hormones (ghrelin and leptin) levels (Felsö et al., 2017). Also, insufficient sleep time is one of the factors that increase weight gain especially in adolescents because of behavioral changes. (Hayes et al. 2017).

Papandreou et al. indicated that in Switzerland, the prevalence of obesity increased from 17.6 at kindergarten to 26.0 at class 8 (from-to). The study showed that obesity was higher among migrants at the beginning of school. Obesity also was found higher in males whose come from southern or eastern Europe and female with low socio-economic status (Papandreou et al.,2017).

Antvorskov et al. (2017) examined the possibility of Diabetes Mellitus, due to childhood obesity. They found that with an increased BMI score, the risk of diabetes also increases.

Schiffl et al. (2017) stated that weight gain grows in Germany and affects adults and children together. Also, it has been found an increased risk of chronic kidney disease with overweight or obesity. They mentioned that obesity activated nephropathies. If significant weight loss occurs, kidney damage can be prevented. For

this reason, public awareness need to be promoted and a healthy lifestyle need to be developed (Schiffl et al., 2017).

In another study in Egypt, education and wealth have been used as determinants which to examine interaction relation with obesity. Study showed that wealth seems to be a risk factor for obesity in women with lower education levels, but women with higher education are protected. The results also showed that obesity risk is occurring in lower socioeconomic groups (Aitsi-Selmi et al., 2012). This result can be important for maternal obesity as well.

Nowadays, the effect of maternal obesity on childhood obesity has been investigated. There is no agreement on the genetic role, family environment or both of them (Primaria, 2013).

Another issue examined by Hubers et al., showed the relationship with BMI, Waist Circumstance (WC), and regional fat distribution. When each other compared that seen existing BMI and WC cut-offs were not appropriate to explain relationship with metabolic diseases and obesity; therefore there is a need for advance clinical practice for establishing a new cut-off point BMI and WC (Hübers et al., 2017).

Nutrition has been an important research area in childhood cancers. Polubok investigated the presence of obesity in children diagnosed with cancer. Acute lymphoblastic leukemia (ALL) is a kind of cancer related to the lymphoid line of blood cells. It is characterized by numerous immature lymphocytes. Overweight was remarkably high in ALL children (Polubok et al., 2017).

Obesity and puberty time were evaluated in a systematic review whose determined that obesity can lead to precocious puberty among girls (Li et al, 2017).

The relationship between increased waist circumference (WC) and hypertension in children whose setting urban area was examined by Farporti. It has been seen that high WC cause higher blood pressure than has got normal WC children (Farporti et al., 2017).

Asthma and obesity association was researched by Okubo et al. in children who were admitted to the hospital with acute asthma attack. Their study showed that obesity was a risk factor for repeated admissions caused by asthma in children, indicating the importance of the prevention of pediatric obesity (Okubo et al., 2017).

CHAPTER 3

DATA AND METHODS

3.1. Data Source

Childhood Obesity Surveillance Initiative (COSI) was established under the leadership of the WHO European Region.

The need for such an initiative was stated at the “WHO European Ministerial Conference on Counteracting Obesity” held in Istanbul in 2006 for the first time.

It was first held in the 2007-2008 school year with the participation of 13 countries according to the COSI protocol.

Turkey joined COSI family in 2013 with a protocol signed by the Ministry of Health. The data of this study are from the Turkey Childhood Obesity Surveillance (COSI TUR) 2016. The study sample was selected by TURKSTAT with a representative Turkey, 12 NUTS region and according to the gender.

COSI-TUR 2016 study conducted in primary school 2nd class 7-8 years old students. But sampling has been coming into being 6 years old 13.9, 7 years-old 79.7, 8 years old 5.9 and 9 years old is 0.5. For this reason, in this study 7 years old children have been selected. Table 3.1 provides necessary information about the sample and its outcomes of the survey.

During the fieldwork of CISI-2016, each team consists of two people, one of is a responsible dietitian. A total of 115 field teams, each consisting of two persons (230 persons) according to the school numbers in the provinces (for example there are 8 field teams for Istanbul, 2 field teams for Kars). "COSI-TUR 2016 Field Examiners Training" was given to the provincial field team leaders who took part in the survey in Ankara between November 29 and December 1, 2016, in order to provide national and international standardization training during data collection. The fieldwork was completed in February 2017. Data collection forms from the central team have been transferred to the electronic medium using optical character recognition technology for electronic coding of the optical coding forms.

Table 3.1. Turkey Childhood Obesity Surveillance (COSI TUR) 2016

Number of schools covered in the survey	585
Number of children total interviewed	11.732
Number of children interviewed in 7 ages	9.825
Number of male children interviewed	5.901
Percentage	50.3
Number of female children interviewed	5.831
Percentage	49.7
Number of families interviewed	11.876
Coverage of the sample	12 NUTS, 81 Province

3.2. Questionnaires

The questionnaires used in the survey were developed and standardized by WHO Euro. The Questionnaire consists of interviewer, family and school forms which have two parts as mandatory and voluntary. In our country mandatory and voluntary parts of the questionnaires were used together. The questionnaires have been translated into "Turkish", made preliminary testing for adaptation, and the number of questions and options were remained without changing for comparison with other country data sets. Questionnaires were prepared as optical encoding and prescribed directives for each form.

- ***Interviewer Registry Form:*** This form was used at schools to measure children's weight and height by the interviewer. Each child's form was different. The interviewers were health workers who are doctor, dietician, nurse and health technician and who are trained in Ankara.
- ***School Information Form****:* This form was used to reveal the nutrition and physical activity capabilities of schools. These answers have been given by a school manager and/or school official.
- ***Family Registry Form****:* This form has been filled by families which were sent to families with students in an enclosed envelope. There was a consent form on the front of the envelope.

The data for this study comes from the COSI TUR, 2016.

3.3. Construction of Variables

The dependent variable of the study is the obesity status of the children. The main independent variable is the SES index. The other covariates are as follows: gender, eating habits, physical activity status (transport to school, attending sports activities etc.), family income, parent's BMI, parent's education, parent's employment status). The full list of the variables including dependent, independent, and other covariates is given in Table 3.2. Totally 9825 seven years old children (5901 male, 5831 female) included in the study but there are some missing data.

Table 3.2. The list of the variables including dependent, independent and other covariates by dummy-coding of categorical variables

	Sample			
	Number	**Mean**	**SD**	**SE**
Dependent Variables				
Obesity status of the children (1=obese; 0=non-obese)	9825	0,1048	0,30632	0,00309
Independent Variables				
Socio-economic status of the households (SES) index	**9099**	-	-	-
Lowest	569	0,0625	0,24204	0,00254
Low	1141	0,1254	0,33119	0,00347
Lower middle	1888	0,2075	0,40554	0,00425
Upper middle	2093	0,2300	0,42085	0,00441
High	2294	0,2521	0,43425	0,00455
Highest	1115	0,1225	0,32788	0,00344
Other covariates				
Sex	**9825**	-	-	-
Male	5086	0,5177	0,49971	0,00504
Female	4739	0,4823	0,49971	0,00504
Physical activity status Attending sport activities	**9460**			
Under 1 h	7897	.8348	.37142	.00382
2-5 H	1372	.1451	.35219	.00362
Over 6 H	191	.0202	.14059	.00145
Physical activity status Transportation mode of children	9650			
walk/bicycle	5516	.5716	.49487	.00504
motor vehicle	3327	.3447	.47531	.00484
Both	807	.0836	.27686	.00282
Birth weight of children	9023	3196,49	616,505	6,490
Physical activity status: Spending Time on Actively/vigorously Playing	**9179**			

Not at all or less than 1 h/day	2424	.2641	.44089	.00460
1–2 h/day	3620	.3944	.48875	.00510
More than 2 h/day	3134	.3415	.47423	.00495
Breastfeeding status of children	**8270**			
0-5 M	2885	.3488	.47663	.00524
5-11M	4397	.5317	.49903	.00549
12-23 M	735	.0889	.28464	.00313
24 +	253	.0306	.17226	.00189
Sleeping duration of children	**8856**	10,2983	1,07918	0,01147
Number of children in the household	**9351**	2,5401	1,30424	0,01349
Number of adults in the household	**9160**	2,4594	1,19221	0,01246
Any person having diabetes in the household	**9610**	0,1460	0,35308	0,00360
Obesity status of mother	**8826**			
Normal	4318	.4892	.49991	.00532
OW	3123	.3538	.47819	.00509
Obese	1385	.1569	.36374	.00387
Obesity status of father	**8589**			
Normal	2767	.3221	.46732	.00504
OW	4207	.4898	.49993	.00539
Obese	1615	.1880	.39075	.00422
Educational level of mother	**9632**			
Illiterate	778	.0807	.27245	.00278
Literate	308	.0320	.17597	.00179
Primary	3341	.3469	.47599	.00485
Secondary	1456	.1512	.35823	.00365
Secondary(İlköğretim)	238	.0248	.15538	.00158
High school	2188	.2271	.41899	.00427
University	1323	.1374	.34428	.00351
Educational level of father	**9519**			
Illiterate	154	.0162	.12617	.00129
Literate	170	.0178	.13234	.00136
Primary	2883	.3028	.45951	.00471
Secondary	1549	.1627	.36915	.00378
Primary/Secondary	186	.0195	.13825	.00142
High school	2722	.2859	.45188	.00463
University	1856	.1950	.39620	.00406
Mather Occupation	**9583**			
Servant	602	.0628	.24269	.00248
Private sector	765	.0798	27107	.00277
Own	322	.0336	18017	.00184
Student	39	.0040	.06348	.00065
Housewife	7487	.7812	41344	.00422
Unemployed but can work	287	.0300	17046	.00174
Unemployed but can't work	63	.0066	.08104	.00083
Retired	18	.0019	04354	.00044
Father Occupation	**9347**			
Servant	1182	.1264	.33237	.00344
Private sector	3939	.4215	.49382	.00511
Own	2630	.2814	.44971	00465
Student	14	.0015	.03851	.00040
Housewife	105	.0113	.10551	.00109
Unemployed but can work	1090	.1166	.32094	.00332
Unemployed but can't work	198	.0212	.14390	.00149
Retired	189	.0202	.14062	.00145

Working status of mother	**9583**			
0	7876	.8218	.38268	.00391
1	1708	.1782	.38268	.00391
Working status of father	**9346**			
0	1406	.1505	.35756	.00370
1	7940	.8495	.35756	.00370
Welfare status of the household	**9600**			
Easily sufficient	2513	.2617	.43961	.00449
Sufficient without serious problem	3168	.3299	.47022	.00480
Barely sufficient	2761	.2876	.45268	.00462
Not sufficient at all	1159	.1207	.32579	.00333
Eating habits: Some foods: chips, consumption	**9036**			
Never	1321	.1462	.35331	.00372
Less than a week	3265	.3613	.48042	.00505
Rare (1-3 times a week)	2657	.2940	.45563	.00479
Mostly(4-6 days a week)	1175	.1301	.33641	.00354
Every day	618	.0684	.25238	.00266
Eating habits: Some foods (candy)consumption	**8961**			
Never	528	.0589	.23541	.00249
Less than a week	2191	.2445	.42982	.00454
Rare (1-3 times a week)	3317	.3701	.48287	.00510
Mostly(4-6 days a week)	1866	.2083	.40611	.00429
Every day	1059	.1182	.32283	.00341
Eating habits: Some foods (pizza)consumption	**9135**			
Never	1073	.1175	.32203	.00337
Less than a week	3558	.3895	.48766	.48766
Rare (1-3 times a week)	3071	.3362	.47244	.47244
Mostly(4-6 days a week)	1093	.1197	.32461	.32461
Every day	339	.0371	.18913	.18913
Eating habits: Some foods (soft drink)consumption	**8775**			
Never	2232	.2543	.43550	.00465
Less than a week	2495	.2843	.45113	.00482
Rare (1-3 times a week)	2486	.2833	.45062	.00481
Mostly(4-6 days a week)	944	.1076	.30987	.00331
Every day	618	.0705	.25596	.00273
Eating habits: Some foods (cake) consumption	**8847**			
Never	303	.0343	.18195	.00193
Less than a week	1748	.1976	.39818	.00423
Rare (1-3 times a week)	3535	.3996	.48985	.00521
Mostly(4-6 days a week)	2243	.2535	.43505	.00463
Every day	1018	.1150	.31909	.00339
Red Color Foods (cakes, pizza and sugar drinks) Index	**8100**			

Zero point	3447	.4255	.49445	.00549
1 Point	1883	.2325	.42244	.00469
2 Points	1264	.1561	.36293	.00403
3 Points	808	.0998	.29974	.00333
4 Points	459	.0566	.23114	.00257
5 points	239	.0296	.16937	.00188

3.4.Construction of Socio-Economic Status (SES) Index

Since the main objective of the study to understand the impact of the socio-economic status of the parents on the obesity status of the children, a Socio-Economic Status (SES) Index was created and parental and child-related factors were examined based on it. In the construction process of the SES Index, five different variables have been used which are mother's and father's educational and occupational status and relative welfare status of the household. Firstly, five different binary variables were created from these variables as described in Table 4. Then, the SES scores were summed up and a new index variable that varies between 0 and 6 was produced from newly constructed binary variables as lowest (0), low (1), lower-middle (2), upper-middle (3), high (4), highest (5).

Table 3.3. The variables used in the construction of SES Index

Variables	SES Score
Mother's education	
If she has more than secondary education	1
If she has primary or less education	0
Father's education	
If he has more than secondary education	1
If he has primary or less education	0
Mother's working status	
If she works as civil servant at the public sector or works as wage earner in the private sector or she is retired	1
If she is house-wife, student, unemployment or she is incapable to work	0
Father's working status	
If he works as civil servant at the public sector or works as wage earner in the private sector or he is retired	1
If he is a stay-at-home dad, student, unemployment or he is incapable to work	0
Welfare status of the household	
If the household income is easily sufficient for earning for a living or it is sufficient without any serious problem	1
If the household income is not sufficient or it barely makes both ends meet	0

In 2015, the Ministry of Health prepared the Food and Beverages Standards in Schools and listed the red category with high calorie, fat, sugar and salt foods and

beverages that are not recommended for excessive consumption (Food and Beverages Standards in Schools, 2015).

According to the guide of the Ministry of Health in 2016, the sale of red category foods was banned with the "Circular on Hygiene Inspection of Food Businesses to be Sold in School Canteens and Educational Institutions" published by the Ministry of Education (the MoE) (Circular, MoE, 2016).

In this study, a Red Color Food Index (RCFI) was created according to the frequency of unhealthy food and beverage which are chips, candies / chocolates, cakes, pizza and sugar drinks consumption of the children reported by mothers in a week. According to the RCFI if children eat unhealthy foods less than 4 days a week, they get zero point, if they eat one unhealthy food more often than 4 days a week, they get one point, if they eat two unhealthy foods more often than 4 days a week, they get two points, if they eat three unhealthy foods more than 4 days a week they get three points, if they eat four unhealthy foods more than 4 days a week they get four points, and those who eat all five more than four days a week, get five points. These are given below Table 3.4.

Table 3.4. The variables used in the construction of Red Color Foods Index (RCFI)

Variables	Red color Score
Consumption unhealthy food in RFC red category less than four days a week	0
Eating one unhealthy food more than four days a week	1
Eating two unhealthy food more than four days a week	2
Eating three unhealthy food more than four day a week	3
Eating four unhealthy food more than four day a week	4
Eating five (all of them) unhealthy food more than four day a week	5

We also created Red Color Food Risk Index (RCFRI) by categorizing the RCFI as low, medium and high-risk groups.

When each one of unhealthy food (chips, candies/chocolates, cakes, pizza, and sugar drink) consumption was “never”, “less than a week” and “1-3 day a week”,

“zero” point is given. When each one of unhealthy food (chips, candies/chocolates, cakes, pizza, and sugar drink) consumption were “4-6 days a week” and “everyday” given 1 point.

All points are summed under a scale between 0-5 points, and finally three groups were created as 0 named as “lower risk” group, 1-4 points are coded as 1 named as “medium risk”, 5 points is coded as 2, named as “high risk” group.

3.5.Definitions

Obesity is defined as the proportion of children with weight-for-height z-score values more than +2 SDs. (WHA 66th, 2017).

Many factors such as genetic, hormonal and biological factors can be responsible in childhood obesity.

*Genetic etiology***:** Obesity is classified under three main categories according to the genetic etiology as polygenic, syndromic and monogenic obesity. The obesity cases which start from infancy period should remind syndromic and monogenic obesity.

Polygenic Obesity: Predisposition to overeating as a result of polymorphisms on multiple genes and environmental factors affecting the individual with such genetic structure as well as many other factors such as nutritional habits identify the obesity of the individual.

*Syndromic Obesity***:** Short or mentally retarded obese individuals should be considered as the cases with syndromic obesity. Prader -Willi, Laurence- Moon-Biedl, Down, Cohen, Carpenter and Alstrom Syndromes may be samples of syndromic obesity.

Monogenic Obesity (single gene disorders): Obesity occurs due to a single gene disorder. Early onset of obesity and desire for overeating and eating attacks in form of crisis are typical characteristics of monogenic obesity. This group includes Leptin mutation or Leptin Deficiency, Leptin receptor gene mutation, POMC deficiency, Prohormone convertase 1 mutation, NTRK2 mutation.

Endocrine Causes: Cushing's syndrome, growth hormone, efficiency, hypothyroidism, pseudo hypoparathyroidism, hypogonadal syndromes are the endocrine diseases which may result in obesity.

Diagnosis of an obese or overweighed child based on percentile curves and calculations carry out the importance and use following indicators:

*Body Weight***:** Before weighing the children, accessories and shoes should be taken off and the children should be left with light clothes. The scale should be placed on a smooth and firm ground, weighing should be done in a light environment at room temperature, the scale should be calibrated, and weighing should be on empty stomach as much as possible.

*Body Length***:** The individual is asked to take off accessories such as hair clips, ribbon, band etc., and shoes before measuring the length. The correct position for body length measurement is a position where the back and shoulders are flat, the child looks forward, head, shoulders, hips, legs and heels are parallel to the measure, feet are slightly open to the sides and legs are flat. The WHO growth charts are performed by lying the children below two years of age and at a standing position for the children above two years. *If the length of a child younger than two years of age will be measured, 0.7 cm should be added into the measurement and marked on the charts. For the children above two years of age who cannot stand, length is measured on a lying position and 0.7 cm is subtracted from the length and result is marked on the chart.*

BMI results are compared with WHO standards. BMI is calculated as follows:

$$\text{BMI} = \frac{\text{Body Weight (kg)}}{\text{Body Length (m2)}}$$

After the calculations, one should look at the growth charts according to age and gender. If children's results are between 85 and 97 percentiles these children are defined as "overweighed" and results above 97 percentiles are defined as "obese" (Manuel of Counteracting Obesity, 2014).

3.6.Statistical Methods

The study includes both descriptive analyses, and a series of multivariate analyses with logistic regression in SPSS 23.0.

In the analyses, descriptive statistics were conducted for bivariate relationships, and ki square test for the initial relationships between the independent and covariate variables and child obesity.

Descriptive analysis, means and standard errors (SEs) were calculated for the whole sample and separately according to child's obesity. Ki square test were used to compare the characteristics of obese and non-obese children.

To test for the relative contribution of each of these variables for the probability of a child being obese, a series of logistic regression models that take the following basic form were used:

$$Z= \log (p/1-p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k$$

Where p is equal to the probability of an event occurring, ß represents the regression coefficients, and x represents k independent variables, some of which are interactions.

The logistic regression analyses were performed under 9 different models in order to understand the impact of SES index on obesity status of children (dependent variable of the study) under the control of other covariates in an additive way.

The description of the models is as follows:

Z = ß0 + ß1 (SES index) (Model 1)

Z = ß0 + ß1 (SES index) + ß2(sex) (Model 2)

Z = ß0 + ß1 (SES index) + ß2(sex) + ß3(Transport to school, BMI mother, BMI Father, HH diabetes) (Model 3)

Z = ß0 + ß1 (SES index) + ß2 (sex) + ß3(Transport to school, BMI mother, BMI Father, HH diabetes) + ß4 (Food consumption) (Model 4)

Z = ß0 + ß0 + ß1 (SES index) + ß2(sex) + ß3(Transport to school, BMI mother, BMI Father, HH diabetes) + ß4 (Food consumption) + ß5 (sleep duration) (Model 5)

Z = ß0 + ß1 (SES index) + ß2(sex) + ß3(Transport to school, BMI mother, BMI Father, HH diabetes) + ß4 (Food consumption) + ß5 (sleep duration) + ß6 (birth weight) (Model 6)

Z = ß0 + ß1(SES index) + ß2(sex) + ß3(Transport to school, BMI mother, BMI Father) + ß4 (Food consumption) + ß5 (sleep duration) + ß6 (birth weight) (Model 7)

$$Z = ß0 + ß1(\text{SES index}) + ß2(\text{sex}) + ß3(\text{Transport to school, BMI mother, BMI Father}) + ß4\ (\text{Food consumption}) + ß5\ (\text{sleep duration}) + ß6\ (\text{birth weight}) + ß7\ (\text{sugar drink}) \quad \text{(Model 8)}$$

$$Z = ß0 + ß1(\text{SES index}) + ß2(\text{sex}) + ß3(\text{Transport to school, BMI mother, BMI Father}) + ß4\ (\text{Food consumption}) + ß5\ (\text{sleep duration}) + ß6\ (\text{birth weight}) + ß7\ (\text{sugar drink}) + ß8\ (\text{Spending Time on Actively/vigorously Playing}) \quad \text{(Model 9)}$$

3.7 Limitations:

There exist several limitations of the study that are mainly originated from the data sets. These are as follows: (1) Regional analysis has not been done in the context of the study due to the fact that the study solely focuses on nationwide results on the topic. (2) Some of the obesity related factors did not take into account in the study, such as additional health problem (co-morbidity), mother obesity at the pregnancy, mother smoking situation, family structure/living with single mother and ethnicity.

All these limitations regarding with data sources may limit the results of the study in terms of their generalizations to overall population.

CHAPTER 4

RESULTS

4.1. Descriptive Results

This chapter aims to present some descriptive and multivariate results about on prevalence of obesity and overweight among children at age 7; children's and families socio-demographic and socioeconomic characteristics, nutrition (eating behaviors, red color food index) as well as school characteristics and obesity status of the children and its relationships with SES of households.

4.1.1. The Profile of Children

Table 4.1 shows that the majority (52 percent) among the children under examination in the thesis are male.

Approximately 20 percent of children are the members of a sport or dancing club. But 84 percent of the children allocate less than 1 hour per week for sports activities. Almost 15 percent of the children spend 2-6 hours per week for attending the sports activities. Only 2 percent of children attend sports activities more than 6 hours per week.

One third of children were inactive. Approximately 40 percent of children playing 1-2 hour/day who were making medium level exercises which is suggested by WHO and 34 percent of children made more than 2 h/day physical activity.

Slightly more than two-thirds of the children sleep 10 hours or more per day; while the remaining of them sleep less than 10 hours per day.

Around 57 percent of the children walk or use bicycle when they go to school. Another 35 percent of the children use motor-vehicle, mostly in the form of the school bus. For approximately 8 percent of the children, it is reported that they use mixed transportation modes in different school days.

Slightly more than 10 percent of the children's birth weight is reported as under 2500 gr. Most of the children's birth weight is in-between 2500-3499 gr (55 percent).

For a fourth of the children, the birth weight is reported to be between 3500 gr and 3999 gr. Only for 9 percent of the children, it is more than 4000 gr. For majority of the children (53 percent), the duration of breastfeeding is found to be 5-11 months. For approximately 35 percent of that it is reported as less than 5 months. For less than 9 percent of them, the duration of breastfeeding is declared as 12-23 months, while for only 3 percent of the children it is found to be over 24 months.

Table 4.1. Percentage of children by sex, times allocated for sport activities, spending time on actively/vigorously playing, sleeping duration, transportation type, birth weight and breastfeeding status.

Variables	Percent	Number of Cases
Sex		
Male	51.8	5086
Female	48.2	4739
Total	100.0	9825
Member sport or dancing club		
Yes	18.1	1707
No	81.9	7748
Total	100.0	9455
Attending sport activities (hour per week)		
Under 1 h	83.5	7897
2-5 h	14.5	1372
Over 6 h	2.0	191
Total	100.0	9460
Spending Time on Actively/vigorously Playing		
Not at all or less than 1 h/day	26.4	2424
1–2 h/day	39.4	3620
More than 2 h/day	34.1	3134
Total	100.0	9179
Sleeping duration of children (hour per day**)**		
Under 10h	32.1	2848
10h or more	67.8	6008
Total	100.0	8856
Transportation to school		
Walking/cycle	57.2	5516
Motor vehicle	34.5	3327
Both	8.4	807
Total	100.0	9650
Birth weight of children		
Under 2500g	10.3	933
2500-3499g	55.1	4968
3500-3999g	26.0	2348
4000 and more gr	8.6	773
Total	100.0	9023
Breastfeeding status of children (month)		
<5 m	34.9	2885
5-11 m	53.2	4397
12-23 m	8.9	735
Over 24 m	3.1	253

Total	100.0	8270

4.1.2. The Profile of Households

As seen in Table 4.2, approximately 15 percent of the households contain only 1 child while 46 percent of them contain 2 children. There are 3 or more children in around 40 percent of the households. Two-adult households seem to be the modal household type (71 percent). Slightly over 4 percent of the households cover only 1 adult, while one-fourth of the households contain 3 and more adults. Mean SD is 2.54 for the number of children; and 2.46 for the number of adults per household in COSI TUR-2016. Approximately 15 percent of the children under examination here live in a household covering a person with diabetes.

In terms of welfare status of the households, while 26 percent of household's welfare status were easily sufficient and 33 percent sufficient without serious problem. 30 percent of households declared their situation was barely sufficient and 12 percent of households reported that their welfare situation was not sufficient at all. It means every 4 in 10 households live in bad conditions.

An analysis of socio-economic status of the households by using the SES Index shows that approximately 19 percent of the children are living in the households with low/lowest SES Index while 37 percent of them are in the households with high/highest SES Index. The remaining 44 percent of the children belong to the households with the middle SES Index.

Table 4.2. Percentage of children by number of children in the HH, adults number in the HH, any person having diabetes in the HH, welfare status of households, socio-economic status (SES) of the households.

Variables	Percent/Mean	Number of Cases
Number of children in the household		
1	14.7	1372
2	45.5	4251
3	24.5	2288
4	8.9	830
5 +	6.4	610
Total	100.0	9351
Mean (SD): 2.54 (1.30)		
Number of adults in the household		
1	4.1	374
2	70.5	6462
3	12.0	1103
4	8.2	749
5 +	5.2	472
Total	100.0	9160
Mean (SD): 2.46 (1.19)		
Any person having diabetes in the household		
Yes	14.6	1403
No	85.4	8208
Total	100.0	9610
Welfare status of households		
Easily sufficient	26.2	2513
Sufficient without serious problem	33.0	3168
Barely sufficient	28.8	2761
Not sufficient at all	12.1	1159
Socio-economic status of the households (SES Index)		
Lowest	6.2	569
Low	12.5	1141
Lower middle	20.8	1888
Upper middle	23.0	2093
High	25.2	2294
Highest	12.2	1115
Total	100.0	9099

4.1.3. The Profile of Parents

The profile of parents has been examined according to the educational level, working status, and the obesity status of the mother and the father.

Table 4.3 shows that approximately 50 percent of the children in the sample lived with a mother with less than a secondary school education (8 percent illiterate, 38 percent literate/primary school); 18 percent live with a mother who completed secondary school, 23 percent with a mother possessing a high school diploma, 14 percent with a mother who had a university degree.

When it comes to the father's education level, it is seen that only 1.6 percent of the fathers were illiterate, and approximately 38 percent of the fathers were literate. 18 percent of the children in the sample live with a father possessing a secondary school diploma, 29 percent with a father possessing a high school and 20 percent with a father who had university degree.

The majority of mothers (78 percent) were not in the labor force but housewives; 18 percent of the mothers worked; 4 percent of the mothers were unemployed and only 0.6 percent of the mothers were student or retired. But conversely, 83 percent of the fathers worked, 14 percent of the fathers were unemployed, only 3 percent of the fathers were student, home maker or retired.

Mother's and father's BMI are based on self-report. Obesity and overweight were found the highest among the fathers (approximately 19 percent and 49 percent) than the mothers (16 percent and 35 percent). Mothers' normal BMI was higher (49 percent) than fathers' normal BMI which was 32 percent.

Table 4.3. Percentage of children by parent's education level, working status and obesity status.

Variables	Percent	Number of Cases
Educational level of mother		
Illiterate	8.1	778
Literate/ Primary	37.9	3649
Secondary	17.6	1694
High school	22.7	2188
University	13.7	1323
Total	100.0	9632
Educational level of father		
Illiterate	1.6	154
Literate/ Primary	32.1	3053
Secondary	18.2	1735
High school	28.6	2722
University	19.5	1856
Total	100.0	9519
Occupation status of mother		
Gov..Private. own	17.6	1689
House wife	78.1	7487
Student. retired.	.6	57
Unemployed	3.7	350
Total	100.0	9583
Occupation status of father		
Gov. Private. own	82.9	7751
Student. home maker. retired	3.3	308
Unemployed	13.8	1287
Total	100.0	9346
Obesity status of mother		
Normal	48.9	4318
Overweight	35.4	3123
Obese	15.7	1385
Total	100.0	8826
Obesity status of father		
Normal	32.2	2767
Overweight	49.0	4207
Obese	18.8	1615
Total	100.0	8589

4.1.4. Children's Eating Behaviors

This section examines the eating behavior of the children for some specific food types (chips, candy/chocolate, pizza, sugar drink) and consumption distribution per week.

Table 4.4 shows that diet frequency based on family reported 20 percent of children in the sample had one or more servings of chips, one-third (33 percent) had one or more servings of candy and chocolate, 37 percent had one or more servings of cake, 16 percent had one or more servings of pizza and 18 percent had one or more sugary drinks more than 4 days in a week. However, 80 percent of children had one or more servings of chips, 67 percent had one or more servings of candy and chocolate, 63 percent had one or more servings of cake, 84 percent had one or more servings of pizza and 82 percent had one or more sugary drinks less than 4 days in a week. Sugary drink consumption and chips consumption more than 4 per week were found lower (20 and 18) than candy and cake consumption (33 and 37). This is mainly caused by the Regulation of 2011 which prohibited the selling of chips and sugary drinks at school cafeterias and canteens (Table 4.4).

Table 4.4 shows that also consumption of harmful foods by days per week according to the red color foods and drinks category index points. According to the table, 42 percent of children eat all harmful foods less than four days a week, 23 percent of children eat one harmful food more than four days in a week, 16 percent of children eat two harmful foods, 10 percent of children eat three harmful foods, 6 percent of children eat four harmful foods; and 3 percent of children eat all 5 harmful foods more than four times in a week.

Table 4.4. Percentage of children by some unhealthy foods (chips, candy, pizza, sugary drink) consumption frequency per week based on mother's report and unhealthy diet (red color food) index points.

Variables	Percent	Number of Cases
Chips Consumption per week		
<4 days a week	80.2	7243
>= 4 days a week	19.8	1793
Total	100.0	9036
Candy-chocolate Consumption per week		
<4 days a week	67.4	6035
>= 4 days a week	32.6	2925
Total	100.0	8960
Cake Consumption per week		
<4 days a week	63.1	5586
>= 4 days a week	36.9	3261
Total	100.0	8847
Pizza, pide, hamburger, fried potato, sausage sandwich Consumption per week		
<4 days a week	84.3	7702
>= 4 days a week	15.7	1433
Total	100.0	9135
Sugar Drink Consumption per week		
<4 days a week	82.2	7213
>= 4 days a week	17.8	1563
Total	100.0	8776
Unhealthy diet (red color food) index points		
Zero	42.5	3447
1	23.2	1883
2	15.6	1264
3	10.0	808
4	5.7	459
5	3.0	239
Total	100.0	8101

4.1.5. Obesity status of children and its relationships with other factors

This section examines the obesity status of children and its relationships with sex, transportation mode to the school, birthweight, any person having diabetes in household (HH), and obesity status of mother and father.

Table 4.5 shows that obesity is higher among male students than female students (12 percent and 9 percent, respectively). There is a significant relationship between being male and obesity ($p<0.001$).

Obesity is higher (13 percent) among children who are using motor vehicle for transportation to school. If children go to school by walking or using a bicycle, obesity was found 9 percent. There is a significant relationship between transport to school with walking or using bicycle and obesity ($p < 0.001$)

Obesity increases when birth weight increase. Obesity was found lowest (8 percent) among the children with low birth weight (under 2499 g). The highest obesity ratio was found (16 percent) among the macrosomic babies (over 4000 g). When the birth weight was among 2500-3499 g and 3500- 3999 g, obesity was found to be 10 percent and 13 percent respectively. There is a significant relationship between increasing birth weight and obesity ($p < 0.001$).

If there is any person with diabetes in the HH, obesity was found approximately 13 percent vs 10 percent which no diabetic person in the HH. This result found significant ($p < 0.005$).

It has been seen that when the BMIs of the mother and the father increase, the obesity of the children also increases. When mother's BMI is thin/normal, overweight, obese; childhood obesity was found to be 7 percent, 12 percent and 18 percent respectively. There is a statistically significant relationship between BMIs of the mother and the father, and obesity ($p < 0.001$).

Table 4.5. Percentage of children obesity by gender, children's transportation to school, birth weight of children, any person with diabetes in the HH and obesity status of the mother and the father.

Variables	Non-obese	Obese	Total	Number of Cases
Gender				
Male	88.4	11.6	100.0	5086
Female	90.7	9.3	100.0	4738
Total	89.5	10.5	100.0	9824
Chi-Square=13.283 p<0.001				
Transportation to school				
Walking/bicycle	91.0	9.0	100.0	5516
Motor vehicle	87.2	12.8	100.0	3327
All of them	87.6	12.4	100.0	808
Total	89.4	10.6	100.0	9651
Chi-Square=34.759 p<0.001				
Birthweight (g)				
0-2499	92.2	7.8	100.0	934
2500-3499	90.3	9.7	100.0	4968
3500-3999	86.9	13.1	100.0	2348
4000-7000	84.2	15.8	100.0	773
Total	89.1	10.9	100.0	9023
Chi-Square= 47.463 p <0.001				
Any person with diabetes in the HH				
Yes	87.4	12.6	100.0	1403
No	89.9	10.1	100.0	8208
Total	89.5	10.5	100.0	9611
Chi-Square= 8.008 p <0.005				
Mother's BMI				
Thin/normal	92.6	7.4	100.0	4318
Overweight	88.0	12.0	100.0	3123
Obese	82.5	17.5	100.0	1385
Total	89.3	10.7	100.0	8826
Chi-Square= 122.464 p <0.001				
Father's BMI				
Thin. normal	93.7	6.3	100.0	2766
Overweight	89.9	10.1	100.0	4207
Obese	80.8	19.2	100.0	1615
Total	89.4	10.6	100.0	8588
Chi-Square= 179.803 p <0.001				

Table 4.6 shows that when the mother and father the education level increases, also the obesity of children increases. According to the education level of the mother (illiterate, literate/primary, secondary, high school, and university respectively),

obesity was found 7 percent, 9 percent, 6 percent, 10 percent, 12 percent, and 13 percent respectively. In addition, according to the education level of the father (illiterate, literate/primary, secondary, high school and university respectively), obesity was found 4 percent, 9 percent, 11 percent, 12 percent and 11 percent respectively. There is a statistically significant relationship between the mother and father education level and obesity ($p < 0.001$).

According to the employment status of the mother, the obesity rate was found higher (14 percent) among the children whose mothers are working either in the public or private sector, self-employed, or retired. However, if children's mother was a student, housewife or unemployed, the obesity was found 10 percent. Higher obesity rate among the children with a working mother suggests that third party care systems like nannies or crèches/kindergartens may have an effect on the dietary habits of the children. When evaluated by the education level employment status of the father, child obesity was found 11 percent among the children with a working father either in public or private sector, self-employed, or retired. However, if the father is unemployed, a student or working home-based, obesity was found only 5 percent. Findings are statistically significant. There is a statistically significant relationship between the mother's and father's employment status and obesity ($p < 0.001$).

According to the breastfeeding status, 12 percent of the children are obese within 0-5 months of breastfeeding. 11 percent of children are obese within 5-11 months of breastfeeding. 9 percent of the children are obese within 12-23 months of breastfeeding. 10 percent of the children are obese within over 24 months of breastfeeding which their breastfeeding duration was over 24 months. These results are not statistically significant ($p > 0.05$).

Table 4.6. Percentage of children obesity by the level of parents' education, occupation, employment status, and the months of breastfeeding.

Variables	Non-obese	Obese	Total	Total Number of Cases
Mother Education				
Illiterate	93.4	6.6	100.0	778
Literate/Primary	90.4	9.6	100.0	3649
Secondary	89.8	10.2	100.0	1694
High School	87.7	12.3	100.0	2187
University	87.3	12.7	100.0	1324
Total	89.5	10.5	100.0	9632
Chi-Square= 30.460 p <0.001				
Father Education				
Illiterate	96.1	3.9	100.0	154
Literate/ Primary	90.9	9.1	100.0	3053
Secondary	89.3	10.7	100.0	1735
High School	88.1	11.9	100.0	2722
University	88.8	11.2	100.0	1856
Total	89.5	10.5	100.0	9520
Chi-Square= 20.670 p <0.001				
Mather Occupation				
Student. housewife. unemployed	90.2	9.8	100.0	7876
Servant. private sector. own. retired	86.2	13.8	100.0	1707
Total	89.5	10.5	100.0	9583
Chi-Square= 22.944 p <0.001				
Father Occupation				
Student. home-based work. unemployed	94.8	5.2	100.0	1407
Servant. private sector. Own. retired	88.6	11.4	100.0	7940
Total	89.5	10.5	100.0	9347
Chi-Square= 49.504 p <0.001				
Breastfeeding				
0-5 M	88.3	11.7	100.0	2885
5-11M	89.5	10.5	100.0	4397
12-23 M	90.9	9.1	100.0	735
24 +	90.1	9.9	100.0	253
Total	89.2	10.8	100.0	8270
Chi-Square= 5.231 p =0.156 (p>0.05)				

Table 4.7 shows that in the household when the number of persons over 18 years old increase, obesity prevalence decreases. If there is one person in the household, obesity was found as approximately 15 percent. But if there are two, three, four and five persons in HH; obesity were found as 11 percent, 12 percent, 9 percent and 5 percent respectively. This can be explained with the food sharing in the

household. It depends on foods have to share with more people and or over 18 household members can work also everybody can eat regularly.

Table also shows the number of persons under age 18 in household and obesity situation of the children. Same situation has been seen with over 18-year persons in the household. There is a statistically significant between number of persons under 18 and over 18 years old person in household and obesity ($p < 0.001$). If there is one person over age 18 in the household, obesity is 18 percent but if there are 5 persons in HH, obesity was found only 3 percent. When two, three, four and five persons under age 1 are living in HH; obesity were found 12 percent, 8 percent and 4 percent respectively. This is mainly due to the fact that if there are more children under 19 in the household, they play with each other or cannot eat healthy food because of high price.

Table shows that obesity interestingly has been found higher among those who do sports than who do not. This relation between playing sports and obesity was statistically significant ($p < 0.002$). Obesity was found 10 percent among those who did not do sports at all, approximately 13 percent in those who do sports 1-4 hours a week or more. This is because fat children may already be doing sports.

Apart from children playing sports status table also shows that children spending time on actively/vigorously playing status in a week. In this analysis if children whose spending time on actively/vigorously playing was not at all or less than 1 h/day, obesity was found approximately 14 percent. When children spending time on actively/vigorously playing was 1–2 h/day, obesity was found 11 percent. But if children spending time on actively/vigorously playing was more than 2 h/day, obesity was found 8 percent. There is a statistically significant relationship between spending time on actively/vigorously playing and obesity ($p <0.001$).

Also, children sleep duration has been examined; it has been seen that when sleep duration was under 7 hours, obesity was found approximately 8 percent. When sleep duration was 7-9.9 hours' obesity was found 10 percent. For sleep duration above

10 hours, obesity was found approximately 11 percent. The results are not statistically significant (p> 795).

Table 4.7. Percentage of children obesity by the number of persons over and under age 18 in the HH, attending sports, spending time on actively/vigorously playing per week and sleep duration.

Variables	Non-obese	Obese	Total	Total Number of Cases
Number of over 18 years old person in house hold				
1	85.3	14.7	100.0	374
2	89.2	10.8	100.0	6462
3	87.9	12.1	100.0	1103
4	90.7	9.3	100.0	749
5	94.9	5.1	100.0	474
Total	89.3	10.7	100.0	9162
Chi-Square=25.686 p<0.001				
Number of household member under 18				
1	82.4	17.6	100.0	1373
2	88.3	11.7	100.0	4251
3	91.7	8.3	100.0	2288
4	95.9	4.1	100.0	830
5	96.7	3.3	100.0	609
Total	89.5	10.5	100.0	9351
Chi-Square=162.135 p<0.001				
Attending sports per week				
Never	90.1	9.9	100.0	7897
1-4 H	87.1	12.9	100.0	1372
>=5 H	87.4	12.6	100.0	191
Total	89.6	10.4	100.0	9460
Chi-Square=12.160 p<0.002				
Spending time on actively/vigorously playing				
Not at all or less than 1 h/day	86.3	13.7	100.0	2424
1–2 h/day	89.0	11.0	100.0	3620
More than 2 h/day	92.0	8.0	100.0	3134
Total	89.3	10.7	100.0	9179
Chi-Square=47.532 p<0.001				
Sleep duration (h)				
Under 7	92.3	7.7	100.0	13
7-9.9	89.9	10.1	100.0	2835
Above 10	89.5	10.5	100.0	6008
Total	89.7	10.3	100.0	8856
Chi-Square=0.459 p>795				

Table 4.8 shows that when chips, candies/chocolate and cake consumption were low, obesity was found that 11 percent, 11 percent, 12 percent respectively. But these consumptions were high, obesity was found 8 percent, 10 percent and 10 percent respectively. Relationship between chips and cake consumption and obesity found that statistically significant ($p < 0.001$ and $p < 0.004$) The results may indicate that mother

of obese children may have had restrictions on the obese child or the mother may say that she eats little to avoid being blamed.

When sugar drink's consumption was low or high, obesity was found 11 percent. There is no statistically significant relationship with candies/chocolate and sugar drink consumptions and obesity.

When pizza consumption evaluated, obesity was found 7 percent, 11 percent, 11 percent respectively when pizza consumption is never, 1-6 days and everyday per week. It means obesity increases as pizza consumption increases and there is a statistically significant relationship with pizza consumption and obesity ($p < 0.000$).

Table 4.8. Percentage of children obesity by unhealthy food consumption (chips, candy/chocolate, cake, pizza, sugary drink) per week.

Variables	Non-Obese	Obese	Total	Total Number of Cases
Chips consumption				
Low	88.7	11.3	100.0	7243
High	92.5	7.5	100.0	1793
Total	89.5	10.5	100.0	9036
Chi-Square= 22.393 p <0.001				
Candy/chocolate consumption				
Low	89.1	10.9	100.0	6035
High	89.9	10.1	100.0	2925
Total	89.3	10.7	100.0	8960
Chi-Square= 1.324 p =0.25				
Cake consumption				
Low	88.5	11.5	100.0	5586
High	90.4	9.6	100.0	3261
Total	89.2	10.8	100.0	8847
Chi-Square= 8.217 p =0.004				
Sugar drink consumption				
Low	89.4	10.6	100.0	7214
High	89.1	10.9	100.0	1563
Total	89.4	10.6	100.0	8777
Chi-Square= 0.179 p =0.672				
Pizza, pide, hamburger, fried potato, sausage sandwich consumption				
Never	93.0	7.0	100.0	1074
1-6 day	88.8	11.2	100.0	6629
Everyday	89.3	10.7	100.0	1432
Total	89.3	10.7	100.0	9135
Chi-Square=17.587 p=.000				

*Low: Never, low than 1 per week, seldom (1-3 days per week) *High: Frequently (4-6 days a week), everyday

Table 4.9 shows that red color food and drink category consumption index by 7 years old children. Obesity is more common (12 percent) in the group that eats less

than four days a week who got zero point. If children eat one, two, three and four kinds from unhealthy foods of one, two, three and four points more than four days a week, obesity was found 11 percent, 9 percent, 9 percent and 8 percent respectively. Obesity appears to be high in the group consuming the least amount of unhealthy foods. Because these group is already obese, and they may have restrictions on eating these kinds of food.

Obesity was found as 12 percent among those who eat all unhealthy foods with 5 index points more than 4 days a week. Obesity is also high among this group. Because obesity increases as unhealthy food consumption increases. There is a statistically significant relationship between red color food and drink category consumption index and obesity (p=0.026).

Table 4.9. Percentage of obesity status of children according to the Red Color Food Category (RCFC) Index

Red Color Food Category Index Points	Non-obese	Obese	Total	Total Number of Cases
0	88.4	11.6	100.0	3447
1	88.9	11.1	100.0	1883
2	90.7	9.3	100.0	1264
3	90.7	9.3	100.0	808
4	92.4	7.6	100.0	459
5	87.9	12.1	100.0	240
Total	89.3	10.7	100.0	8101

Chi-Square= 12.762 p =0.026

4.1.6. Children Obesity and its relationships with SES of households

Table 4.10 shows that obesity increases as socio economic status (SES) index increases. Obesity was found the lowest (5 percent) in the lowest SES index group vs the highest (15 percent) in the highest SES group. When the SES index was low, lower middle, upper middle and high group respectively, obesity was found 8 percent, 9 percent, 11 percent and 12 percent respectively. There were found that statistically significant relationship between socio economic status (SES) index and obesity (p <0.001).

Table 4.10. Percentage of children obesity by Socio-Economic Status (SES) Index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	95.4	4.6	100.0	569
Low	92.1	7.9	100.0	1141
Lower middle	90.6	9.4	100.0	1888
Upper middle	89.2	10.8	100.0	2093
High	88.1	11.9	100.0	2294
Highest	85.4	14.6	100.0	1114
Total	89.5	10.5	100.0	9099

Chi-Square=57,126 P<0.001

Table 4.11 shows that among male children, if SES index was the lowest, obesity was found 5 percent. When SES index was low, lower middle, upper middle, high and highest; obesity was found as 9 percent, 9 percent, 12 percent, 13 percent, and 19 percent, respectively.

Table 4.12 shows that among female children, if SES index was the lowest, obesity was found 4 percent. SES index was low, lower middle, upper middle, and high and highest; obesity was found 7 percent; 10 percent; 10 percent, 11 percent, and 11 percent respectively. There is statistically significant relationship between SES index and obesity in either gender group ($p < 0.001$).

There is more relation between the SES and obesity in male children than female children. The relation between SES and obesity was found to be stronger among the male than female children.

Table 4.11. Percentage of male children obesity by SES Index

SES Index	Non-obese	Obese	Total	Number of Cases
Lowest	95,3	4.7	100.0	316
Low	91.0	9.0	100.0	579
Lower middle	90.7	9.3	100.0	958
Upper middle	88.1	11.9	100.0	1116
High	87.0	13.0	100.0	1181
Highest	81.3	18.7	100.0	528
Total	88.4	11.6	100.0	4679

Chi-Square = 52.128 $p<0.001$

Table 4.12. Percentage of female children obesity by SES index of the households

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	95.6	4.4	100.0	251
Low	93.1	6.9	100.0	563
Lower middle	90.5	9.5	100.0	931
Upper middle	90.5	9.5	100.0	977
High	89.3	10.7	100.0	1113
Highest	89.1	10.9	100.0	586
Total	90.6	9.4	100.0	4421

Chi-Square = 15.301 $p<0.001$

Table 4.13 shows that obesity by the SES index in children going to school by walking/bicycle. In the categories of lowest, low, lower middle, upper middle, high and highest SES, obesity was found 3 percent, 8 percent, 8 percent, 10 percent, 10 percent, and 14 percent respectively.

Table 4.14 shows that obesity by SES index in children going to school by motor vehicle. In the categories of lowest, low, lower middle, upper middle, high and highest SES index, obesity was found 7 percent and 6 percent. If SES were lower middle and upper middle, obesity was found 12 percent. But if SES were high and highest level, obesity was found 14 and 15 percent respectively. It means that using motor vehicle to go to school at every SES level, obesity is increasing compared to walking. It has been seen that there is a statistically significant relationship between SES index with children go to school by walking/bicycle and by motor vehicle and obesity ($p <0.001$ and $p <0.011$).

Tables 4-13 and 4-14 also shows a significant relationship between SES and obesity persists when children go to school by walking or by motor vehicle. There is no interaction between them.

Table 4.13. Percentage of children obesity who go to school with walking/bicycle by SES index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	96.7	3.3	100.0	396
Low	91.7	8.3	100.0	842
Lower middle	92.0	8.0	100.0	1238
Upper middle	91.1	9.9	100.0	1242
High	90.3	9.7	100.0	1058
Highest	85.6	14.4	100.0	305
Total	91.1	8.9	100.0	5081

Chi-Square = 30.967 $p<0.001$

Table 4.14. Percentage of children obesity who go to school with motor vehicle by SES index

SES Index	Non-obese	Obese	Total	Number of Cases
Lowest	92.7	7.3	100.0	124
Low	93.6	6.4	100.0	218
Lower middle	87.8	12.2	100.0	482
Upper middle	87.6	12.4	100.0	645
High	86.0	14.0	100.0	968
Highest	85.5	14.5	100.0	708
Total				3145

Chi-Square = 14.918 $p=0.011$

Table 4.15 shows that when SES index was lowest and low, obesity was found 11 percent. However, obesity was found 11 percent, 13 percent, 12 percent, and 17 percent respectively in the lower middle, upper middle, high and highest SES categories. There is no statistical significance between SES index with children use of all transportation modes and obesity (p=0.789).

Table 4.15. Percentage of children obesity who go to school with walking/bicycle/motor vehicle by SES index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	89.5	10.5	100.0	38
Low	89.5	10.5	100.0	57
Lower middle	88.6	11.4	100.0	140
Upper middle	87.2	12.8	100.0	179
High	88.3	11.7	100.0	248
Highest	83.0	17.0	100.0	94
Total	87.6	12.4	100.0	756

Chi-Square = 2.417 p=0.789

Table 4.16 shows that percentage of children obesity with birthweight under 2500 gr by SES index. When SES index was lowest and low, obesity was found approximately 1 and 6 percent. However, obesity was found 13 percent, 7 percent, 9 percent, and 6 percent in the lower middle, upper middle, high and highest SES index categories, respectively. There is statistically significant relationship between SES index and obesity in children with under 2500 g birthweight (p=0.023).

Table 4.16. Percentage of children obesity with birth weight under 2500 gr by SES index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	98.7	1.3	100.0	75
Low	94.3	5.7	100.0	122
Lower middle	87.0	13.0	100.0	200
Upper middle	92.7	7.3	100.0	177
High	91.0	9.0	100.0	189
Highest	94.3	5.7	100.0	88
Total	91.9	8.1	100.0	851

Chi-Square 12,997 p=0.023

Table 4.17 shows that obesity status of children by SES index in children with between 2500 g - 3499 g birthweight. When SES index is lowest, obesity was found 4 percent. If SES index is low, lower middle, upper middle, high and highest, obesity was found 9 percent, 7 percent, 11 percent,10 percent, and 13 percent respectively. It is seen that obesity increases as the SES improves and there is statistically is significant relationship between SES index and obesity in children with 2500 g - 3499 g birth weight ($p < 0.001$).

Table 4.17. Percentage of children obesity of with birth weight between 2500 g – 3499 g by SES index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	96.0	4.0	100.0	277
Low	90.8	9.2	100.0	534
Lower middle	92.8	7.2	100.0	916
Upper middle	89.3	10.7	100.0	1074
High	89.7	10.3	100.0	1228
Highest	86.9	13.1	100.0	619
Total	90.4	9.6	100.0	2648

Chi-Square 26.974 $p<0.001$

Table 4.18 shows the obesity by SES index in children with 3500 g-3999g birth weight. It is clearly seen that when the birthweight of children is between 3500 g-3999 g, obesity increases at every SES index level and there is statistically significant correlation between SES index and obesity (p =0.005). When SES index was lowest, obesity was found 8 percent. If SES index were low, lower middle, upper middle, high and highest level, obesity was found 9 percent, 13 percent, 11 percent, 15 percent and 17 percent respectively.

Table 4.18. Percentage of children obesity with birth weight between 3500 - 3999gby SES index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	91.9	8.1	100.0	86
Low	91.4	8.6	100.0	255
Lower middle	87.1	12.9	100.0	450
Upper middle	89.2	10.8	100.0	529
High	84.6	15.4	100.0	603
Highest	82.6	17.4	100.0	287
Total	87.0	13.0	100.0	2210

Chi-Square 16.533 p=0.005

Table 4.15, 4-16; 4-17 and 4-18 show that birth weight does not affect relationship between the SES index and obesity. In each group, obesity shows the same pattern with SES index.

Table 4.19 shows the obesity status by SES index in children with over 4000 g birth weight (macrosomia). In this group when SES index was lowest, obesity was found 11 percent. If SES index was low and lower middle, obesity was found 8 percent and 14 percent respectively. However, SES index in upper middle, high and highest level, obesity was clearly growing up to 20 percent, 12 percent and 22 percent, respectively. There is statistically is significant relationship between SES index and obesity in children with over 4000 g birth weight (p=0.026).

Table 4.19. Percentage of children obesity with birth weight between 4000 g-7000g by SES index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	88.6	11.4	100.0	35
Low	92.1	7.9	100.0	101
Lower middle	85.9	14.1	100.0	156
Upper middle	80.2	19.8	100.0	172
High	88.4	11.6	100.0	172
Highest	77.8	22.2	100.0	90
Total	85.1	14.9	100.0	726

Chi-Square 12.779 p=0.026

Table 4.20 shows the obesity status by SES index in children living any person with diabetes in HH. When SES was lowest, obesity was found only 4 percent. But as SES improved from low to lower middle, upper middle, high and highest; obesity was found 10 percent, 12 percent, 14 percent and 16 percent respectively.

In case of diabetes the increase of obesity compared of SES level is not statistically significant ($p = 0.086$).

However, while obesity increases with wealth, obesity decreases in the richest group and the rational significance may be weakened. The richest group may also be aware of diabetes.

Table 4.20. Percentage of childhood obesity with any person with diabetes in the HH by SES Index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	95.8	4.2	100.0	71
Low	90.4	9.6	100.0	198
Lower middle	87.8	12.2	100.0	255
Upper middle	86.2	13.8	100.0	318
High	83.9	16.1	100.0	280
Highest	87.0	13.0	100.0	169
Total	87.3	12.7	100.0	1291

Chi-Square 9.642 p = 0.086

Table 4.21 shows the obesity status by SES index in children living in HH without any person with diabetes. Obesity was found only 4 percent, when SES is lowest. But when SES level is improved as low, lower middle, upper middle, high and highest, obesity was found 8 percent, 9 percent, 10 percent, 11 percent, and 15 percent, respectively.

If there is any person without diabetes in the household, relationship between the SES index and obesity was found significant (p = 0.000).

Table 4.21. Percentage of obesity status of children any person without diabetes in the HH according to the SES Index

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	95.7	4.3	100.0	489
Low	92.4	7.6	100.0	934
Lower middle	91.0	9.0	100.0	1615
Upper middle	89.9	10.1	100.0	1755
High	88.8	11.2	100.0	2001
Highest	85.0	15.0	100.0	941
Total	89.9	10.1	100.0	7735

Chi-Square 9.642 p =0.000

Table 4.22 shows the obesity status by SES index in children with normal BMI mother. Obesity was found approximately 3 percent and 4 percent when SES is low and lowest. Obesity was found 7 percent in the lower middle, upper middle and high level SES. Obesity was found 12 percent in highest level SES. It has been seen that as SES level improves, the obesity of children whose mother is normal obesity increases. There is statistically significant relationship between SES index and obesity in children with normal BMI mother ($p < 0.001$).

Table 4.22. Percentage of children obesity by SES Index with normal BMI mother.

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	96.6	3.4	100.0	234
Low	96.3	3.7	100.0	407
Lower middle	93.3	6.7	100.0	700
Upper middle	92.8	7.2	100.0	899
High	92.6	7.4	100.0	1139
Highest	87.9	12.1	100.0	736
Total	92.5	7.5	100.0	4115

Chi-Square =37.340 $p < 0.001$

Table 4.23 shows that when SES level was low, lowest, lower middle, upper middle, high and highest, obesity approximately was found 5 percent, 9 percent, 8 percent, 14 percent, 15 percent, and 18 percent respectively. It has been seen that as SES level improves, the obesity of children whose mother is overweight increases. There is statistically significant relationship between SES index and obesity in children with overweight mother ($p < 0.001$).

Table 4.23. Percentage of children obesity by SES Index with overweight BMI mother.

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	95.5	4.5	100.0	156
Low	91.0	9.0	100.0	365
Lower middle	91.8	8.2	100.0	672
Upper middle	85.7	14.3	100.0	755
High	85.1	14.9	100.0	634
Highest	82.4	17.6	100.0	272
Total	87.8	12.2	100.0	2954

Chi-Square 37.683 $p < 0.001$

Table 4.24 shows that obesity approximately was found 10 percent, 18 percent, 17 percent, 20 percent, 21 percent, and 23 percent respectively, when SES was low, lowest, lower middle, upper middle, high and highest level, respectively. It has been seen that as SES level improves, the obesity of children whose mother is obese increases. On the other hand, at every SES level obese mother's child have been found more obese than normal or overweight mother's children. There is statistically significant relationship between SES index and obesity in children with obese mother ($p < 0.001$).

Tables 4-22, 23, 24 shows that when relationship SES and obesity is evaluated according to the mother's BMI relationship continues in each mother's BMI category and as SES improves obesity increases. It cannot be mentioned as an interaction.

Table 4.24. Percentage of children obesity by SES Index with obese BMI mother

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	90.2	9.8	100.0	51
Low	82.3	17.7	100.0	164
Lower middle	83.1	16.9	100.0	325
Upper middle	80.4	19.6	100.0	388
High	78.9	21.1	100.0	421
Highest	77.4	22.6	100.0	199
Total	80.7	19.3	100.0	1548

Chi-Square 22.261 $p < 0.001$

Table 4.25 shows the obesity status of children by SES index with normal BMI father. Obesity was found 3 percent when SES index are lowest. When SES index was low and lower middle, obesity was found as 4 percent. But SIS index were upper middle, high and highest; obesity was found 7 percent, 8 percent, and 10 percent, respectively. As SES improves, child obesity increases gradually. There is statistically significant relationship between SES index and obesity in children with obese normal BMI father (p=0.004).

Table 4.25. Percentage of children obesity by SES Index with normal BMI father.

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	96.8	3.2	100.0	216
Low	95.6	4.4	100.0	340
Lower middle	95.6	4.4	100.0	543
Upper middle	92.7	7.3	100.0	658
High	92.1	7.9	100.0	582
Highest	90.5	9.5	100.0	306
Total	93.6	6.4	100.0	2645

Chi-Square 17.336 p=0.004

Table 4.26 shows that children obesity was found approximately 4 percent if SES index is lowest when father BMI overweight. If SES index is low, lower middle, upper middle, high and highest; obesity was also found respectively 8 percent, 10 percent, 9 percent, 11 percent, and 16 percent respectively. There is a statistically significant relationship between SES index and obesity in children with overweight father ($p < 0.001$).

Table 4.26. Percentage of children obesity by SES Index with overweight BMI father

SES Index	Non-obese	Obese	Total	Number of Cases
Lowest	95.6	4.4	100.0	226
Low	91.9	8.1	100.0	457
Lower middle	89.9	10.1	100.0	810
Upper middle	90.8	9.2	100.0	861
High	89.5	10.5	100.0	1138
Highest	84.5	15.5	100.0	534
Total	89.8	10.2	100.0	4026

Chi-Square 28.199 $p<0.001$

Table 4.27 shows that if children's father are obese, obesity was found 10 percent, 18 percent, 17 percent, 20 percent, 21 percent, and 23 percent in the lowest, low, lower middle, upper middle, high, and highest levels of SES respectively and there is no statistically significant obesity and SES index with obese fathers (p=0.241).

If father's BMI status is normal, children are less likely to get obesity and increase gradually in SES level changes. But when the father is overweight and obese, children obesity reaches very high values.

Table 4.25, 26 and 27 shows that when the relationship between SES and child obesity is evaluated according to the father's BMI, the relationship continues in each father's BMI category (normal, overweight and obese) and improved SES also increases obesity. So, here we did not observe any interactions.

Table 4.27. Percentage of children obesity by SES Index with obese BMI father

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	90.2	9.8	100.0	51
Low	82.3	17.7	100.0	164
Lower middle	83.1	16.9	100.0	325
Upper middle	80.4	19.6	100.0	388
High	78.9	21.1	100.0	421
Highest	77.4	22.6	100.0	199
Total	80.7	19.3	100.0	1548

Chi-Square = 6.741 p=0.241

Table 4.28 shows that obesity status by SES index in children with red color food index (RCFI) score is 'zero'. RCFI score 'Zero" point means the group that consumes the least amount of 5 unhealthy foods or named red color foods (which are chips, candies/chocolate, cakes, pizza and sugar drinks) in other words those who eat less than 4 days a week. In this group, obesity was found approximately 5 percent at

lowest SES index level. Obesity is approximately 8 percent, 10 percent, 11 percent respectively, 13 percent, and 16 percent respectively in line with SES level low, lower middle, and upper middle, high and highest. There is a statistically significant relationship between obesity and SES index in children with red color food index (RCFI) score is 'zero' ($p < 0.001$).

Table 4.28. Percentage of obesity status by SES index in children with red color food index (RCFI) score is 'Zero'

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	95.5	4.5	100.0	198
Low	91.7	8.3	100.0	360
Lower middle	89.6	10.4	100.0	586
Upper middle	89.0	11.0	100.0	721
High	87.4	12.6	100.0	886
Highest	83.6	16.4	100.0	513
Total	88.5	11.5	100.0	3264

Chi-Square = 26.981 $p < 0.001$

Table 4.29 shows that obesity status by SES index in children with red color food index (RCFI) score is ‘1’. RCFI score is ‘1” point means the group that eating one of 5 unhealthy food types 5 unhealthy foods or named red color foods (which are chips, candies/chocolate, cakes, pizza and sugar drinks) more than 4 days a week. In this group at the lowest SES level obesity was found approximately 3 percent. When SES is low, lower middle, upper middle and high level obesity was found approximately 10 percent, 11 percent, 11 percent, and 13 percent respectively. But obesity was found 10 percent at the highest SES index level. There were no found statically significant between obesity and SES index in children with red color food index (RCFI) score is ‘1’ (p=0.211).

Table 4.29. Percentage of obesity status by SES index in children with red color food index (RCFI) score is ‘1’

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	96.7	3.3	100.0	90
Low	90.2	9.8	100.0	204
Lower middle	89.0	11.0	100.0	328
Upper middle	88.6	11.4	100.0	420
High	87.5	12.5	100.0	510
Highest	89.6	10.4	100.0	230
Total	89.1	10.9	100.0	1782

Chi-Square = 7.132 p =0.211

Table 4.30 shows that obesity status by SES index in children with red color food index (RCFI) score is ‘2’. RCFI score is ‘2” point means that this group 2 pest from 5 unhealthy foods or named red colored foods (which are chips, candies/chocolate, cakes, pizza and sugar drinks) are eaten frequently. In at the lowest SES index level, obesity was found approximately 9 percent. When SES improved as low, lower middle, upper middle, and obesity was found approximately 7 percent, 6 percent, 8 percent respectively. But at the high and highest SES index level, obesity was found 13 percent and 14 percent. As unhealthy foods consumption increases from this results obesity also increases at the SES index high and highest level. There is statistically significant relationship between obesity and SES index in children with red color food index (RCFI) score is “2” (p=0.03).

Table 4.30. Percentage of obesity status by SES index in children with red color food index (RCFI) score is ‘2’

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	91.5	8.5	100.0	59
Low	93.0	7.0	100.0	142
Lower middle	93.8	6.2	100.0	242
Upper middle	92.1	7.9	100.0	317
High	87,4	12,6	100,0	286
Highest	85.9	14.1	100.0	156
Total	90.6	9.4	100.0	1202

Chi-Square = 12.213 p =0.03

Table 4.31 shows that obesity status by SES index in children with red color food index (RCFI) score is ‘3’. RCFI score ‘3’ point means that this group 3 from 5 unhealthy foods or named red color foods (which are chips, candies/chocolate, cakes, pizza and sugar drinks) are eaten frequently. Obesity was found approximately zero percent at the lowest SES index level. It has been seen that obesity was found approximately 7 percent and 10 percent in low and lower middle SES categories. At the upper middle and high level SES index, obesity was the same (7 percent). But at the highest SES level, obesity was found 14 percent. There is no statistically significant between obesity status and SES index in children with red color food index (RCFI) score is ‘3 (p=0.06).

Table 4.31. Percentage of obesity status by SES index in children with red color food index (RCFI) score is “3”

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	100.0	0.0	100.0	35
Low	93,5	6,5	100,0	92
Lower middle	89,9	10,1	100,0	207
Upper middle	93,1	6,9	100,0	173
High	93,1	6,9	100,0	173
Highest	85.9	14.1	100.0	85
Total	90.5	9.5	100.0	755

Chi-Square = 10.288 p =0.06

Table 4.32 shows that obesity status by SES index in children with red color food index (RCFI) score is ‘4’. RCFI score is ‘4” point means that this group 4 from 5 unhealthy foods or named red color foods (which are chips, candies/chocolate, cakes, pizza and sugar drinks) are eaten frequently. Obesity was found zero percent at the lowest and low SES index levels. When SES improves as lower middle and high level obesity was found approximately 7 percent and 9 percent, but obesity was found 10 percent at the highest SES level. There is no statistically significant between obesity status and SES index in children with red color food index (RCFI) score is ‘4” (p=0.418).

Table 4.32. . Percentage of obesity status by SES index in children with red color food index (RCFI) score is “4”

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	100.0	0.0	100.0	27
Low	100.0	0.0	100.0	59
Lower middle	92.7	7.3	100.0	109
Upper middle	90.9	9.1	100.0	99
High	90.2	9.8	100.0	92
Highest	9.00	10.0	100.0	30
Total	92.5	7.5	100.0	416

Chi-Square = 4.980 p = 0.418

Table 4.33 shows that obesity status by SES index in children with red color food index (RCFI) score is ‘5’. RCFI score is ‘5” point means that more than 4 of the unhealthy foods (all of them) are eaten per week. Obesity was found zero percent at the lowest SES index level. When SES index level were low, upper middle, high and highest, obesity was found approximately 16 percent, 14 percent, 15 percent, and 27 percent respectively. But at the lower middle SES index level, obesity was interestingly found only 6 percent. There is no statistically significant between obesity status and SES index in children with red color food index (RCFI) score is ‘5’ (p=0.06).

Tables 4-29 and Table 4.33 also shows that obesity status by SES index in children with Red Color Food Index (RCFI) score relationship between SES and obesity continues almost for every level of RCFI. There is no marked interaction.

Table 4.33. Percentage of obesity status by SES index in children with red color food index (RCFI) score is ‘5’

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	100.0	0.0	100.0	23
Low	84.0	16.0	100.0	25
Lower middle	94.1	5.9	100.0	51
Upper middle	86.3	13.7	100.0	51
High	84.8	15,2	100,0	46
Highest	72,7	27,3	100,0	22
Total	87.6	12.4	100.0	218

Chi-Square = 10.458 p = 0.06

Table 4.34 shows that obesity status of children by SES Index with RCFI score is lower risk group. RCFI score lower risk group means those who get "zero" point from unhealthy food **(**chips, candies/chocolates, cake, pizza, sugary drink) consumption (never, less than once a week, 1-3 days a week=0, 4-6 days a week and every day=1). In this group if SES index was lowest level, obesity was found approximately 5 percent. When SES index improved as low, lower middle, upper middle, high and highest level, obesity was found approximately 8 percent, 10 percent, 11 percent, 13 percent, and 16 percent respectively. There is statistically significant relationship between obesity and SES index in children with RCFI score is lower risk group ($p < 0.001$).

Table 4.34. Percentage of obesity status by SES Index in children with RCFI score is lower risk group.

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	95.5	4.5	100.0	198
Low	91.7	8.3	100.0	360
Lower middle	89.6	10.4	100.0	586
Upper middle	89.0	11.0	100.0	721
High	87.4	12.6	100.0	886
Highest	83.6	16.4	100.0	513
Total	88.5	11.5	100.0	3264

Chi-Square =26.981 $p<0.001$

Table 4.35 shows that obesity status of children by SES Index with RCFI score is medium risk group. RCFI score is medium risk group means who get "1-4" point from unhealthy food **(**chips, candies/chocolates, cakes, pizza, sugar drink) consumption (never, less than once a week, 1-3 days a week=0, 4-6 days a week and every day=1).

Obesity was found approximately 4 percent, at lowest SES index level. When SES index improves as low, lower middle, upper middle, high and highest level, obesity was found approximately 8 percent, 9 percent, 10 percent, 11 percent, and 12 percent respectively. There is statistically significant relationship between obesity and SES index in children with RCFI score is medium risk group (p=0.003).

Table 4.35. Percentage of obesity status by SES Index in children with RCFI score is medium risk group

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	96.2	3.8	100.0	211
Low	92.4	7.6	100.0	498
Lower middle	91.0	9.0	100.0	885
Upper middle	89.7	10.3	100.0	999
High	88.7	11.3	100.0	1060
Highest	87.8	12.2	100.0	501
Total	91.1	9.9	100.0	4154

Chi-Square =17.977 p=0.003

Table 4.36 shows that obesity status of children by SES Index with RCFI score is high risk group. RCFI score is high risk group means who get "5" point from unhealthy food **(**chips, candies/chocolates, cakes, pizza, sugar drink) consumption (never, less than once a week, 1-3 days a week=0, 4-6 days a week and every day=1).

In this group if SES index was lowest, obesity was found zero percent. When SES index improved as low, upper middle, high and highest level; obesity was found approximately 16 percent, 14 percent, 15 percent, and 27 percent respectively. But at SES index lower middle level, obesity was found 6 percent. There is no statistical significance between obesity status and SES index in children with RCFI score is high risk group (p=0.06).

Table 4.36. Percentage of obesity status by SES Index in children with RCFI score is high risk group.

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	100.0	0	100.0	23
Low	84.0	16.0	100.0	25
Lower middle	94.1	5.9	100.0	51
Upper middle	86.3	13.7	100.0	51
High	84.8	15.2	100.0	46
Highest	72.7	27.3	100.0	22
Total	87.6	12.4	100.0	218

Chi-Square =10.458 p=0.06

Table 4.34, 35 and 36 shows that when the RCFI is grouped, when Red Color Food Risk Index (RCFRI) evaluated, the relationship between SES and obesity continues regardless of RCFI unhealthy food consumption pattern. There is no interaction. RCFRI does not affect the size of the relationship between SES and obesity.

Table 4.37 shows that obesity status by SES Index in children with physical activity status: spending time on actively/vigorously playing, not at all or less than 1 h/day in a week.

In this group children physical activity was “not at all or less than 1 h/day” in a week and when SES index was lowest level, obesity was found 6.8 percent. When SES index improved as low, lower middle, upper middle, high and highest level; obesity was found approximately 8.9 percent, 14.6 percent, 14.1 percent, and 13.2 percent respectively. There is statistically significant relationship between obesity and SES index in children with physical activity status is spending time on actively/vigorously playing, not at all or less than 1 h/day in a week (p=0.000).

Table 4.37. Percentage of obesity status by SES Index in children with physical activity status: spending time on actively/vigorously playing, not at all or less than 1 h/day in a week.

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	93.2	6.8	100.0	133
Low	91.1	8.9	100.0	291
Lower middle	85.4	14.6	100.0	464
Upper middle	85.9	14.1	100.0	481
High	86.8	13.2	100.0	597
Highest	79.2	20.8	100.0	283
Total	86.3	13.7	100.0	2250

Chi-Square =23.699 p=0.000

Table 4.38 shows that obesity status by SES Index in children with physical activity status: spending time on actively/vigorously playing, 1–2 h/day in a week.

In this group which is children physical activity were1–2 h/day in a week, and SES index was lowest level, obesity was found 4.6 percent. When SES index improved as low, lower middle, upper middle, high and highest level; obesity was found approximately 11 percent, 10 percent, 11 percent, 12 percent, and 13 respectively. There is statistically significant relationship between obesity and SES index in children with physical activity status is spending time on actively/vigorously playing, 1-2 h/day in a week (p=0.023).

Table 4.38. Percentage of obesity status by SES Index in children with physical activity status: spending time on actively/vigorously playing, 1–2 h/day in a week.

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	95.4	4.6	100.0	217
Low	89.0	11.0	100.0	355
Lower middle	89.6	10.4	100.0	685
Upper middle	89.5	10.5	100.0	791
High	88.1	11.9	100.0	849
Highest	86.6	13.4	100.0	479
Total	89.1	10.9	100.0	3376

Chi-Square =13.039 p=0.023

Table 4.39 shows that obesity status by SES Index in children with physical activity status: spending time on actively/vigorously playing, more than 2 h/day in a week.

In this group if SES index was lowest, obesity was found 4 percent. When SES index improved as low, lower middle, upper middle, high and highest level; obesity was found approximately 6 percent, 5 percent, 10 percent, 10 percent, and 9 respectively. There is statistically significant relationship between obesity and SES index in children with physical activity status is spending time on actively/vigorously playing, more than 2 h/day in a week (p=0.023).

Table 4.39. Percentage of obesity status by SES Index in children with physical activity status: spending time on actively/vigorously playing, more than 2 h/day in a week.

SES Index	Non-obese	Obese	Total	Total Number of Cases
Lowest	96.5	3.5	100.0	173
Low	94.5	5.5	100.0	381
Lower middle	94.7	5.3	100.0	622
Upper middle	90.0	10.0	100.0	709
High	89.6	10.4	100.0	760
Highest	90.9	9.1	100.0	297
Total	91.9	8.1	100.0	2942

Chi-Square = 24.311 p=0.023

Table 4.37, 38 and 39 shows that when obesity status of children whose physical activity status: Time Spent on Actively/vigorously Playing: not at all or less than 1 h/day, 1-2 h/day and more than 2 h/day in a week, the relationship continues regardless of the SES effect Spending Time on Actively/vigorously Playing pattern. There is no interaction.

1.2. Multivariate Analysis

Table 4.40 shows the results of logistic regression for assessing the risk of obesity when the SES was the only one variable in the equation. When we considered the impact of the SES on child obesity (Model 1), we observed that as the SES increases the risk of obesity among 7 age children increases significantly. If SES was low and lower middle level, obesity was found 1.7 times and 2.1 times higher; if SES was upper middle and high-level obesity was found 2.5 times and 2.8 times higher. Finally, when SES in the highest level, obesity was found 3.5 times higher compared with the lowest SES.

Table 4.40. Logistic Regression Model 1 for assessing the risk of obesity, only SES in the model.

			95 percent Confidence Interval	
Variables	**Odds Ratio**	**p value**	**Lower**	**Upper**
SES Index				
Lowest	1.000	-	-	-
Low	1.793	<0.001	1.413	2.807
Lower middle	2.157	<0.001	1.664	3.291
Upper middle	2.524	<0.001	1.854	3.830
High	2.803	<0.001	2.336	4.238
Highest	3.581	<0.001	1.145	5.488
Constant	0.048			
Model p value	<0.001			
Nagelkerke R^2	0.014			

In Model 2 in Table 4.41, we observed that the SES still has a significant impact on the risk of obesity among children at age 7 even after we controlled the sex of the children. The risk of obesity is 1.3 times higher among male children as opposed to female children.

Table 4.41. Logistic Regression Model 2 for assessing the risk of obesity, SES and sex of the child in the model

Variables	Odds Ratio	p value	95 percent Confidence Interval	
			Lower	Upper
SES Index				
Lowest	1.000	-	-	-
Low	1.817	0.009	1.160	2.846
Lower middle	2.186	<0.001	1.432	3.337
Upper middle	2.543	<0.001	1.675	3.859
High	2.837	<0.001	1.876	4.291
Highest	3.664	<0.001	2.390	5.618
Sex				
Male	1.292	<0.001	1.128	1.480
Female	1.000	-	-	-
Constant	0.041			
Model p value	<0.001			
Nagelkerke R^2	0.017			

In Model 3 in Table 4.42 shows, which included SES, sex, transport to school, mother and father's BMI, and any person with diabetes in the HH. According to model 3 when SES was low and lower middle level, risk of obesity was found 1.9 times and 2.0 times higher. If SES was upper middle, high and highest level, risk of obesity was found 2.4, 2.6 and 4.0 times higher respectively. When sex was included in the model, risk of obesity was 1.4 times more common among the male children. Using motor vehicle to transporting school risk of obesity was found 1.4 times higher, but when using all transport modes (bicycle, walking, and motor vehicle), risk of obesity was found 1.5 times higher. If the mother is overweight, risk of obesity increases by 1.7 times, but if mother is obese, risk of obesity increases by 2.6 times. When father is overweight risk of obesity increases 1.4 times, but if the father is obese, risk of obesity increases by 2.9 times. If there is any person with diabetes in the household, children's risk of obesity increases by 1.1 times. There is no change.

Table 4.42. Logistic Regression Model 3 for assessing the risk of obesity, SES, sex, transportation type of the children, BMI of parents and any diabetes in the HH in the model

			95 percent Confidence Interval	
Variables	**Odds Ratio**	**p value**	**Lower**	**Upper**
SES Index				
Lowest	1.000	-	-	-
Low	1.916	.014	1.140	3.221
Lower middle	2.090	.003	1.280	3.413
Upper middle	2.477	<0.001	1.526	4.020
High	2.683	<0.001	1.656	4.345
Highest	4.007	<0.001	2.431	6.604
Sex				
Male	1.414	<0.001	1.219	1.640
Female	1.000	-	-	-
Transport to school				
walk/bicycle	1.000	-	-	-
motor vehicle	1.424	<0.001	1.210	1.677
Both	1.524	<0.001	1.185	1.960
BMI m				
Normal	1.000	-	-	-
Overweight	1.769	<0.001	1.492	2.098
Obese	2.672	<0.001	2.180	3.274
BMI f				
Normal	1.000	-	-	-
Overweight	1.490	<0.001	1.228	1.808
Obese	2.961	<0.001	2.402	3.649
Any Person with Diabetes in the HH				
Yes	1.157	0.146	0.950	1.409
No	1.000	-	-	-
Constant	0.014			
Model p value	<0.001			
Nagelkerke R^2	0.087			

Table 4.43 shows model 4 logistic analysis, which included SES, sex, transport to school, mother and father's BMI, any person with diabetes in the HH, consumption of pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches. According to the model 4; if SES was low, lower middle, upper middle, high and highest level, obesity was found 1.8, 2.0, 2.4, 2.6, and 3.7 times higher respectively. Risk of obesity increase 1.4 times among the male children. Using only motor vehicle or all (walking/bicycle/motor vehicle) to go to school increases risk of obesity 1.4 times. If

the mother is overweight, risk of obesity increases by 1.7 times, but if mother is obese, risk of obesity increases by 2.7 times. When father is overweight, risk of obesity increases 1.5 times, but when the father is obese, risk of obesity increase 3.0 times. If there is a diabetes mellitus case in the household, risk of children obesity increases by 1.1 times. There is no change.

Table 4.43. Logistic Regression Model 4 for assessing the risk of obesity, SES, sex, transportation type of the children, BMI of parents, any diabetes in the HH, and consumption pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches in the model

			95 percent Confidence Interval	
Variables	**Odds Ratio**	**p value**	**Lower**	**Upper**
SES Index				
Lowest	1.000	-	-	-
Low	1.866**	0.025	1.081	3.221
Lower middle	2.063***	0.006	1.233	3.452
Upper middle	2.413***	0.001	1.450	4.015
High	2.665***	<0.001	1.605	4.424
Highest	3.788***	<0.001	2.242	6.401
Sex				
Male	1.371***	<0.001	1.178	1.595
Female	1.000	-	-	-
Transport to school				
walk/bicycle	1.000	-	-	-
motor vehicle	1.432***	<0.001	1.212	1.691
Both	1.484***	0.003	1.147	1.921
BMI m				
Normal	1.000	-	-	-
Overweight	1.715***	<0.001	1.440	2.042
Obese	2.700***	<0.001	2.195	3.321
BMI f				
Normal	1.000	-	-	-
Overweight	1.506***	<0.001	1.234	1.837
Obese	3.088***	<0.001	2.492	3.825
Any Person with Diabetes in the HH				
Yes	1.146	0.183	0.938	1.401
No	1.000	-	-	-
Consumption pizza, Hamburger, Pastry, fried potatoes, salami-sausage, sandwiches				
Never	1.000	-	-	-
1-6 day	1.321	0.053	0.997	1.751
Everyday	1.443	0.027	1.042	1.998
Constant	0.011			
Model p value	<0.001			
Nagelkerke R^2	0.089			

Consumption of pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches have been included in model 4. If the consumption of these foods is 1-6 days a week, risk of obesity increases by 1.3 times; but if there is everyday consumption, risk of obesity increases by 1.4 times.

Table 4.44. Logistic Regression Model 5 for assessing the risk of obesity, SES, sex, transportation type of the children, BMI of parents, any diabetes in the HH, consumption pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches and sleep duration in the model

			95 percent Confidence Interval	
Variables	**Odds Ratio**	**p value**	**Lower**	**Upper**
SES Index				
Lowest	1.000	-	-	-
Low	2.067	0.014	1.159	3.689
Lower middle	2.361	0.002	1.368	4.076
Upper middle	2.413	0.001	1.403	4.150
High	2.877	<0.001	1.678	4.931
Highest	3.947	<0.001	2.258	6.898
Sex				
Male	1.442	<0.001	1.229	1.691
Female	1.000	-	-	-
Transport to school				
walk/bicycle	1.000	-	-	-
motor vehicle	1.448	<0.001	1.216	1.725
All	1.505	0.003	1.149	1.972
BMI m				
Normal	1.000	-	-	-
Overweight	1.713	<0.001	1.426	2.056
Obese	2.758	<0.001	2.223	3.422
BMI f				
Normal	1.000	-	-	-
Overweight	1.561	<0.001	1.265	1.927
Obese	3.302	<0.001	2.633	4.141
Any Person with Diabetes in the HH				
Yes	1.204	0.079	0.979	1.482
No	1.000	-	-	-
Pizza. Hamburger, Pastry, Fried potatoes, salami-sausage, sandwiches				
Never	1.000	-	-	-
seldom	1.301	0.083	0.966	1.751
Frequently	1.488	0.023	1.056	2.095
Sleep duration	1.061	0.110	0.987	1.142
Constant	0.005			
Model P value	0.000			
Nagelkerke R^2	0.094			

Table 4.44 shows model 5 logistic analysis, which included SES, sex, transport to school, mother and father's BMI, any person with diabetes in the HH, consumption of pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches and sleep duration.

According to model 5; if SES was low, lower middle, upper middle, high and highest level, and risk of obesity was found 2.0, 2.3, 2.4, 2.8 and 3.9 times higher respectively. Risk of obesity increases by 1.4 times among the male children. Using only motor vehicle to go to school increases risk of obesity by 1.4 but using all (walking/bicycle/motor vehicle) to go to school increases risk of obesity by 1.5 times. If the mother is overweight, risk of obesity increases by 1.7 times, but if mother is obese, risk of children obesity increases by 2.7 times. When father is overweight, risk of obesity increases by 1.5 times, but when the father is obese, risk of obesity increases by 3.3 times. If there is any person with diabetes mellitus in the household, children risk of obesity increases by 1.2 times. Consumption of pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches have been included in model 4. If consumption is seldom, risk of obesity increases by 1.3 times; but if consumption is frequent, risk of obesity increases approximately by 1.4 times. Sleep duration does not affect the risk of children obesity.

Table 4.45 shows that in model 6 logistic analysis, which included SES, sex, transport to school, mother and father BMI, any diabetes in the household, consumption of pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches, sleep duration and birth weight.

According to Model 6; if SES was low, lower middle, upper middle, high and highest level, and risk of childhood obesity was found 1.7, 2.0, 2.0, 2.3, and 3.2 times higher respectively. Risk of obesity increases by 1.3 times among the male children. Using only motor vehicle to go to the school increases the risk of obesity by 1.3 but using all (walking/bicycle/motor vehicle) to go to the school increases risk of obesity by 1.5 times. If the mother is overweight, the risk of children obesity increases by 1.6 times, but if mother is obese, the risk of obesity increases by 2.6 times.

Table 4.45. Logistic Regression Model 6 for assessing the risk of obesity, SES, sex, transportation type of the children, BMI of parents, any diabetes in the HH, consumption pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches, sleep duration and birth weight in the model

			95 percent Confidence Interval	
Variables	**Odds Ratio**	**p value**	**Lower**	**Upper**
SES Index				
Lowest	1.000	-	-	-
Low	1.767	0.056	0.986	3.167
Lower middle	2.024	0.012	1.169	3.504
Upper middle	2.069	0.009	1.201	3.566
High	2.398	0.002	1.396	4.120
Highest	3.284	<0.001	1.875	5.753
Sex				
Male	1.388	<0.001	1.179	1.634
Female	1.000	-	-	-
Transport to school				
walk/bicycle	1.000	-	-	-
motor vehicle	1.394	<0.001	1.167	1.666
All	1.532	0.002	1.167	2.013
BMI m				
Normal	1.000	-	-	-
Overweight	1.681	<0.001	1.396	2.025
Obese	2.682	<0.001	2.154	3.340
BMI f				
Normal	1.000	-	-	-
Overweight	1.591	<0.001	1.283	1.973
Obese	3.243	<0.001	2.574	4.087
Any Person with Diabetes in the HH				
Yes	1.219	0.065	0.988	1.503
No	1.000	-	-	-
Pizza. hamburger. Pasty. Fried potatoes. salami-sausage, sandwiches				
Never	1.000	-	-	-
Seldom	1.228	0.182	0.908	1.659
Frequently	1.430	0.043	1.011	2.023
Sleep duration	1.066	0.092	0.990	1.149
Birth Weight				
< 2500	1.000	-	-	-
2500 -3499	0.953	0.750	0.707	1.284
3500 - 3999	1.323	0.076	0.971	1.804
>=4000	1.396	0.072	0.971	2.008
Constant	0.006			
Model P value	0.000			
Nagelkerke R^2	0.097			

When father is overweight, risk of obesity increases by 1.5 times, but father is obese risk of children obesity increases by 3.2 times. If there is any person with

diabetes mellitus in the household, risk of children obesity increases by 1.2 times. If pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches consumption is seldom, risk of obesity increases by 1.2 times; but when consumption is frequent, risk of obesity increases by 1.4 times.

Sleep duration does not affect obesity of children. When children's birth weight is over 3500 gr, risk of children obesity increases by 1.4 times.

Table 4.46 shows Model 7 logistic analysis, which included SES, sex, transport to school, mother and father's BMI, consumption of pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches, sleep duration and birth weight.

According to Model 7; if SES was low, lower middle, upper middle, high and highest level, risk of children obesity was found 1.5, 1.7, 1.8, 2.1, and 2.9 times higher respectively. The risk of obesity increases by 1.3 times among the male children. Using only motor vehicle to go to school risk of obesity increases by 1.3 but using all (walking/bicycle/motor vehicle) to go to school risk of obesity increases by 1.5 times. If the mother is overweight, risk of obesity increases by 1.7 times, but if mother is obese, risk of obesity increases by 2.7 times. When father is overweight, risk of children obesity increases by 1.5 times, but father is obese, risk of obesity increases by 3.2 times. If pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches consumption is seldom, risk of obesity increases by 1.1 times; but if consumption is frequent, risk of obesity increases by 1.4 times.

Sleep duration does not affect the risk of obesity children. When children's birth weight is over 3500 gr, the risk of childhood obesity increases by 1.3 times.

Table 4.46. Logistic Regression Model 7 for assessing the risk of obesity, SES, sex, transportation type of the children, BMI of parents, consumption pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches, sleep duration and birth weight in the model

			95 percent Confidence Interval	
Variables	**Odds Ratio**	**p value**	**Lower**	**Upper**
SES Index				
Lowest	1.000	-	-	-
Low	1.585	0.105	0.908	2.768
Lower middle	1.795	0.028	1.066	3.025
Upper middle	1.840	0.021	1.098	3.085
High	2.132	0.004	1.276	3.563
Highest	2.938	<0.001	1.723	5.009
Sex				
Male	1.389	<0.001	1.180	1.634
Female	1.000	-	-	-
Transport to school				
walk/bicycle	1.000	-	-	-
motor vehicle	1.392	<0.001	1.165	1.662
All	1.520	0.003	1.158	1.995
BMI m				
Normal	1.000	-	-	-
Overweight	1.725	<0.001	1.433	2.076
Obese	2.736	0.000	2.200	3.404
BMI f				
Normal	1.000	-	-	-
Overweight	1.585	<0.001	1.280	1.963
Obese	3.234	<0.001	2.570	4.069
Pizza. hamburger. Pasty. Fried potatoes. salami-sausage. sandwiches				
Never	1.000	-	-	-
seldom	1.193	0.243	0.887	1.605
Frequently	1.415	0.047	1.005	1.991
Sleep duration	1.067	0.086	0.991	1.150
Birth Weight				
< 2500	1.000	-	-	-
2500 thru 3499	0.945	0.707	0.702	1.271
3500 thru 3999	1.309	0.087	0.962	1.781
>=4000	1.378	0.082	0-.960	1.980
Constant	0.007			
P value	<0.001			
Nagelkerke R^2	0.094			

Table 4.47 shows that in model 8 logistic analysis, which included SES, sex, transport to school, mother and father BMI, consumption of pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches, sleep duration, birth weight, and sugary drink consumption.

According to Model 8; if SES was in the low, lower middle, upper middle, high and highest level, the risk of childhood obesity was found 1.6, 1.6, 2.0, 2.1, and 3.1 times higher, respectively. Risk of obesity increases by 1.3 times among male children. Using only motor vehicle to go to school increases the risk of obesity by 1.3, but using all (walking/bicycle/motor vehicle) to go to school increases the risk of obesity by 1.4 times. If the mother is overweight, the risk of obesity increases by 1.7 times, but if mother is obese, risk of obesity increases by 2.6 times. When father is overweight, the risk of obesity increases by 1.5 times, but if the father is obese, risk of obesity increases by 3.0 times. If pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches consumption is seldom, the risk of obesity increase 1.1 times; but if consumption is frequent, risk of obesity increases by 1.3 times.

When children's birth weight is between 3500 g – 3999 g, the risk of childhood obesity increases by 1.5 times, but if children's birth weight is over 4000 g, the risk of children obesity increases by 1.6 times. Sugary drink consumption does not affect the obesity.

Table 4.47. Logistic Regression Model 8 for assessing the risk of obesity, SES, sex, transportation type of the children, BMI of parents, consumption pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches, sleep duration birth weight and sugar drink consumption in the model

			95 percent Confidence Interval	
Variables	**Odds Ratio**	**p value**	**Lower**	**Upper**
SES Index				
Lowest	1.000	-	-	-
Low	1.638	0.087	0.930	2.885
Lower middle	1.658	0.064	0.970	2.831
Upper middle	2.018	0.009	1.191	3.420
High	2.199	0.003	1.301	3.718
Highest	3.142	0.000	1.826	5.405
Sex				
Male	1.322	0.001	1.127	1.551
Female	1.000	-	-	-
Transport to school				
walk/bicycle	1.000	-	-	-
motor vehicle	1.342	0.001	1.128	1.597
All	1.487	0.004	1.138	1.944
BMI m				
Normal	1.000	-	-	-
Overweight	1.732	<0.001	1.444	2.077
Obese	2.612	<0.001	2.105	3.242
BMI f				
Normal	1.000	-	-	-
Overweight	1.547	<0.001	1.256	1.907
Obese	3.070	<0.001	2.452	3.844
Pizza. hamburger. Pasty. Fried potatoes. salami-sausage. sandwiches				
Never	1.000	-	-	-
seldom	1.175	0.274	0.880	1.570
Frequently	1.328	0.102	0.945	1.865
Birth Weight				
< 2500	1.000	-	-	-
2500 thru 3499	1.161	0.343	0.853	1.581
3500 thru 3999	1.578	0.005	1.145	2.173
>=4000	1.681	0.006	1.160	2.436
Sugar drinks				
Never	1.000	-	-	-
seldom	0.956	0.638	0.793	1.152
Frequently	1.018	0.888	0.798	1.297
Constant	0.012			
Model p Value	0.000			
Nagelkerke R^2	0.089			

Table 4.48 shows that in model 9 logistic analysis, which included SES, sex, transport to school, mother and father BMI, consumption of pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches, sleep duration, birth weight, sugary drink consumption and physical activity: spending time on actively/vigorously playing

According to the Model 9; if SES was in the low, lower middle, upper middle, high and highest level, risk of children obesity was found 1.5, 1.5, 1.9, 2.0, and 2.7 times higher, respectively. The risk of obesity increases by 1.3 times among male children. Using only motor vehicle to go to school increases the risk of obesity by 1.3, but using all (walking/bicycle/motor vehicle) to go to school increases the risk of obesity by 1.4 times. If the mother is overweight, the risk of obesity increases by 1.7 times, but if mother is obese, the risk of obesity increases by 2.6 times. When father is overweight, the risk of obesity increases by 1.5 times, but if the father is obese, the risk of obesity increases by 3.0 times. If pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches consumption is seldom, the risk of obesity increase 1.1 times; but if consumption is frequent, the risk of obesity increases by 1.2 times.

When children's birth weight is between 2500-3499 g, the risk of childhood obesity increases by 1.1 times; 3500 g-3999 g, the risk of children obesity increases by 1.5 times, but if children's birth weight is over 4000 g, the risk of children obesity increases by 1.6 times. Sugary drink consumption does not affect the obesity. When children's time spent on actively/vigorously playing is not at all or less than 1 h/day in a week risk of obesity increases by 1.95 times approximately 2 times; if children's spending time on actively/vigorously playing is 1–2 h/day in a week; the risk of obesity increases by 1.42 times.

Table 4.48. Logistic Regression Model 9 for assessing the risk of obesity, SES, sex, transportation type of the children, BMI of parents, consumption pizza, hamburger, pasty, fried potatoes, salami-sausage, sandwiches, sleep duration birth weight, sugar drink consumption and spending time on actively/vigorously playing in the model

			95 percent Confidence Interval	
Variables	**Odds Ratio**	**p value**	**Lower**	**Upper**
SES Index				
Lowest	1.000	-	-	-
Low	1.562	.127	.881	2.768
Lower middle	1.572	.100	.917	2.696
Upper middle	1.976	.012	1.163	3.359
High	2.064	.007	1.217	3.502
Highest	2.773	<0.001	1.604	4.794
Sex				
Male	1.376	<0.001	1.169	1.620
Female	1.000	-	-	-
Transport to school				
walk/bicycle	1.000	-	-	-
motor vehicle	1.307	.003	1.094	1.562
All	1.458	.007	1.108	1.918
BMI m				
Normal	1.000	-	-	-
Overweight	1.714	<0.001	1.425	2.063
Obese	2.606	<0.001	2.090	3.249
BMI f				
Normal	1.000	-	-	-
Overweight	1.515	<0.001	1.223	1.877
Obese	3.042	<0.001	2.420	3.825
Pizza, hamburger, Pasty, Fried potatoes, salami-sausage, sandwiches				
Never	1.000	-	-	-
seldom	1.152	.347	.858	1.549
Frequently	1.276	.172	.900	1.809
Birth Weight				
< 2500	1.000	-	-	-
2500 thru 3499	1.165	.336	.854	1.590
3500 thru 3999	1.508	.013	1.091	2.084
>=4000	1.595	.015	1.094	2.325
Sugar drinks				
Never	1.000	-	-	-
seldom	0.904	.988	.817	1.195
Frequently	0.911	1.014	.790	1.303
Spending time on actively/vigorously playing				
Not at all or less than 1 h/day	1.950***	<0.001	1.584	2.402
1–2 h/day	1.423***	<0.001	1.165	1.739
More than 2 h/day	1.000			
Constant	.010			
Model p Value	<0.001			
Nagelkerke R^2	0,099			

According to the logistic analysis results, higher SES was significantly related with higher risk of obesity among children in all models. Sex is a consistent predictor

of obesity across all the models. Among the male children, using transportation vehicle, whose mother and/or father is obese, whose birth-weight is over 3500 gr are under the risk of obesity.

Physical activity is an important factor to prevent childhood obesity. For children who make not at all or less than 1 h/day physical activity, the risk of obesity increase approximately 2 times.

Children who eat pizza and others frequently per week were 1.3 times more likely to be obese than children who eat seldom per week. Interestingly, there was no relation between child obesity and frequency of consumption sugar, sugar drink, and pastry.

CHAPTER 5

DISCUSSION

In this section, sociodemographic characteristics, related factors, and obesity outcomes in relation to the SES index are discussed respectively.

Some sociodemographic characteristics and obesity: In our study, obesity is found higher among male students than female students (12 percent vs 9 percent, respectively). The reason can be the fact that male children are "more protected" in the family in a way to influence their eating habits.

It has been seen when the BMIs of the mother and the father increase, children's obesity also increases. Cunha et al. found that among the under 5 years old children obesity was 17.4 percent including overweight. Lee et al. found that one of the best predictors of childhood obesity were parental obesity history. If mother is overweight, her child is 1.4 times is more likely to be overweight. It's twice as much if a mother is a girl (Cunha et al., 2013, Lee et al., 2019). These findings suggest that children's obesity prevention efforts should begin with their parents.

As the education levels of the mother and father increase, childhood obesity is increasing too. It depends on the fact that educated mother has a paid job outside and their children have to stay with a baby sitter or kinder garden. Cunha et al. found that obesity more in mothers with low education level (Cunha et al, 2013).

In Europe Spinelli showed that children obesity and severe obesity was higher in mothers with low education level by (Spinelli et al, 2019).

Liu et al. found that in northern China the education level of father together with the high-income level affects obesity in girls and urban area (Liu et all, 2018).

Also, when the mother has a job, children obesity is high. Because baby-sitter or kinder garden staff may care less for the children than their mother. Mother can provide better care from baby sitter. When the father's occupation evaluated, it is seen that if children's father has employment in public sector, private sector, self-employed,

or retired, childhood obesity was found higher vs unemployed fathers. It depends on family income. Lee et al. also found that family income is an important predictor for childhood obesity because of SES (Lee et al., 2019). Furthermore, mothers with higher education are more likely to have a greater feeling of power and control over their lives, which would enable them to model healthier behaviors around diet and physical activity for their children, who are socialized by the family environment.

Obesity and its determinants: When the breastfeeding duration was evaluated obesity was found 12 percent which children's breastfeeding duration was in-between 0-5 months. When breastfeeding duration is longer, childhood obesity seems reduced. But there is no statistically significant ($p > 0.05$).

Consistent with the existing literature (Arenz et al., 2004; Owen et al., 2005), breastfeeding is found to be protective for young children in the models. Exactly why this relationship exists is not fully understood, but possible mechanisms include the nutritional differences in breast milk versus formula, and the relationship between breastfeeding and metabolic programming (Arenz et al. 2004; Owen et al. 2005).

Many studies have found that breastfeeding reduces childhood obesity and postponing bottle feeding may protect from obesity. There is support for breastfeeding at least for the first6 months to decrease the likelihood of childhood overweight/obesity. (J.A. Ortega-García et al., 2018, L.S.Jurado et al. 2016, L. Marseglia et al., 2015, Seung Chik Jwa et al., 2014, M.Weyermann et al., 2006, A.S. Ryan, 2007). S. C. Jwa et al's study's in 1.5-8 aged children has been seen that even partial or short term breastfeeding prevents the development of obesity particularly for boys. (Seung Chik Jwa et al., 2014).

On the other hand, Alan S. Ryan has stated that breastfeeding is helpful in preventing obesity in children but should not be considered as a sole measure. Because while breastfeeding has increased in the USA obesity has also increased in children. (A.S. Ryan, 2007).

Studies looking at the effect of family structure on the development of obesity in children are inadequate in the literature. In our study took account in household

size according to the over and under 18 years old person. In the household, when the number of persons over 18 years old increase, obesity prevalence decreases. This can be explained with the food sharing in the household. It depends on foods have to be shared with more people and or over 18 household members can be working also everybody can eat regularly. Same situation has been seen with persons under age 18 in the household. When number of under18 years old person are increasing, obesity prevalence has been seen to decrease. This is mainly due to the fact that if there are more children under 19 in the household, they play with each other or cannot eat healthy food because of high price. Datar A. stated that in USA obesity is less common in families with more children. Because children watch less TV and eat less outside the home. The extended family structure appears to be protective against to children obesity (A. Datar, 2017). Chen et. al. showed that obesity is more common is single child and single mother families. It means that families with mother, father and siblings have an effective role for childhood obesity. Chen et al. also examined structure of family and childhood obesity among children at eight class. They stated that the relationship between family structure and obesity has continued from kindergarten and condense in eight class at most (Chen et al., 2014).

In our study member of a sport or dancing club have been found that approximately 20 percent but 80 percent not. Interestingly, obesity has been found higher among those who do sports than who do not. This is because fat children may already be doing sports. But when children spending time on actively/vigorously playing, status evaluated actively playing for > 1 h each day were 73.4 percent. Also children who make not at all or less than 1 h/day physical activity, risk of obesity increase approximately 2 times. Around 57 percent of the children walk or bicycle when they go to the school.

Whiting et al. showed that at the COSI Europe 2015-2017 analysis approximately 54 were not members of any sport or dancing club, 80 were actively playing more than one hour a day, 50.0 went to the school walking or with bicycle (Whitinin et.al.2020). When compared results in Turkey children actively playing situation was similar COSI

Europe, children walk or bicycle when they go to the school situation was better. But Turkey the worst country goes to the any sport or dance club in the COSI Europe study.

Physical activity (PA) has important place in preventing of children obesity (including overweight). Also PA is effective for reducing adult obesity (Hills et al., 2011). Suter and Ruckstuhl examined the environmental, social and cultural factors for children obesity which are cause their sedentary lifestyle in Switzerland. They found that some social, cultural features are effective through the parent role model. For example, low physical activity which develops as a results of a sedentary parental role model such as a watching TV, can continue in adulthood in children. Parents as role models can cause unhealthy eating habits in children (Suter and Ruckstuhl, 2006). In Poland, a study found that among boys there was a significantly relationship between obesity and less physical activity. Also the possibility of obesity or overweight increase among inactive teenagers (B.Glinkowska, W. M Glinkowski, 2018). Vincente Rodriguez et al. developed a list of recommendations for physical activities and sports to help prevent and manage obesity for children and adolescent. (Vincente-Rodriguez et al., 2016). Wang et al., stated that in children school-based interventions are effective which in obesity prevention efforts (Wang Y, 2015).

In this study found that 70 percent of children sleep 10 hours or more. Whereas in COSI Europe Whiting et al. showed in pooled analysis approximately 85 percent children are sleep 9–11 hours (Whiting et al. 2020). On the contrary to literature in our study showed that children's sleep duration did not affect the children obesity, there was no statistical significance between sleep duration and obesity. Ash described that a relationship between insufficient sleep and obesity in early childhood and infancy period (Ash, 2017). Hayes et al. stated that there is a relationship between sleep quality and obesity/overweight also linked behaviors. A regular sleep schedule is recommended in the treatment of adolescent obesity (Hayes JF et al., 2017).

In our study, it was found that 42 percent of children have eaten all of harmful foods less than four days a week, 23 percent of children have eaten all harmful foods once more often than four days a week, 16 percent of children have eaten two harmful

foods, 10 percent who have eaten three harmful foods, 6 percent who eat four harmful foods; 3 percent of children who eat more than four times or all of them.

When chips, candies/chocolate and cake consumptions were low, obesity was found higher than high consumption of these food products. It depends on two things: Mothers may have had restrictions on the obese child or the mother may say that she eats little to avoid being blamed. There is an exception for pizza consumption which is obesity increases as pizza consumption increases. In Turkey there is school canteens regulations since 2011. In 2011, chips and fizzy drinks were prohibited at schools. In addition to the chips and sugar drinks, chocolate and sugar sales were also prohibited at schools in 2016. However, although content arrangement is being done on pastry, no compliance check is conducted for the implementation of the criteria. In addition, there is a raised awareness among the families regarding the consumption of chips, fizzy drinks, and sugary food. This increase can be at lower levels regarding the pastry.

Red color food and drink category consumption index has been created including from 0 to 5 points. According to the index points obesity is more common (12 percent) in the group that eats less than four days a week. Obesity appears to be high in the group consuming the least amount of unhealthy foods. Because these group is already obese, and they may have a restriction. Obesity was found to be also high (12 percent) in those group who eat all unhealthy food more than 4 days a week, whose their got 5 point in the index. Because obesity increases, as unhealthy food consumption increases.

In round four (2015–2017) COSI Europe which analysis done by J. Williams et al. found that the lowest consumption daily of savory snacks (Potato Crisps, Corn Chips, Popcorn or Peanuts) were in Denmark zero percent, Lithuania and Latvia approximately one percent, Ireland approximately two percent which are part of north Europe. The highest daily consumption (every day consumption) was Albania 21.5 percent Tajikistan 11 percent, Montenegro and Turkmenistan 9 percent, Turkey 7 percent. In the same study consumption of sweets (candies, chocolates) has been evaluated. Daily consumption of candies/chocolates were found 0.4 percent in

Denmark, 12 percent in Turkey to 21 percent in Turkmenistan. There were no manifest regional trends for daily sweet snack consumption. Also there were no significant between male and female children. Every day soft drinks **c**onsumption was found in Northern European countries lowest level which were zero percent in Ireland, 2 percent in Lithuania, and 2 percent in Denmark, 7.5 percent in Turkey. Daily soft drink consumption was observed relatively high in the Central Asian countries which are Tajikistan (32.8percent) and Turkmenistan (25.8 percent),. There was not been observed statistically significant between boys and girls (Williams et al., 2020).

Pfingst found that in her doctorate thesis in the last seven days children 46 had one or more servings of sweet food, and 67 had one or more servings of juice (L. Pfingst, 2010).

Our study main target is to examine the relationship between SES and obesity. Looking at the historical development of the relationship between SES and diseases, it has been seen that in the past several decades an increasing of research on socioeconomic disparities in health.

Socio-economic status (SES) and obesity: SES-health relationship is present for the majority of illnesses and conditions, including obesity. SES, thus, is a go into as a "fundamental cause" of disease because it is associated with material and psychosocial resources – money, education, power, and social networks – that either constrain or enable a person to adopt healthy lifestyles (Link and Phelan 1995, Pfingst, 2010).

Although SES is inversely associated with obesity in some studies, the evidence is complicated. The earliest relationship between obesity and SES in developed countries was evaluated by Sobal and Stunkard (1989). They found that in the developed countries there were a strong inverse relationship between socio-economic status (SES) and obesity among women, although there was not consistent relation among men and children. But in the developing countries, they found that there was strong straight a relationship between obesity and SES among men, women, and children (Sobal & Stunkard, 1989).

After Sobal and Stunkard who found 36 percent inverse associations, 38 percent no associations, and 26 percent positive associations among children. The most recent review showed that the relationship between obesity and socio economic status (SES) has become predominantly inverse, positive relations have just disappeared, and also parental education is the most consistent predictor (Shrewsbury and Wardle, 2008; Pfingst, 2010).

Pampel et al. found that the associations with SES and obesity shifted from positive to negative. The developments in the SES lead to improving in health, on the other hand it can also cause to rising obesity and SES inequalities (Pampel et al. 2012).

Buoncristiano et al. results showed in COSI 2016 Europe Countries that an inverse relationship between prevalence of childhood overweight and obesity and parental education in high income countries, while the opposite relationship emerged in most of the upper-middle, low-middle- or low-income countries. The same was true for family perceived wealth, while parental employment status did not appear to influence prevalence (Buoncristiano et al., 2020).

There are some studies on relationship between food security, health insurance and obesity in children. These factors can be indirect SES indicators and findings were mixed.

In some studies, it has been revealed that the relationship between food insecurity and obesity is one of the public health problems associated with disparities nutrition. Weight gain in children seems to be associated with food insecurity (Casey et al., 2006). But Savage found that food insecurity and family medical insurance were not associated with children's BMI (Savage, 2012).

Important finding from Nobari who showed that because of the extending socio-economic disparities in the household, preventing obesity strategies should include the especially low-income children (Nobari et al., 2018).

School children in Mexico were shown to be more likely to consume processed foods with higher socio-economic levels (Garcia-Chavez et al., 2017).

In Iranian study, Khashayar found in multivariate analysis that to being boy increases risk of obesity 1.58 times; having positive family history increases risk of obesity 2.04 times. Also, low birthweight increases risk of obesity 1.33 times, high birth weight increases risk of obesity 1.8 times compared to the normal birth weight. Compared to low socio-economic status (SES), moderate SES increases obesity risk 1.44 times and high SES increases1.89 times (Khashayar et al. 2018).

Wagner el al. found that the SES in childhood affects BMI, waist circumference and obesity in adults, high adiposity indicators were seen in men with high SES and but in women with low SES (Wagner et al., 2018).

Our study showed that obesity is increases as socio economic status (SES) index increases. Obesity was found the least (5 percent) in the lowest SES index group vs in the highest (15 percent) SES group.

Obesity is increasing among male and female children in parallel to the improved SES index. There is more relation between the SES and obesity in male children than female children. The relation between SES and obesity was found to be stronger among male children than female children.

There is significant relationship between SES and obesity if school commuting is done by walking or motor vehicle. Obesity increases in parallel with improved SES index. But there is no any interaction.

Birth weight does not affect relationship between the SES and obesity. In each group obesity shows the same pattern with SES index.

In case of diabetes, the richest group may also be aware of diabetes. If there is no person having diabetes in the household, the relation between the SES index and obesity is significant.

When relationship SES and obesity is evaluated according to the mother's and father's BMI, the relationship continues in each BMI category (normal, overweight and obese) and as SES improves obesity increases. It cannot be mentioned an interaction.

Relationship between unhealthy food consumption, SES index, and obesity continue. There is no interaction.

When the RCFI is grouped, the relationship continues regardless of the SES effect unhealthy food consumption pattern. There is no interaction. RCFI does not affect the size of the relationship between SES index and obesity.

Scientific evidence on protective factors contributing to a healthy weight in children is insufficient, especially living in lower socioeconomic status.

The findings presented in this chapter have several implications for policy and program interventions for childhood obesity. Some of these findings are consistent with the literature, while others make an important contribution to how SES affects the likelihood of being obese.

First, the findings suggest that SES index is one of the important indicators and the main driver of childhood obesity. Net of all variables included in the model, the effect of SES index remains persistent and strong. SES index includes parent's education, parent's working status and welfare status of the household. These findings suggest that SES index, in other words parent's education, parent's working status and welfare status of the household, affects childhood obesity through factors other than the type of foods children consume, transport to school, and the activities they engage in.

Sex is a consistent predictor of obesity across all the models. Among male children, using transportation vehicle, whose mother and/or father having obesity, whose birth-weight over 3500 gr are under the risk of obesity. Mothers' and fathers' BMI seem to play an especially important role. Parents who became overweight or obese are more likely to have poor nutritional diets and are less likely to get adequate physical activity. Their habits may affect their children's diet and physical activity.

Overall, the relationship between mother's education and child's obesity suggests that, while income strategies to prevent childhood obesity are an important intervention, a focus on improving mother's education may be a more preventive

solution. But in our country high educated mother's children also found obese and strategies should take into account this results.

Children who eat pizza frequently per week were risk of obesity increase 1.3 times than children who eat seldom per week. Interestingly, there was no relation between chilhood obesity and frequency of consumption sugar, sugar drink and pastry.

It is noteworthy that the majority of indicators for diet, activity, and TV lose significance after controlling for SES index. However, measurement of these individual behaviors may be overlooking factors related to diet and activity that may be more important than just the items children consume, such as total caloric intake, eating behaviors, portion size, the way foods are prepared, and the duration or intensity of activity that children engage in. Mothers with higher education may be more knowledgeable about portion size and food preparation, healthy eating habits, and appropriate levels of activity than mothers with lower education. But this awareness is not invalid our country. Educated mothers children more obese than low educated mother.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

In almost every society, the disease is defined as a "bad thing" and its incidence and prevalence are thought as problems. Morbidity and mortality due to diseases and population dynamics (population growth) relations are clear. Diseases affect births, marriages and divorces, and even migration. There is a new perspective about on the developed countries are entering a new stage of mortality transition, where both new and antiquated infectious diseases will emerge and increasing obesity and physical inactivity will cause in deteriorating health, and perhaps lowered life expectancy. The communicable diseases that dominated the world before the mortality transition have been largely replaced by degenerative diseases in developed countries but increasingly also in the less developed countries.

Now the more developed the countries are over a century, the “mortality transition” resulted in a near doubling of life expectancy at birth. Such continuous improvement can be attributed to greatly improved living standards, control of communicable diseases and public health measures. Although advances in medicine contributed relatively late to the mortality transition in developed countries, in less developed countries, on the contrary, medical technological innovations made an early and significant contribution. Improvements in mortality in developing countries cannot be explained by medical advances alone. Improvements in living standards are a prerequisite. Preventable deaths from tobacco and obesity outbreaks are common in developed countries and it spreads to developing countries. The mortality transition is important and going on and communicable diseases (emerging reemerging diseases) mortality also going on (Lindquist, HJ., 2015).

In the light of these developments, childhood obesity, which is the precursor of obesity, which is one of the diseases in the demographic transition, and its determinants are discussed in this study.

Causes and theories explaining obesity are very different. One of them is “lay theories of obesity” which is interested in characteristic-level beliefs. In this point of view some people think psychological and physical behaviour are not change, while others think they are changeable (Thibodeau, Flusberg,); Other theory is “Circle of Discontent” (Marks, 2015): It explain that imbalances in homeostasis causing overweight and obesity. According to this theory, imbalance cause to “gain weight”, gaining weight lead to “body dissatisfaction” and “negative affect” and the results is “overconsumption”. But main issue is to understand the “cause of this circle”. What triggers weight gain? In this point, many studies focused on genetic, physiological, and behavioral factors. Also many research focused on “obesogenic environment” and “marketing pressure” to explain to effect on psychological and physical attributes in the lay theories, and under the circle of discontent. Also association with “socio economic status and obesity” taken in hand by researchers some of whose studies were discussed in this study.

Chronic diseases (CVH, Cancers, Diabetes, COPD) have become the most important cause of mortality and morbidity in the world and in our country. Tobacco use, physical inactivity, harmful use of alcohol, and unhealthy diet (obesity) are common risk factors for these diseases. These diseases are increased by aging, rapid unplanned urbanization and the globalization of unhealthy lifestyles *(WHO, Global Action Plan for The Prevention and Control of Non Communicable Diseases 2013-2020).*

Burden of disease in Turkey in 2015 ranking the top ten is as follows: low back pain, ischemic heart disease, diabetes mellitus, congenital birth defects, sense organ diseases, cerebra vascular diseases, depressive disorders, neonatal preterm birth complications, tracheal, broncos and lung cancers and road injuries (IHME, GBD, 2025). It has been calculated that 13.3 of all deaths and 7.3 of total DALY can be reduced with the prevention of obesity (Hastalık Yükü Çalışması, 2004).

Tackling obesity (including childhood obesity) is one of the a key role in reducing NCDs.

In our study showed that some socio demographic factors that increase childhood obesity are; to be male, parent's obesity/overweight, parent's occupation, higher number of children and adult in the household. According to the results, the family should be included in life-style changing efforts. In terms of being a role model for parents, awareness and family-oriented training should be provided, taking into account cultural characteristics.

Obesity increase when using vehicle in school transportation and inactive physical activity (not or less than 1 h/day). For this reason, build environment and urban planning should be designed according to the walkability and suitable bicycle roads. Urban planning should be promoting bicycle in the urban traffic, traffic should be easy for pedestrian instead of vehicles. Obesity increased in children with a birth weight of more than 3500 g and having obese parents. In this point, it is important to follow the weight gain during pregnancy.

Health promotion interventions should be included health literacy.

Childhood obesity prevention interventions should include diet and physical activity together. These interventions should preferably target school-age children and cover both the school and family setting.

Marketing pressure to the children is important issue for tackled to the childhood obesity. This issue has a "halo effect" and has been used by food companies.

The use of health style messages in advertisement for children is a marketing method used by food companies. Food companies commonly use healthy lifestyle messages in child-directed advertising, and this situation increase public health worries because of a "halo effects" for low nutritional foods. Using healthy messages in advertisement for children benefits brands by creating a "healthy food perception". Unfortunately, this marketing method negatively effects children's adoptions of healthy eating habits (Harris et al, 2018).

WHO urges to Member States reduce marketing pressure on children. N. Yardım et al., (2020) indicated that in Turkey the frequency and duration of food and beverage advertisements containing high energy, sugar, salt, and saturated fat which

were not suitable for children were found to be high (Yardim et al., 2020). Implementing Regulation on the Procedures and Principles of Radio Television High Council (RTUK) Broadcasting Service initiated on 27.03.2018 and food and beverage advertisements containing high energy, sugar, salt and saturated fat banned at the children T.V channels and children programs. But also monitoring and evaluation mechanisms should be established. (RTUK, Official Gazette, 2018)

Some studies showed that pregnancy weight, smoking at the pregnancy and other related factors are associated with childhood obesity. Some limitations in those studies were that gaining mother weight through the pregnancy and mother smoking were not examined.

Although the relationship between SES and child obesity with race, have been evaluated in some studies, but race was not taken into account in this study. But in USA the protective effect of the SES on children obesity has been found less in Black than in White (Assari, 2018). Another study which the interaction terms indicated that Black and Asian children living in families with higher incomes are also at the higher risk obesity than white children in the USA (Pfingst, 2010).

Soskolne examined the childhood obesity and found that low SES as a protective factor for obesity (Soskolne et al, 2018).

A mother who was born in a country has no protective effect on immigrant children obesity. Also, the risk of overweight among Blacks is found to be high (Matrinson et al., 2012).

Considering that there are different ethnic identities in our country especially most of Syrian immigrants this is a deficiency considering different eating and physical activity habits. There may need culturally appropriate strategies are needed to address obesity among children from different racial/ethnic backgrounds

In this study another limitation is “family structure” was not taken into account which child living with single parents or 2 parents. Pfingst showed that obesity is more common in children of single mothers compared to children staying with parents. (Pfingst, 2010).

In Turkey, “healthy living center” and “obesity centers” established at primary health care level and at the hospitals. At the primary health care family physicians who examined the obese person according to their clinical guideline which includes information on the children obesity and sent to healthy living centers for nutrition consultancy and therapy. If obese person has referral criteria, they sent to the obesity center at the hospitals.

Although a number of other pathologies like type 2 diabetes, respiratory diseases, metabolic syndrome, fatty liver develop with obesity in childhood (Casado de Frias E, 2006), in this study additional health problem, co morbidity did not ask.

Other enabling factors are revealed weight gain above the level recommended during pregnancy and a higher weight at birth who are did not concern in this study.

Salsberry and Reagan (2005) indicated that efforts for preventing overweight should begin in early childhood even before conception. Whitaker’s (2004) findings showed that interventions against child obesity should start at birth, especially if the mother is obese. Clinical implications suggest that children at risk of obesity should be screened early as part of primary prevention and interventions efforts.

Children obesity/overweight have developed prior to school age and mostly continued through childhood. Obesity in children starts in the preschool period and continues the preschool period. In order for the work to be done to be effective, interventions should start in early childhood.

In the prevention efforts for the childhood obesity hereditary should also be taken into account with in addition to factors such as parental education, SES, environmental (available some unhealthy foods and recreational area ext.) to help weight gain,

Another point for attention on childhood obesity is affected by cultural differences. Sobal pointed out that obesity and SES relationship changes as a cultural differences and development patterns. While being overweight or obesity is better in developing countries, thinness is considered better in developed modern countries. The

relationship between SES and obesity may give an idea about the overweight in some societies (Sobal, 1991).

Also, Caprio et al. thinks that culture influences the risk of childhood obesity also cultural differences may explain in disparities developing childhood obesity. However, culture is dynamic and changing rapidly. It shows that additional studies are needed to demonstrate the cause-consequences relationship between the culture and childhood obesity.

Obesity is also important issue because of a cause of stigmatization for people. Causes of obesity are complex which are consist of dietary patterns, lifestyle, genetic, psychological, sociocultural, economic, and environmental factors.

Interventions should include reducing the marketing pressure on children, high tax for foods which high fats, sugar and salt and providing better access to cheap and healthy food. Walking and cycling paths and wide recreation areas and parks are needed in all cities. The interventions should give children healthy behavior at an early age.

There is need to evaluate programs not only at some settings like schools, especially economic, education policies, environmental and evidence-based interventions. Hence, the strategies that should consider the effects of many socio-economic, demographic, and environmental items on childhood obesity including overweight. It would be the most effective way to prevent and manage this multifactorial health concern.

As discussed in this study, in developed countries, childhood obesity is less common in households with high SES, while in developing countries it is more common in households with high SES. In the study, we found that as SES increases, childhood obesity increases. In the context of Turkey, this situation may be evaluated with its position in the process of demographic transition. Turkey as a country still in the demographic transition, as SES increases, the child obesity increases as well. However, as Turkey completes its demographic transition this picture reverses as we observed now in most of the developed countries.

Our models reinforce the importance of SES and its components (education of mother and father, occupation of mother and father and welfare of family) for child obesity. In the group with high SES, the target group should be more educated families by increasing their parental awareness. It seems important to regulate their daily life in a way that increases healthy nutrition and physical activity. Educational messages that take into account SES differences in childhood obesity prevention efforts can be enhanced by public support at school and outside. There is a need for further studies to understand the existing uncertainties about the effect of SES on childhood obesity. For this, population and health strategies should be taken into account in macro and micro (obesity) level.

Policy makers should be aware of socio economic situation (SES) and obesity relations. SES can be the main cause of illness. Because SES facilitate accessing to health services, ultimately, the diagnosis and treatment of the diseases are affected. Even if the intervention mechanisms change, the SES relationship with the disease may continue. If these are not taken into account by policy makers, strategic actions result in the implementation of ineffective individual interventions and ultimately in the failure to deliver effective community-based health interventions (Link and Phelan, 1995).

On the other hand, socio-economic situation is important in obesity prevention strategies. Because suggestions for healthy nutrition and increasing physical activity should be applicable by the society. If it is not possible to access recommended healthy food and drinks and physical activity facilities for health (e.g. if healthy foods are expensive, if sports facilities like swimming pool are not free of charge, if the city plan is not suitable for walking and cycling), it will not be possible even if the developed strategies are requested by the public.

In our country, obesity treatment is covered by the Social Security Institution (SSI). Obesity diagnosis and treatment at the primary health care is provided by free or charge. Also, at the secondary healthcare level, obesity diagnosis and treatment are provided including BMI 35 plus co morbidity and over BMI 40 surgical treatment. So, the main issue seems to be in the regulation of fiscal policies to implement the

interventions which are agricultural, taxation, urban planning etc. for disease prevention and control.

Another main issue is the need for multi-sectoral approach for prevention and control of NCDs with risk factors and obesity. In Turkey Ministry of Health conducted *Adult, Childhood Obesity Prevention and Physical Activity Action Plan* and all sectors should support the implementation of the action plan.

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